



MARINE MAMMAL COMMISSION

12 January 2016

Ms. Jolie Harrison, Chief
Permits and Conservation Division
National Marine Fisheries Service
Office of Protected Resources
1315 East-West Highway, Room 13635
Silver Spring, MD 20910

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Municipality of Anchorage, through its Port of Anchorage (POA) department, seeking an incidental harassment authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA). POA is seeking authorization to take small numbers of marine mammals by harassment incidental to a test pile program in Anchorage, Alaska, during a one-year period¹. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 16 December 2015 notice (80 Fed. Reg. 78176) announcing receipt of the application and proposing to issue the authorization subject to certain conditions.

Background

POA is proposing to conduct a test pile program as part of the Anchorage Port Modernization Project. The purpose is to obtain representative pile installation and capacity data near the area of the future pier-head line. POA would install 10 48-in steel pipe piles using a vibratory and impact hammer. Eight of the piles would remain and be incorporated into the new port design, while two piles would be cut off at the mudline. The activities would occur for up to 31 days during daylight hours only.

NMFS preliminarily has determined that the proposed activities could modify temporarily the behavior of small numbers of up to five species² of marine mammals, but that the total taking would have a negligible impact on the affected species or stocks. NMFS does not anticipate any take of marine mammals by death or serious injury. It believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of POA's proposed mitigation measures. The mitigation, monitoring, and reporting measures include—

- (1) using and testing the efficacy of various sound attenuation devices (e.g., pile cushions, resonance-based systems, and bubble curtains);

¹ The authorization would be valid from 1 April 2016 until 31 March 2017, but all pile driving is expected to be completed by 1 July.

² The Commission understands that NMFS plans to increase the number of harbor seal takes to 62 and decrease the harbor porpoise takes to 31.

- (2) collecting in-situ sound source, sound propagation, and ambient sound measurements and adjusting the Level A and B harassment zones, as necessary;
- (3) using standard ramp-up, delay, power-down, and shut-down procedures;
- (4) prohibiting pile driving during low-light hours or poor weather if the extent of the Level A harassment zone cannot be monitored adequately;
- (5) implementing additional delay and shut-down procedures if a beluga whale calf or an aggregation of five or more beluga whales is observed approaching or within the disturbance zone;
- (6) ceasing pile driving if authorized numbers of takes for any marine mammals are met or exceeded;
- (7) using up to four (shore- and vessel-based) marine mammal observers to monitor the Level A and B harassment zones 30 minutes before, during, and 30 minutes after the pile-driving activities;
- (8) reporting injured and dead marine mammals to NMFS and the Alaska Regional Stranding Coordinators using NMFS's phased approach and suspending activities, if appropriate; and
- (9) submitting a final comprehensive report to NMFS.

Inadequate basis for issuance of beluga whale incidental take authorizations

As indicated in previous letters regarding proposed incidental harassment authorizations for other sound-producing activities in Cook Inlet³, the Commission remains concerned about the potential impacts of anthropogenic activities on the endangered Cook Inlet beluga whale population. The Commission has recommended that NMFS defer issuance of incidental take authorizations and regulations until it has better information on the cause or causes of the ongoing decline of beluga whales and has a reasonable basis for determining that authorizing additional takes by harassment would not contribute to or exacerbate that decline. Consistent with these concerns, the Commission once again recommends that NMFS defer issuance of any incidental take authorizations or regulations to POA or any other applicant proposing to conduct sound-producing activities in Cook Inlet until such time that NMFS can, with reasonable confidence, support a conclusion that those activities would affect no more than a small number of Cook Inlet beluga whales and have no more than a negligible impact on the population. That conclusion should be based on clear and consistent criteria regarding the MMPA's small numbers and negligible impact standards, which currently do not exist. Therefore, the Commission further recommends that, before issuing any further authorizations such as the one requested here, NMFS develop a policy that sets forth clear criteria and/or thresholds for determining what constitutes small numbers and negligible impact for the purpose of authorizing incidental takes of marine mammals. The Commission would welcome the opportunity to discuss that policy as it is being developed.

Programmatic environmental impact statement

The Commission is concerned that NMFS is continuing to propose and issue authorizations for the incidental taking of Cook Inlet beluga whales without adequate consideration of the combined or cumulative impacts of current and planned activities on this population. In the

³ See the Commission's 21 October 2011, 9 January 2013, 31 January 2014, 4 April 2014, 9 May 2014, 14 September 2014, 13 April 2015, 20 April 2015, and 24 July 2015 letters.

Commission's 14 July 2015 letter on NMFS's Draft Cook Inlet Beluga Whale Recovery Plan, the Commission recommended that NMFS place annual limits on the total number and types of incidental takes authorized, based on the most recent population estimate. In addition, the Commission believes that NMFS should draft and finalize its programmatic environmental impact statement (PEIS) on the issuance of incidental take authorizations in Cook Inlet (notice of intent published on 14 October 2014, 79 Fed. Reg. 61616) before issuing any additional authorizations. For these reasons, the Commission recommends that NMFS finalize its PEIS and establish annual limits on the total number and types of takes that are authorized for sound-producing activities in Cook Inlet before issuing any additional incidental take authorizations or regulations.

If NMFS decides to issue the requested authorization, notwithstanding the Commission's recommendation, the Commission has the following additional concerns regarding the proposed authorization.

Beluga whale takes

Based on the *Federal Register* notice, NMFS proposed to authorize up to 32 takes by Level B harassment for beluga whales during POA's pile-driving activities. POA estimated 20 beluga takes⁴ based on the site-specific densities and the associated ensonified areas of each test pile location and then requested authorization for an additional 12 takes⁵ to account for the possibility of a single large group occurring in the project area during the activities⁶. The Commission finds the requested level of taking to be unusually high since the proposed activities could occur on only 31 days, with approximately 27 hours of pile driving⁷. For SAE Exploration, Inc. (SAE), NMFS authorized up to 30 takes by Level B harassment for seismic activities that could occur 24 hours per day for up to 160 days. Although the densities for beluga whales in POA's project area are greater than SAE's, both activities would occur in Critical Habitat 1 and the ensonified area for SAE's activities⁸ is 100 times greater than POA's area⁹. The Commission wonders why in this instance NMFS is proposing to authorize a substantially greater number of beluga takes than were calculated, while it appears that NMFS is underestimating the potential number of beluga takes in other instances—NMFS has capped the beluga whale takes at 30¹⁰ for previous seismic activities. In those instances, a specific level of taking has been authorized irrespective of the potential number of takes that were estimated based on the proposed activities. Accordingly, the Commission recommends that NMFS adopt a consistent approach when determining the potential number of takes of beluga whales in Cook Inlet for future incidental take authorization applications regarding sound-producing activities.

⁴ Rounded up from 19.245 takes.

⁵ Rounded up from 11.1 takes.

⁶ The Commission understands that, due to POA including the incorrect number of days of activities (43.5 days were included rather than the proposed 31 days) and some rounding issues (summing fractions of takes across days and then rounding up) in the take calculation, NMFS likely will authorize only 24 takes of beluga whales—13 of those takes were based on the revised calculation plus an additional 11 takes based on the possibility of single large group occurring in the project area during the proposed activities.

⁷ With additional restrikes possible.

⁸ Ranging from 1,808–2,126 km².

⁹ Ranging from 15.54–22.14 km².

¹⁰ Seismic operators (i.e., SAE, Apache Alaska Corporation) base these takes on the daily ensonified area x the density in that area and then summed across all the days of the survey activities until 30 takes are reached, meaning some areas may not be surveyed if the allotted takes are met.

Mitigation and monitoring measures

NMFS proposed to require POA to implement delay and shut-down procedures if a beluga whale calf or an aggregation of five or more beluga whales is observed approaching or within the Level B harassment zone¹¹. In previous incidental harassment authorizations, NMFS has required that the action proponent implement delay and shut-down procedures if a single beluga is observed approaching or within the Level B harassment zone. Those requirements have been associated with the use of airguns and sub-bottom profilers (both chirps and boomers). In addition, NMFS has required that action proponents implement delay and shut-down procedures if five or more harbor porpoises or killer whales are observed approaching or within the Level B harassment zone. It is unclear if NMFS believes those measures are not relevant to impact and vibratory pile-driving activities or if NMFS believes those measures are now unnecessary in general. Therefore, the Commission recommends that NMFS require POA to implement delay and shut-down procedures if a single beluga or if five or more harbor porpoises or killer whales are observed approaching or within the Level B harassment zones for impact and vibratory pile driving or provide sufficient justification regarding why implementation of those procedures is not necessary for the proposed activities. In either case, those procedures should be incorporated consistently into future proposed incidental harassment authorizations.

The Commission hopes you find its letter useful. Please contact me if you have questions regarding these recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

¹¹ Based on either the 160- or 125-dB re 1 μ Pa threshold, the latter has been adjusted from 120-dB re 1 μ Pa based on ambient conditions.

Submitted via email

January 15, 2015

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*Re: Proposed One-Year Authorization for Port of Anchorage to Take Marine Mammals
Incidental to Pile Driving in Cook Inlet, Alaska*

Dear Ms. Harrison:

On behalf of the Center for Biological Diversity and The Humane Society of the U.S., and our millions of members and activists, I welcome the opportunity to submit comments on the National Marine Fisheries Service's ("NMFS") proposed one-year authorization to take small numbers of marine mammals by harassment incidental to pile driving activities conducted by the Port of Anchorage ("POA") in Cook Inlet, Alaska between April 1, 2016 and March 31, 2017. *See* 80 Fed. Reg. 78176 (December 16, 2015).

Our organizations strongly oppose the issue of a one-year authorization.

This new proposal raises significant concerns, including the long-term and cumulative effects on endangered Cook Inlet beluga whales. Pile driving produces some of the loudest anthropogenic high-intensity sounds in the marine environment.¹ The pile driving threatens marine mammals, including beluga whales, by displacing them from key foraging habitat, causing hearing loss, masking communications, and interfering with natural behaviors.

As NMFS is well aware, the population of Cook Inlet beluga whales has declined precipitously in the last 30 years. In 1979, the estimated population of Cook Inlet beluga whales was approximately 1,300.² By 2014, the population had dropped over 75 percent, to only 340 whales.³ Despite a cessation of subsistence hunting in 2006, the population of Cook Inlet beluga whales has not rebounded. In fact, it declined at an average rate of 0.4 percent per year over the

¹ Gedamke, Jason and Amy R. Scholik-Schlomer, Overview and summary of Recent Research into the Potential Effects of Pile Driving on Cetaceans (2011).

² NMFS, Conservation Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*) (2008).

³ Shelden, K.E.W., Sims, C.L., Vate Brattström, L., Goetz, K.T., and Hobbs, R.C., AERIAL SURVEYS OF BELUGA WHALES (*DELPHINAPTERUS LEUCAS*) IN COOK INLET, ALASKA, JUNE 2014, available at <http://www.afsc.noaa.gov/Publications/ProcRpt/PR2015-03.pdf>.

past decade.⁴ NMFS listed the Cook Inlet beluga whale as endangered in October 2008 and designated 3,016 square miles of critical habitat in April 2011. 73 Fed. Reg. 62919 (Oct. 22, 2008); 76 Fed. Reg. 20180 (Apr. 11, 2011).

NMFS recently acknowledged the precarious state of Cook Inlet beluga whales when it proposed issuing a programmatic environmental impact statement that would analyze the multitude of anthropogenic activities (including the expected increase in activities) over multiple years, expressing “concern” about the “lack of recovery” of the whales. 79 Fed. Reg. 67616, 61617 (Oct. 14, 2014). NMFS has also admitted that “[i]t is not known what specific factor or combination of factors continue to limit [the Cook Inlet beluga] population’s growth.”⁵ Notably, NMFS has not yet issued a recovery plan for Cook Inlet beluga whales as required by the Endangered Species Act (“ESA”). Although NMFS began its development in 2010, it has yet to finalize a recovery plan. While we understand the complexity of the issues in the recovery plan – and NMFS’s fiscal and resource constraints in reviewing it – we nonetheless urge NMFS to issue and finalize a recovery plan.

Despite the lack of final recovery plan for – and continued decline of – Cook Inlet beluga whales, the agency is now prepared to issue POA a one-year authorization under the MMPA to take beluga whales and other marine mammals. NMFS has also issued proposed IHAs that would allow at least five companies – Apache, Furie, SAExploration, Bluecrest, and Buccaneer – to take marine mammals incidental to seismic surveys and drilling in Cook Inlet, contributing to the cumulative noise impacts on beluga whales and other marine mammals.

A one-year rule affecting the Cook Inlet beluga population is inappropriate at this time given the continued decline of beluga whales with no clear indication of the primary causes for that decline, and the lack of (1) a final recovery plan for beluga whales, several years after the recovery team was established and a draft recovery plan was submitted to NMFS; (2) a programmatic environmental impact statement (“EIS”) for human activities in Cook Inlet that have the potential to result in takes of beluga whales; (3) data – or even a monitoring plan – to better understand the year-round distribution of beluga whales and the individual and cumulative effects of human activities in Cook Inlet; and (4) an analysis of the subsequent impacts on the Cook Inlet beluga whale of the construction and operation of the Anchorage Port Modernization Project (APMP), which would not be built but-for the activities in the current proposal. The manifest deficiencies in the proposed rule are discussed in further detail below.

This proposed one-year rule also departs from the agency’s new focus on cumulative impact management of the Cook Inlet beluga population – a focus that was reflected in its November 2014 workshop – and is profoundly disappointing.

⁴ *Id.*

⁵ NMFS, Conservation Plan at 2.

Our organizations endorse the U.S. Marine Mammal Commission’s (“Commission”) repeated recommendation that NMFS “defer issuance” of any “take authorization[] until it has better information on the cause or causes of the ongoing decline and has a reasonable basis for determining that authorizing additional takes by harassment would not contribute to or exacerbate that decline.”⁶

We strongly urge NMFS not to authorize the take of *any* Cook Inlet beluga whales until, at a minimum, it:

- 1. Implements a recovery plan with research priorities;**
- 2. Issues a comprehensive EIS that addresses cumulative impacts to the Cook Inlet beluga;**
- 3. Adopts a comprehensive monitoring plan; and**
- 4. Conducts an analysis of the cumulative effects of the Test Pile Program and subsequent construction and operation of the Anchorage Port Modernization Project (APMP).**

Without this information and data relevant to the management of Cook Inlet belugas we believe that, at a minimum, NMFS cannot make a finding of “negligible impact” as the MMPA requires.

Deficiencies in NMFS’s Analysis and Determination

NMFS’s proposed rules contains a number of serious deficiencies, some of which are described below.

A. Negligible Impact and Small Numbers

Our organizations echo the concerns repeatedly expressed by the Commission that “any activity that may contribute to or that may worsen the observed decline [of Cook Inlet beluga whales] should not be viewed as having a negligible impact on the population.”⁷ The take of 32 beluga whales per year [19.245 (density method) plus 12 (large group method)] – on a declining population – may result in a greater than negligible impact on Cook Inlet belugas. Not only is the take of these whales potentially significant, but the habitat impacted by POA’s activities is “Type 1” habitat, also termed “High Value/High Sensitivity” and includes what NMFS believes to be the most important and sensitive areas of the Cook Inlet for beluga whales. 80 Fed. Reg. 78180. While the area directly impacted by the Test Pile Activities is excluded from critical habitat designation due to national security reasons, noise is a primary constituent element of

⁶ Comments from Rebecca Lent, Executive Director, Marine Mammal Commission, to Jolie Harrison, Chief, Permits and Conservation Division, NMFS Office of Protected Resources re: seismic surveys in Cook Inlet (September 4, 2014). See also letters from the Commission to NMFS dated 21 October 2011, 9 January 2014, 31 January 2014, 4 April 2014 and 9 May 2014. Those letters are hereby incorporated by reference.

⁷ Comments from Rebecca Lent, Executive Director, Marine Mammal Commission, to Jolie Harrison, Chief, Permits and Conservation Division, NMFS Office of Protected Resources re: seismic surveys in Cook Inlet (September 4, 2014).

beluga whale critical habitat and pile driving activities will negatively affect the species' critical habitat and population.

NMFS states that the onset of pile driving could result in behavioral changes that are “difficult to predict,” yet could be biologically significant if the change affects growth, survival, or reproduction. In order to make an informed negligible impact determination, NMFS must obtain data on behavioral modification and analyze it. Also, NMFS underestimates the harm from pile driving under the assumption that the activities will only involve intermittent pile driving, thus producing only 22 hours of pile driving. Authorizing take based on this assumption underestimates actual take which will occur over a much greater amount of time. For example, marine mammals have been noted to cease communications and echolocation activities for two to three days in an area after pile driving.⁸

Compounding its “small numbers” and “negligible impact” determination is the fact NMFS continues to improperly estimate take. As noted in previous letters, NMFS calculates beluga take using a predictive habitat density model (Goetz et al. 2012) that is based on data from 1-2 summer months and that is expressly confined to summer distribution, when belugas are generally concentrated in the Upper Inlet, even though POA's activity would occur over a one-year period. Moreover, while NMFS buffered the exposure estimate “by adding the estimated size of a notional large group of beluga whales [In order to] to reduce risk to the Test Pile Program of the unintentional take of a larger number of belugas that would be authorized by using the density method alone,” NMFS only adds 12 beluga whales to its estimate. NMFS makes this determination despite acknowledgment that “large groups of belugas were regularly seen in the area over the past 7 years, and that group size ranged as high as 100 whales.” 80 Fed. Reg. 78194.

NMFS acknowledges that the generic sound thresholds it currently employs to determine when an activity might cause harassment to marine mammals is imprecise, yet continues to use the 190dB and 160/125 dB levels (impact/non-impact) as thresholds for Level A and Level B harassment. NMFS currently in the process of revising and updating its acoustic thresholds “to incorporate newer science and utilize improved methods.” The new criteria will likely increase the estimated number of beluga whales and other marine mammals that could be disturbed by exploratory activities, and in some cases the increased level of disturbance could be large. It is irrational to proceed with outdated thresholds when NMFS already has developed a more appropriate method. NMFS should not issue further take authorizations until it has completed its revision of acoustic thresholds for Level B take.

Current scientific literature establishes that behavioral disruption can occur at substantially lower received levels for some species, including species that will be impacted by the proposed survey here. For example, a single seismic survey has been shown to cause endangered fin and

⁸ Gedamke & Scholik-Schlomer (2011).

humpback whales to stop vocalizing – a behavior essential to breeding and foraging – and cause other baleen whales to abandon habitat over an area at least 100,000 square nautical miles.⁹ Similarly, a low-frequency, high-amplitude fish mapping device was recently found to silence humpback whales at a distance of 200 kilometers, where received levels ranged from 88 dB to 110 dB.¹⁰ Bowhead whales migrating through the Beaufort Sea have shown almost complete avoidance of seismic airgun received levels at 120 dB to 130 dB and below.¹¹ Modeling showed that pile driving could mask strong bottlenose dolphin vocalizations 10-15 km from the source.¹²

Some odontocetes are highly sensitive to a range of low-frequency and low-frequency-dominant anthropogenic sounds. In 2011, a study found that beaked whales stopped foraging and communicating instead fleeing sonar at levels below what regulators consider disturbance.¹³ Cuvier's beaked whales exhibited alarming behavioral impacts when exposed to sonar at low received levels 89-120db.¹⁴ Harbor porpoises have been observed to engage in avoidance responses 50 miles from a seismic airgun array, a result that is consistent with both captive and wild animal studies showing porpoises abandoning habitat in response to pulsed sounds at very low received levels, well below 120 dB.¹⁵

Although NMFS is clearly aware of these studies showing sound can have significant behavioral impacts to marine mammals well below 160 dB, NMFS irrationally sets the Level B harassment threshold at 160 dB. If NMFS were to modify its threshold estimates, as it must based on the best available science, the estimated number of marine mammal takes incidental to the proposed pile driving would be significantly higher than NMFS's current estimates.

⁹ Clark, C.W., and Gagnon, G.C., Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); *see also* MacLeod, K., Simmonds, M.P., and Murray, E., Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. borealis*) amid oil exploration and development off northwest Scotland, *Journal of Cetacean Research and Management* 8: 247-254 (2006).

¹⁰ Risch, D., Corkeron, P.J., Ellison, W.T., and van Parijs, S.M., Changes in humpback whale song occurrence in response to an acoustic source 200 km away, *PLoS ONE* 7(1): e29741. doi:10.1371/journal.pone.0029741 (2012).

¹¹ Miller, G.W., Elliot, R.E., Koski, W.R., Moulton, V.D., and Richardson W.J., Whales, in Richardson, W.J. (ed.), Marine Mammal and Acoustical Monitoring of Western Geophysical's Open-Water Seismic Program in the Alaskan Beaufort Sea, 1998 (1999); Richardson, W.J., Miller, G.W., and Greene Jr., C.R., Displacement of migrating bowhead whales by sounds from seismic surveys in shallow waters of the Beaufort Sea, *Journal of the Acoustical Society of America* 106:2281 (1999).

¹² David, J.A. Likely sensitivity of bottlenose dolphins to pile-driving noise, *Water and Environment Journal* 20:48-54 (2006).

¹³ Tyack, P.L. et al., 2011. Beaked whales respond to simulated and actual navy sonar. *PLoS one*, 6(3), p.e17009.

¹⁴ DeRuiter, Stacy L. et al., First Direct Measurements of Behavioural Responses by Cuvier's Beaked Whales to Mid-Frequency Active Sonar, *Biology Letters*, 9: 20130223 1 (2013).

¹⁵ *See, e.g.*, Bain, D.E., and Williams, R., Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35).

B. Cumulative Impacts from Multiple Activities in Cook Inlet

NMFS must consider whether the cumulative impacts from proposed activities, “either individually *or in combination*,” may have a greater than negligible impact on the Cook Inlet beluga whale and other marine mammals. 50 C.F.R. § 216.107(f)(2) (emphasis added). The requirement to consider activities “in combination” applies at minimum to all marine and estuarine waters north of 60° N. latitude (50 C.F.R. § 216.103 (definition of “Arctic waters”)) and therefore encompasses virtually the entirety of the beluga’s designated critical habitat.

To satisfy the cumulative impacts analysis requirement, NMFS must consider the cumulative impacts of noise in Cook Inlet, including noise impacts from seismic surveys. These noises are repeatedly impacting the same individuals, and it is imperative that NMFS determine what activities or combination of activities would exceed the cumulative negligible impact threshold. Indeed, we urge the agency in strongest terms to perform such an analysis before any additional MMPA authorizations are issued to take Cook Inlet beluga whales. In this, we echo the Commission, which has repeatedly recommended that NMFS defer take authorizations for the belugas “until it has a better understanding of the factor or factors that are causing or contributing to the observed population trend or until the population begins to demonstrate sustained growth.” As the Commission noted, deferral is particularly appropriate since NMFS has not ruled out the possibility that the “combined, aggregate, or cumulative disturbance associated with the broad suite of activities occurring in the Inlet (e.g., oil and gas exploration, development, and production, port construction, shipping, coastal development, military activities, fisheries, etc.) is the cause or a significant contributor to the continued 10-year decline of this endangered population.”¹⁶

In addition, NMFS must properly analyze the impacts of the subsequent port modernization on marine populations and species. The pile driving in this authorization will spawn further port construction and traffic, and these cumulative effects will be long-lasting. As detailed in the notice of proposed IHA, “[s]ubsequent incidental take authorizations will be required to cover pile driving under actual construction associated with the APMP. Construction is anticipated to last five years.” 80 Fed. Reg. 78176. The modernized port, in turn, will result in increased vessel traffic and harassment of marine mammals, including beluga whales. Despite this, NMFS makes no serious effort to analyze the cumulative population-level effects of these impacts.

Deferral – or, at a minimum, full consideration of cumulative effects – is particularly important here in light of increasing activities impacting beluga whales in Cook Inlet. In addition to POA’s proposal, there is a growing interest in oil and gas exploration and development. NMFS has proposed five IHAs that would authorize the take of marine mammals incidental to seismic surveys and drilling in Cook Inlet. Before issuing any additional marine mammal takes, NMFS must consider whether the cumulative impacts from these proposed activities, on top of POA’s

¹⁶ Comments from R. Lent, MMC Executive Director, to P. Michael Payne, Chief of Permits and Conservation Division, NMFS (Jan. 31 2014).

authorization, are having “either individually or in combination” a greater than negligible impact on the Cook Inlet beluga whale and other marine mammals. To that end, we urge NMFS to issue its programmatic EIS under NEPA, as well as its recovery plan under the ESA, which would address direct, indirect, and cumulative impacts of anthropogenic activities on Cook Inlet beluga whales.

Conclusion

Given the manifest deficiencies in the proposed rule, the imperiled status of the beluga population, the population’s continued decline, the lack of recovery plan, and the failure to consider cumulative impacts, we urge the agency to conclude that a one-year authorization is inappropriate at this time.

As always, we welcome the opportunity to discuss these issues with you and your staff. For further discussion, please do not hesitate to contact me at (510) 844-7109 or ejeffers@biologicaldiversity.org.

Sincerely,

/s Emily Jeffers

Emily Jeffers
Staff Attorney, Oceans Program
Center for Biological Diversity

Sharon B. Young
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The Humane Society of the U.S.

January 15, 2016

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VIA EMAIL (ITP.Pauline@noaa.gov)

Re: Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Test Pile Program

Dear Ms. Harrison:

Friends of Animals (FoA) submits these comments on the *Taking of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Test Pile Program*.¹ The proposed action to grant the Port of Anchorage's request for an Incidental Harassment Authorization (IHA) would violate the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the National Environmental Policy Act (NEPA). FoA requests that National Marine Fisheries Service (NMFS) deny the IHA due to the legal, ecological, and ethical ramifications that such an issuance would have on the endangered Cook Inlet beluga whales in the area. We also ask that NMFS cease permitting any anthropogenic activities in Cook Inlet until an Environmental Impact Statement (EIS) analyzing the effects of takes on Cook Inlet marine mammals is completed.

BACKGROUND AND THE PORT OF ANCHORAGE PROJECT

The Cook Inlet is a long, narrow body of water that extends from Anchorage, Alaska to the Gulf of Alaska, northeast of the Aleutian Islands. The area is known for its unpredictable tides and weather, as well as its growing human presence. Cook Inlet is home to the genetically distinct, small population of Cook Inlet beluga

¹ Friends of Animals is an international nonprofit advocacy organization, incorporated in the state of New York since 1957. With nearly 200,000 members worldwide, FoA advocates on behalf of animals both domestic and free-living. FoA has commented on numerous federal actions regarding Cook Inlet marine mammals, and specifically, Cook Inlet beluga whales.

whales, whose numbers have fallen greatly over the years. Cook Inlet is now home to only 340 beluga individuals.²

A. Cook Inlet Beluga Whales.

Beluga whales are part of the family of toothed whales and are related to narwhals. Belugas are small whales, with very rotund heads, and stark white skin. They can weigh up to 3,000 pounds and can be as long as 15 feet.³ Belugas live on average for 40 years, with females breeding after age four, producing one calf every couple of years.⁴ They use echolocation to locate their prey and feed on fish and some other species, such as crabs and squid.⁵ The Cook Inlet population does not migrate.⁶

A recent study shows that belugas live mainly in the upper parts of the Inlet during the summer months, and then they shift further south in the fall, winter, and spring.⁷ The belugas' summer range has substantially decreased in recent years.⁸

The Cook Inlet beluga whale population has suffered great losses over the past few years; the population decreased 75% since 1979.⁹ Even after subsistence hunting, the main threat to the population, was banned in 1999, the population still failed to recover.¹⁰ The lack of recovery of this special population of whales means that other factors besides subsistence hunting are involved in the population decline. Furthermore, threats to Cook Inlet beluga whales are exacerbated by the whales' already small population size, and their tendency to congregate together in areas.¹¹ Small populations are more vulnerable to even seemingly normal

² National Marine Fisheries Service, "Draft Recovery Plan for the Cook Inlet Beluga Whale," *NOAA Fisheries*, May 15, 2015,

<http://alaskafisheries.noaa.gov/protectedresources/whales/beluga/recovery/draft-cibrecoveryplan051515.pdf> ("Recovery Plan") at 1.

³ See Center for Biological Diversity, "Natural History", *Center for Biological Diversity*, http://www.biologicaldiversity.org/species/mammals/Cook_Inlet_beluga_whale/natural_history.html.

⁴ *Id.*

⁵ *Id.*

⁶ *Id.*

⁷ See Marc Lammers, et al, "Passive acoustic monitoring of Cook Inlet beluga whales (*Delphinapterus leucas*)," *The Journal of the Acoustical Society of America*, 134(3) (2013): 2497-2504 (attached as Exhibit 2).

⁸ Center for Biological Diversity.

⁹ Species in the Spotlight: Cook Inlet Beluga Whale. NOAA Fisheries.

http://www.fisheries.noaa.gov/stories/2015/05/spotlight_cook_inlet_beluga_whale.html.

¹⁰ See L. Lowry, G. O'Corry-Crowe, & D. Goodman, "*Delphinapterus leucas* (Cook Inlet subpopulation)," *The IUCN Red List of Threatened Species*, Version 2015.2,

<http://www.iucnredlist.org/details/61442/0>.

¹¹ *Id.* and Recovery Plan at 73.

fluctuations in their environment and also risk loss of genetic viability.¹²

NMFS has long been involved with the Cook Inlet beluga whales. In 2008, they listed the population as endangered under the ESA, and they designated critical habitat in 2011. At the end of 2014, NMFS announced their intent to prepare an EIS in order to analyze the effects of Incidental Take Authorizations on marine mammals in Cook Inlet from human-led activities. In May of 2015, they released the Cook Inlet Beluga Whale Draft Recovery Plan (“Recovery Plan”) in hopes of better understanding why the population is not recovering and how they can best aid it moving forward. The Recovery Plan includes ten threats to Cook Inlet beluga recovery, ranging from low to high concern. Two high concern threats with unknown and potentially high magnitude, noise and cumulative/synergistic effects, are both likely to be products of the proposed Port of Anchorage action.¹³

Also in May of 2015, NOAA launched a year-long awareness and agency collaboration campaign, Species in the Spotlight: Survive to Thrive, which features eight endangered species, including the Cook Inlet beluga whale. Additionally, NMFS also held a public comment period on the proposed preparation of annual Environmental Assessments (EA) in order to analyze the effects of incidental taking of marine mammals from anthropogenic activities in Cook Inlet, as well as the proposed implementation of an annual permitting cycle. Lastly, NMFS held a comment period on a revised version of a guidance document that lays out the effects of human-produced sound on marine mammals. Yet, despite taking all of these actions on behalf of the Cook Inlet beluga whales and highlighting, in many of its own documents, the possible detrimental effects of noise, NMFS continues to permit Level B takes of Cook Inlet belugas.

B. Port of Anchorage Request to Take Cook Inlet Beluga Whales.

The Port of Anchorage department of the Municipality of Anchorage has requested an IHA for Cook Inlet belugas and other marine mammals from March 2016-2017 for its Test Pile Program as part of a larger Anchorage Port Modernization Project. If granted, the IHA would authorize Level B takes for 32 Cook Inlet beluga whales.¹⁴ Level B takes have “the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, feeding, or sheltering.”¹⁵

¹² Lowry, O’Corry-Crow, & Goodman.

¹³ Recovery Plan at 75.

¹⁴ 80 Fed. Reg. 78194 (Dec. 16, 2015).

¹⁵ 16 U.S.C. § 1362(18).

The project in question involves the installation of ten test piles, which is expected to be completed by July 2016, but would have a valid IHA until March of 2017.¹⁶ Both vibratory and impact pile-driving will be part of the project and have “potential to affect marine mammals within the waterways adjacent to the POA.”¹⁷ The piles will be thrust 175 feet into the ground using both vibratory and impact techniques; the pile driving will also involve the use of cranes, floating barges, and tugs.¹⁸

ISSUING THE IHA WOULD VIOLATE THE MMPA

The Marine Mammal Protection Act (“MMPA”) was enacted in response to Congressional concern that “certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities.”¹⁹ Under the MMPA, it is unlawful to take any marine mammal unless as permitted by statutory exception, 16 U.S.C. § 1371(a), where take is defined as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.”²⁰

One statutory exception permits citizens to take “small numbers of marine mammals of a species or population stock” for “not more than five consecutive years” only if the taking: “(1) will have a negligible impact on such species or stock; and (2) will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses.”²¹ NMFS would violate the MMPA by issuing the IHA for the Port of Anchorage because: (1) a large, not small, number of Cook Inlet beluga whales would be harassed; and (2) the taking would have a significant, non-negligible impact on Cook Inlet beluga whales.

A. Issuing the IHA Would Harass a Large Number of Cook Inlet Beluga Whales.

Under the Marine Mammal Protection Act, “The taking of small numbers of marine mammals under section 101(a)(5)... may be allowed only if the Director of the Fish and Wildlife Service finds, on the best scientific evidence available, that the total taking during the specified time period will have a negligible impact on the species.”²²

The proposed Level B takes by harassment for the project asks for takes of 32 individual beluga whales, which is 9.41% of the population using the 340 estimate

¹⁶ 80 Fed. Reg. 78176.

¹⁷ 80 Fed. Reg. 78177.

¹⁸ *Id.*

¹⁹ 16 U.S.C. § 1361(1).

²⁰ 16 U.S.C. § 1362(13).

²¹ 16 U.S.C. § 1371(a)(5)(A)(i).

²² 50 CFR 18.27(b).

(though NMFS actually states a higher number, 10.2%, using a population estimate of 312).²³ Taking 32 individuals may be a small number for a population of thousands of animals, but it is a large number of animals considering that the Cook Inlet population consists of only 340 individuals. Even when animals are harassed under Level B takes, they may still be injured, possibly to the extent that the injury alters their life processes permanently or even leads to death from prolonged, intense, or multiple exposures to injurious sources. Moreover, individual animals may be taken multiple times by this project or by a combination of this and other projects in the area. NMFS itself notes that “An estimate of the number of Level B takes, alone, is not enough information on which to base an impact determination.”²⁴

B. Issuing the IHA Would Have a Significant, Non-negligible Impact on Cook Inlet Beluga Whales.

NMFS argues that issuing the IHA would have a negligible impact on Cook Inlet beluga whales. FoA disagrees. A taking has a “negligible impact” if it “cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.”²⁵ To determine if a taking will have a negligible impact, NMFS should consider, amongst other things: **(1) The context in which the takes occur (e.g., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/ contemporaneous actions when added to baseline data)**; and (2) The status of stock or species of marine mammals (i.e., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population).²⁶ As explained below, these factors indicate significant non-negligible impact to Cook Inlet beluga whales.

1. The Context in Which the Takes Occur: Impacts to Areas of Significance.

The Port of Anchorage’s proposed activities would negatively impact the beluga’s habitat, an area of significance. The Port lies within Cook Inlet beluga critical habitat but was not designated as such for matters of national security.²⁷ Nonetheless, this area is vital to Cook Inlet beluga life processes. Though excluded from the listing, this habitat within the Port of Anchorage is considered Type 1 Habitat—“High Value/High Sensitivity” habitat, of the utmost importance to these animals.²⁸ Though NMFS notes that the Port of Anchorage “is a relatively low-use

²³ 80 Fed. Reg. 78194 and 78196.

²⁴ *Id.* at 78195.

²⁵ 50 C.F.R. § 216.103.

²⁶ 80 Fed. Reg. 37488 (June 30, 2015).

²⁷ 80 Fed. Reg. 78180 (also citing 76 Fed. Reg. 20180).

²⁸ *Id.*

area” for the whales, studies show that it is used for foraging and travelling by the belugas, with most whales present there in late August and mid-September.²⁹ If the pile driving is not complete by July of 2016, this means that the project’s activities could overlap with the time period with the largest annual beluga presence.

Additionally, NMFS acknowledges that belugas are “highly mobile animals” and that the “probability of observing a beluga whale can change drastically and increase well above predicted values based on season, prey abundance, tide stage, and other variables.”³⁰ “In all years, beluga whales have been observed to enter the project footprint while construction activities were taking place, including pile driving and dredging.”³¹ During these times, belugas dived, travelled, and likely fed; NMFS reports no apparent behavioral changes, but effects to belugas may not always be visible to the naked eye or visible at all (internal injury).³² NMFS has not adequately accounted for this mobility and unpredictability in evaluating the Port of Anchorage’s request for an IHA and its mitigation and monitoring measures, and it should do so before proceeding in making its decision.

2. The Context in Which the Takes Occur: Impacts to the Local Population.

The Port of Anchorage’s proposed activities would negatively impact the local population. As a Distinct Population Segment, any negative impacts to the Cook Inlet population could affect the species as a whole. The potential impacts on the Cook Inlet beluga whales resulting from anthropogenic activities are varied and numerous. They include masking, behavioral changes, stress, hearing loss/hearing threshold shift, and physical or physiological effects.

Anthropogenic noises can severely harm a whale’s hearing ability. This is particularly concerning since whales rely on all manner of sound to communicate and navigate. As NMFS itself notes in its Federal Register notice: “Hearing is the most important sensory modality for marine mammals, and exposure to sound can have deleterious effects.”³³ If the noises made by the anthropogenic activities in Cook Inlet are of a similar frequency as a whale’s communication noises, the anthropogenic noises can “mask,” or cover up, the whale’s natural sounds.³⁴ The Lammers study in Cook Inlet concluded that “[a]nthropogenic noise [including that] originat[ing] from . . . industrial/construction activities . . . overlap[ed] in frequency with beluga and killer whale signals and may therefore have contributed to masking

²⁹ 80 Fed. Reg. 78181.

³⁰ *Id.* at 78193.

³¹ *Id.* at 78195.

³² *Id.*

³³ *Id.* at 78182-83.

³⁴ Lammers, et al., at 2497.

[i.e., the covering up of whale noises by anthropogenic ones].”³⁵ “Masking periods varied in duration between a few minutes to the majority of the 24-h day, depending on the [testing] location.”³⁶ At one testing location, the researchers found that for 9.9 and 16.3 hours per day in the summer and winter, respectively, whale communication signals were covered up, or “masked,” by anthropogenic noises.³⁷

Some claim that Cook Inlet belugas have become habituated to anthropogenic noise. This is unlikely. Belugas are particularly sensitive to anthropogenic noises because they have not had as much time to adapt to these noises, as compared to natural noises in their environment.³⁸

In addition to masking, anthropogenic activities can result in noise than can provoke temporary threshold shift (TTS) or permanent threshold shift (PTS). With prolonged or high intensity exposure to noise, marine mammals can lose part of all of their hearing. This can have effects on the ability of the animals to live normal lives. Threshold shift can directly result in permanent damage or contribute to cumulative impacts; “Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing TTS onset might elicit PTS.”³⁹

NMFS asserts that “no marine mammals have shown to experience TTS or PTS as a result of being exposed to pile driving activities” and yet on the same page also admits that “In general, little is known about the potential for pile driving to cause auditory impairment or other physical effects in marine mammals.”⁴⁰

The Lammers et al. study notes that beluga signals can “span a broad range of frequencies.”⁴¹ Their social sounds usually fall below about 12 kHz, but can extend higher; as for echolocation, frequencies normally fall between 40 and 120 kHz.⁴² NMFS cites earlier research (Southall *et al.* 2007), that places belugas in the mid-frequency hearing range, identifying their functional hearing within the 150-160 kHz range.⁴³ The expected frequencies of the equipment that would be used for this proposed project, listed by NMFS in the Federal Register notice, all have the

³⁵ *Id.* at 2501.

³⁶ *Id.*

³⁷ *Id.*

³⁸ L.E. Ogden, “The mysterious squeaks and whistles of beluga whales,” *BBC Earth*, January 20, 2015, <http://www.bbc.com/earth/story/2015/0120-mystery-squeaks-of-beluga-whales>.

³⁹ 80 Fed. Reg. 78184.

⁴⁰ *Id.*

⁴¹ Lammers, et al., at 2498.

⁴² *Id.*

⁴³ 80 Fed. Reg. 78183.

potential to fall within the Cook Inlet beluga whales' hearing range for social sounds (12 kHz or less, using the Lammers standard) and interfere with their hearing.

- 1) Small vessels: 0.25-1.0 kHz
- 2) Tug docking gravel barge: 0.2-1.0 kHz
- 3) Vibratory driving of 72-in steel pipe pile: 0.01-1.5 kHz
- 4) Impact driving of 36-in steel pipe pile: 0.01-1.5 kHz
- 5) Impact driving of 66-in cast-in-steel-shell (CISS) pile: 0.01-1.5 kHz⁴⁴

While effects on individual animals are varied, NMFS notes, citing Yelverton, *et al.*, 1973, that impulse sounds can result in "behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality."⁴⁵

The 2015 NMFS beluga Draft Recovery Plan also addresses the impacts of noise. Specifically, the Recovery Plan lists that there are many noises from anthropogenic activities that can affect the beluga whales. NMFS ranks the noises by order of potential impacts to the belugas. Some of these noises mentioned in the Recovery Plan are expected to be produced by the proposed pile driving program, including the following:

1. Tug boat (the most impactful sound)
3. Small vessel
5. Pile driving (hammering or vibratory)⁴⁶

3. The Context in Which the Takes Occur: Cumulative Impacts.

The Port of Anchorage's proposed activities would result in negative cumulative impacts. As NMFS' Recovery Plan states, "Although individual activities may be deemed insignificant when considered independently, creeping normality (e.g., death by a thousand cuts) can cause substantial adverse effects to nearly any entity, including CI [Cook Inlet] belugas, at both individual and population levels."⁴⁷ Furthermore, although "[a]pplications for Incidental Harassment Authorizations (IHAs) historically have been reviewed on the basis of an individual activity in isolation . . . [the] high level of human activity in Cook Inlet has increased such that cumulative effects of multiple activities must be appropriately accounted for."⁴⁸

Though NMFS's Draft Recovery Plan identifies cumulative impacts as a threat of high concern, for years, NMFS has permitted activities that have caused effects

⁴⁴ 80 Fed. Reg. 78182.

⁴⁵ *Id.* at 78183.

⁴⁶ Recovery Plan at 85

⁴⁷ Recovery Plan at 148.

⁴⁸ *Id.*

that, when taken altogether, greatly threaten the Cook Inlet beluga whales. The Port of Anchorage is only the latest in a string of many requests of Level B takes of Cook Inlet belugas. Since 2012, NMFS has authorized at least 134 counts of Level B take for this population, with two proposed projects' takes still pending.⁴⁹ If those projects, plus this project, receive their requested take authorizations, NMFS will have authorized over 340 takes for a population of 340 animals.⁵⁰ Further, NOAA recently listed 26 different development projects occurring in Cook Inlet beluga habitat, including the Port of Anchorage expansion.⁵¹

In response to FoA's previous comments about cumulative effects on the whales, NMFS wrote that "Neither the MMPA or NMFS's implementing regulations specify how to consider other activities and their impacts on the same populations when conducting a negligible impact analysis."⁵² However, this is not true. NMFS itself has expressed that cumulative impacts should also be considered when determining if an impact is negligible under the MMPA.⁵³ Additionally, regulations state that "An incidental harassment authorization shall be modified, withdrawn, or suspended if, after notice and opportunity for public comment, the Assistant Administrator determines that:

- 1) The conditions and requirements prescribed in the authorization are not being substantially complied with; or
- 2) **The authorized taking, either individually or in combination with other authorizations, is having, or may have, more than a negligible impact on the species or stock or**, where relevant, unmitigable adverse impact on the availability of the species of stock for subsistence uses."⁵⁴

Additionally, the Recovery Plan also speaks of synergistic effects from activities within the Inlet. Synergistic effects are interactions that could arise from the combination of two or more threats.⁵⁵ These interactions could be reasonably

⁴⁹ These numbers were obtained by looking at Federal Register notices; *see also* "Development in Cook Inlet" NOAA, Feb. 3, 2015, <https://alaskafisheries.noaa.gov/protectedresources/whales/beluga/development.htm> (attached as Exhibit 1)

⁵⁰ These numbers were obtained by looking at Federal Register notices.

⁵¹ Though each of these projects used to be listed on NOAA's website, the website has since been re-designed and no longer includes the information about these projects. FoA has attached a copy of the old webpage here as Exhibit 1.

⁵² 80 Fed. Reg. 50995 (Aug. 21, 2015).

⁵³ 80 Fed. Reg. 37488.

⁵⁴ 50 C.F.R. § 216.107(f).

⁵⁵ Recovery Plan at 97.

expected to adversely affect Cook Inlet beluga whales through effect on annual rates of recruitment or survival.⁵⁶

ISSUING THE IHA WOULD VIOLATE THE ESA

The Cook Inlet population of beluga whales is an endangered species, and as such is protected under the ESA. The ESA was enacted in response to Congressional concern that “various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation.”⁵⁷ NMFS can issue permits for incidental take for “otherwise lawful activities”.⁵⁸ However, a permit cannot be issued if the taking will appreciably reduce the likelihood of the survival and recovery of the species in the wild.⁵⁹ Granting the IHA to the Port of Anchorage *would* appreciably reduce the likelihood of the survival and recovery of the species in the wild. This issuance would continue a pattern that has been long-held by NMFS in granting IHAs that have barraged the Cook Inlet belugas with years of noise and other cumulative impacts.

Mitigation of noise and other impacts from this pile driving project are not enough. The inevitable presence of human error, as well as unpredictable environmental conditions, mean that the mitigation strategies proposed cannot fully protect the Cook Inlet belugas from the myriad of threats facing them. NMFS itself notes that “Given the size of the disturbance zone for vibratory pile driving, it is impossible to guarantee that all animals would be observed or to make comprehensive observations for fine-scale behavioral reactions to sound.”⁶⁰ Moreover, if an animal enters into the Level B take area during pile driving, the driving will continue; it is only when the animal enters the Level A area that the driving would halt.⁶¹ Resting the fate of this population of whales on these mitigation strategies is much too large of a gamble to make considering the unknown impacts to the whales and their small, unstable population size.

ISSUING THE IHA WOULD VIOLATE NEPA

NEPA is the “basic national charter for protection of the environment.”⁶² One way in which agencies are held accountable by NEPA is through the creation of an Environmental Impact Statement (EIS). Proposed agency plans that significantly

⁵⁶ *See id.*

⁵⁷ 16 U.S.C. § 1531(a)(1).

⁵⁸ 16 U.S.C. § 1539(a)(1)(B).

⁵⁹ 16 U.S.C. § 1539(a)(2)(B)(4).

⁶⁰ 80 Fed. Reg. 78187.

⁶¹ *Id.* at 78188.

⁶² 40 C.F.R. § 1500.1(a).

affect the human and natural environment necessitate an EIS. At minimum, NMFS must prepare an EIS in order to mitigate undesirable impacts, to weigh alternatives, to communicate all relevant information to the public, and to adequately measure the impacts to the natural environment, wildlife, humans, and their resources that could result from issuing an IHA to the Port of Anchorage.

Preparing an EIS is a requirement for all “major Federal actions significantly affecting the quality of the human environment.”⁶³ Permitting is considered to be a significant action, as determined by the proposed plan’s context and intensity. In evaluating the proposed action’s intensity, agencies must consider “the degree to which the proposed action affects public health or safety; unique characteristics of the geographic area such as...ecologically critical areas; the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; the degree to which the action may establish a precedent for future actions; whether the action is related to other actions with individually insignificant but cumulatively significant impacts; and the degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.”⁶⁴

The possible effects on ecologically critical areas, the degree to which this action may establish a precedent, the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks,⁶⁵ the extent of other actions in the area that can cause cumulative impacts, and the degree to which this action may adversely affect ESA-listed species or habitat all contribute to the proposed action being considered a significant, highly intense action. This means that NMFS must prepare an EIS **before** deciding on whether to authorize any take of Cook Inlet beluga whales.

NMFS MUST CONSIDER THE ETHICAL REASONS NOT TO PERMIT CONTINUED HARASSMENT OF MARINE LIFE

It is time for the NMFS to recognize that individual animals have intrinsic value, and this in turn demands that NMFS incorporate ethics into its consideration of wildlife management activities on public lands and in public waters. There is a growing recognition among conservationists and biologists that ethics must play a greater role in

⁶³ 42 U.S.C. § 4332(2)(C)

⁶⁴ 40 C.F.R. § 1508.27.

⁶⁵ *See e.g.* 80 Fed. Reg. 78190 (acknowledging that, “[t]o date, no studies have been conducted that explicitly examine the impacts to marine mammals from pile driving sounds or from which empirical sound thresholds have been established.”).

wildlife policy.⁶⁶ But as Fox and Bekoff point out: “[w]hile many agree that ethics must play a central role in any project involving [animals], it is often interesting to note that in many books on human-animal interactions . . . there is often no mention of ethics. This needs to change.”⁶⁷ The same must be said for the regulation of animals.

Undoubtedly, discussions in the context of policy development about ethics and animals can make some people uncomfortable. But, of course, just a generation ago it was also unheard of for an agency to even incorporate the humane treatment of animals into its decision-making process. This has changed dramatically. Our generation must now adopt the same approach to educating the decision-makers and the public as to the role of ethics in making wildlife management decisions. Indeed, it is our jobs as conservationists, animal advocates and scientists “to work toward public education and information dissemination to address real and perceived fears held” by others.⁶⁸ What is missing in the NMFS’s current regulations, policies, and environmental analysis is the viewpoint of the animals. Again, from Fox and Bekoff:

The growing body of literature on animal cognition and emotions demonstrates undeniably that animals have interests and points of view. Like us, they avoid pain and suffering and seek pleasure. They form close social relationships, cooperate with other individuals, and likely miss their friends when they are apart. Emotions have evolved, serving as “social glue,” and playing major roles in the formation and maintenance of social relationships among individuals. Emotions also serve as “social catalysts,” regulating behaviours that guide the course of social encounters when individuals follow different courses of action, depending on their situations. If we carefully study animal behaviour, we can better understand what animals are experiencing and feeling and how this factors into how we treat them.⁶⁹

When issuing documents for public comment, NMFS should not merely focus the attention of the public and the decision-maker on the human perspective of the wildlife-human relationship. Instead, it must include a legitimate discussion of ethics, and the rights of wildlife, to assist the reader in fully considering the best alternative to choose to help manage wildlife-human interactions. This approach would be consistent with the purposes of NEPA. In preparing an EIS for the Port of Anchorage’s activities and for all other anthropogenic activities in Cook Inlet, NMFS should provide full and fair discussion of the issues and inform decision makers and the public of the reasonable

⁶⁶ See, e.g., Camilla H. Fox and Marc Bekoff, “Integrating Values and Ethics into Wildlife Policy and Management—lessons from North America,” *Animals*, 1(1) (2011): 126-143.

⁶⁷ *Id.* at 129.

⁶⁸ *Id.* at 128

⁶⁹ *Id.* at 131.

alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment.⁷⁰

CONCLUSION

Marine mammals play an invaluable role in their ecosystems, are an important part of many communities' cultures, bring delight to millions of people worldwide, and have intrinsic values on their own as living creatures. In *Alaska v. Lubchenco*, 825 F. Supp. 2d 209, 216 (D.D.C.), the court concluded that NOAA's decision to list the Cook Inlet beluga whale population as endangered under the ESA was not arbitrary or capricious. The court reasoned that "[t]he absence of an expected change is sometimes indistinguishable from the presence of an observed one. So when the best available science predicts that a recently enacted ban on subsistence hunting will reverse the abrupt depletion of a species, a decade without any noticeable recovery in the species' population should raise a concern that the true cause of its decline has not been fully addressed."⁷¹ NMFS should take the necessary steps to put an end to activities that continue to push the belugas towards extinction. This means ceasing permitting of IHAs and other take authorizations until noise, cumulative impacts, and other effects from anthropogenic activities can be fully addressed in an EIS.

NMFS has an obligation to enforce the MMPA, ESA, and NEPA, to conduct extensive research on anthropogenic activities in Cook Inlet, and to protect wildlife and their habitat from non-negligible impacts. Halting the Port of Anchorage proposed project and preparing a draft EIS for their proposed IHA, as well as an EIS for anthropogenic project takes of beluga more broadly, is the first step to ensure that this duty is upheld. FoA respectfully submits these comments and hopes that NMFS will consider the ethical, ecological, and legal implications of issuing the IHA to the Port of Anchorage.

Sincerely,

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⁷⁰ See 40 C.F.R. § 1502.1.

⁷¹ *Id.* at 212.

Exhibit 1

NATIONAL HEADQUARTERS • 777 POST ROAD SUITE 205 • DARIEN, CT 06820 • T 203 656 1522 • F 203 656 0267

NEW YORK OFFICE • 1841 BROADWAY SUITE 350 • NEW YORK, NY 10023 • T 212 247 8120 • F 212 582 4482

WILDLIFE LAW PROGRAM • 7500 E. ARAPAHOE ROAD SUITE 385 • CENTENNIAL, CO 80112 • T 720 949 7791

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National Oceanic and Atmospheric Administration

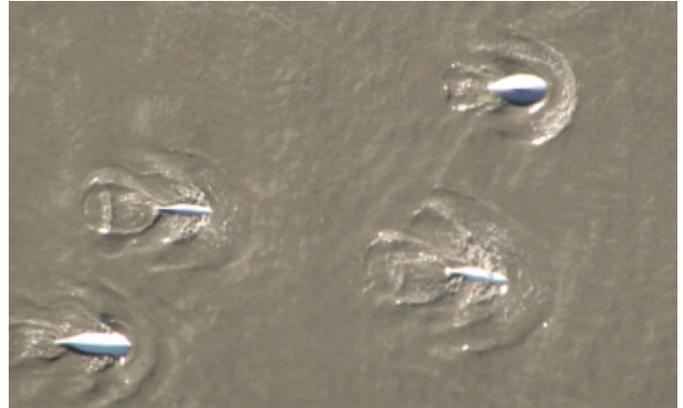
National Marine Fisheries Service, Alaska Regional Office

Cook Inlet Beluga Whales

DEVELOPMENT PROJECTS IN COOK INLET BELUGA HABITAT

PROJECTS:

Anchorage Water and Wastewater Utility
ACS Fiber Optic Cable Project
Buccaneer Alaska Operation
Chuitna Coal Project
City of Palmer Wastewater Treatment Plant
Cook Inlet Mixing Zones
Cook Inlet Oil and Gas
Apache Alaska Corporation - 3D Seismic Program
Bluecrest Alaska Operating, LLC
ConocoPhillipsAlaska
Furie/Escopeta Oil Company - Kitchen Lights Unit
Seismic - Beluga River, Granite Point
State of Alaska Oil and Gas Lease Sales
National Pollution Discharge Elimination System
Diamond Point Granite Rock Quarry
Fort Richardson - US Army
Knik Arm Bridge and Toll Authority (Knik Crossing)
Knik Arm Ferry
ORPC Alaska Tidal Energy Projects
Pebble Mine
Port of Anchorage Expansion
Port MacKenzie
Seward Highway
Ship Creek



Cook Inlet beluga whales. Zoomed image, extracted from experimental footage taken in August 2011, is not part of video used to aid in abundance estimation. Photo: NOAA Fisheries, NMML, permit 14245.

ANCHORAGE WATER AND WASTEWATER UTILITY

Evaluation of the Effects of Discharge Permit Reauthorization on Endangered Species, Final Draft, CH2MHILL, February 2011

ACS FIBER OPTIC CABLE PROJECT

ACS letter to NMFS, February 2008
Alaska Marine Route map
Homer to Gulf of Alaska map
Nikiski to Anchorage map

BUCCANEER ALASKA OPERATION

79 FR 19252, April 08, 2014. Notice of receipt of application from Buccaneer Alaska Operation, LLC for an Incidental Harassment Authorization to take marine mammals, by harassment, incidental to conducting a multi-well offshore exploratory drilling program in upper Cook Inlet during the 2014 open water season. Comment period through May 7, 2014.

CHUITNA COAL PROJECT

NMFS Letter to US Army, November 2011

US Army Letter to NMFS, September 2011

NMFS letter to the EPA, January 2007

Supplemental Environmental Impact Statement (SEIS) Project ([external website](#))

NMFS letter to EPA, October 2007

NMFS letter to EPA, July 2007

NMFS response letter, August 2006

Monthly project report for marine fish and mammal studies - June 2006

Monthly project report for marine fish and mammal studies - April 2006

CITY OF PALMER WASTEWATER TREATMENT PLANT

NMFS letter to Tetra Tech re: threatened and endangered species, March 2012

COOK INLET MIXING ZONES

Endangered Species Act Section 7 Consultation on the U.S. Environmental Protection Agency's Proposed Approval of the State of Alaska's Mixing Zone Regulation Section of the State of Alaska Water Quality Standards, December 20, 2010

COOK INLET OIL AND GAS

Apache Alaska Corporation - Cook Inlet 3D Seismic Program

Incidental Harassment Authorizations

79 FR 45428, August 05, 2014. Notice that NMFS has received a request from Apache Alaska Corporation for authorization to take marine mammals incidental to oil and gas exploration seismic operations in Cook Inlet from March 2015 through February 2020. Comment period through September 4, 2014.

79 FR 13626, March 11, 2014. Notice that NMFS has issued an Incidental Harassment Authorization to Apache Alaska Corporation to take marine mammals, by harassment, incidental to a proposed 3D seismic survey in Cook Inlet. Effective March 4, 2014 through December 31, 2014.

78 FR 80386, December 31, 2013. Notice that NMFS has received an application from Apache Alaska Corporation for an Incidental Harassment Authorization to take marine mammals, by harassment, incidental to a proposed 3D seismic survey in Cook Inlet. Comment period through January 29, 2014.

Order re: Motion for Summary Judgement. The Native Village of Chickaloon, the Natural Resources Defense Council, the Center for Biological Diversity, and the Center for Water Advocacy v. the National Marine Fisheries Service re: issuance of an Incidental Harassment Authorization to Apache Alaska Corporation to conduct seismic surveys in Cook Inlet, Alaska, Case No. 3:12-cv-00102-SLG, May 2013

78 FR 12720, February 25, 2013. Notice that NMFS has issued an Incidental Harassment Authorization to the Apache Alaska Corporation to take marine mammals, by harassment, incidental to a proposed 3D seismic survey in Cook Inlet, Alaska, between March 2013 and March 2014. Effective March 1, 2013 to March 1, 2014.

77 FR 73434, December 10, 2012. Notice that NMFS has received an application from Apache Alaska Corporation for an Incidental Harassment Authorization.

77 FR 27720, May 11, 2012. Notice that NMFS has issued an Incidental Harassment Authorization to the Apache Alaska Corporation to take marine mammals, by harassment, incidental to a proposed 3D seismic survey in Cook Inlet, Alaska, between April 2012 and April 2013. Effective April 30, 2012, to April 30, 2013.

76 FR 58473, September 21, 2011. Notice of an application from Apache Alaska Corporation for an Incidental Harassment Authorization.

Section 7 Biological Opinions

Revised Biological Opinion on the 3-D Seismic Surveys of Cook Inlet, Alaska by Apache Alaska Corporation, February 2013

Revised Biological Opinion on the 3-D Seismic Surveys of Cook Inlet, Alaska by Apache Alaska Corporation, May 2012

Biological Opinion on the 3-D Seismic Surveys of Cook Inlet, Alaska by Apache Alaska Corporation, February 2012

Related Documents

Biological Assessment for Alaska Apache Corporation Cook Inlet 3D Seismic Program, SA Exploration, Inc., August 2011

Draft Environmental Assessment for the Issuance of IHA to Apache Alaska Corporation for Take Marine Mammals Incidental to 3D Seismic Surveys in Cook Inlet, AK, October 2011

NMFS Review of Request for a Letter of Concurrence, March 2011

Bluecrest Alaska Operations, LLC

Incidental Harassment Authorizations

79 FR 54398, September 11, 2014. Notice that NMFS has received an application from Bluecrest Alaska Operating, LLC, for an Incidental Harassment Authorization to take marine mammals, by harassment, incidental to conducting an offshore exploratory drilling program in lower Cook Inlet, AK, during the 2015 open water season. Comment period through October 14, 2014.

ConocoPhillipsAlaska

Class I Liquid Waste Well - Endangered Species Act, Section 7 Consultation

NMFS to EPA letter, June 2009

EPA to NMFS letter, March 2009

Beluga River 3D Seismic Project

72 FR 17118, April 6, 2007. Notice of issuance of IHA's to take marine mammals, by harassment, incidental to conducting seismic operations in the northwest portion of Cook Inlet, Alaska, to ConocoPhillips Alaska, Inc. and Union Oil Company of California for a period between mid-March and mid-June, 2007.

Environmental Assessment of the Issuance of Incidental Harassment Authorizations to ConocoPhillips Alaska, Inc. and Union Oil Company to Take Marine Mammals by Harassment Incidental to Conducting Seismic Operations in Northwestern Cook Inlet, Alaska, March 2007

72 FR 536, January 5, 2007. Notice of proposed authorizations for two incidental take authorizations; request for comments by February 5, 2007.

ConocoPhillips ([external website](#))

Chevron/Union Oil Company Granite Point Onshore/Offshore 3D Seismic Survey

72 FR 536, January 5, 2007. Notice of proposed authorizations for two incidental take authorizations; request for comments by February 5, 2007.

Furie/Escojeta Oil Company, LLC - Kitchen Lights Unit

79 FR 12160, March 04, 2014. NMFS has received an application from Furie Operating Alaska LLC for an Incidental Harassment Authorization to take marine mammals, by harassment, incidental to a proposed 3D seismic survey in Cook Inlet, Alaska, between May 2014 and May 2015. Comment period through April 3, 2014.

Underwater Acoustic Measurement of the Spartan 151 Jack-up Drilling Rig in the Cook Inlet Beluga Whale Critical Habitat, December 2011

Map of Cook Inlet Beluga Whale Critical Habitat and Proposed Kitchen Lights Unit Well Location

Cook Inlet Beluga Whale Biological Evaluation Kitchen Lights Unit, August 2011; Jacobs Engineering Group Inc. for National Marine Fisheries Service; the U.S. Army Corps of Engineers; the Department of the Interior Bureau of Ocean Energy Management, Regulation and Enforcement; and the Alaska Department of Environmental Conservation regarding the potential impacts of an oil spill in the proposed project region.

State of Alaska Correspondence

State of Alaska, Department of Natural Resources (DNR) letter to Escojeta re: AOGCC rig inspection, August 2011

State of Alaska, DNR letter to Escojeta re: jack-up drilling rig, August 2011

NMFS concurrence letter to the US Army Corp of Engineers, August 2011

Trustees for Alaska letter to NMFS and US Army Corp of Engineers, August 2011

Letter from the US Army Corp of Engineers to NMFS with more information, August 2011

Letter from the Trustees for Alaska to the US Army Corp of Engineers, July 2011

NMFS letter to the US Army Corp of Engineers requesting more information, July 2011

Letter from US Army Corp of Engineers to NMFS for an initial consult on the Escopeta Oil Company oil/natural gas well, Kitchen Lights Unit, April 2011

State of Alaska, Department of Natural Resources (DNR), Division of Oil and Gas

DNR Cook Inlet oil and gas lease sales ([external link](#))

Cook Inlet Areawide Lease Sale:

State of Alaska Superior Court Decision on 1999 Cook Inlet Areawide Oil and Gas Lease Sale, May 2000

NMFS letter to DNR, February 2000

NMFS letters to DNR, November 19 and 30, 1999

NMFS letter to DNR, October 1999

NMFS letter to DNR, June 1998

Upper Cook Inlet Seismic Survey

State of Alaska, Alaska Coastal Management Plan Public Notice, Coastal Consistency Review, January 2007

State of Alaska, Alaska Coastal Management Plan Review Start-up Letter, January 2007

National Pollution Discharge Elimination System

72 FR 30377, May 31, 2007. Reissuance of the NPDES general permit for oil and gas exploration, development and production facilities in Cook Inlet

Environmental Protection Agency website with final permit and response to comments ([external website](#))

NMFS comments to EPA on the NPDES Revised Biological Evaluation, October 2006

DIAMOND POINT GRANITE ROCK QUARRY

Notice of Permit Application to the US Army Corps of Engineers, July 2009

NMFS final response letter to US Army Corp of Engineers, September 2009

NMFS request for extension letter to the US Army Corps of Engineers, August 2009

FORT RICHARDSON - US ARMY

Section 7 Consultation Biological Opinion on the Resumption of Year-Round Firing Opportunities at Fort Richardson, AK, May 2011

Letter to NMFS Office of Protected Resources, May 2011

Letter to Ft Richardson, May 2011

Draft EIS for Resumption of Year-Round Firing Opportunities at Fort Richardson, January 2010 ([external website](#))

NMFS letter to U.S. Army about DEIS, June 2010

Biological Assessment of the Cook Inlet Beluga Whale for the Resumption of Year-Round Firing in Eagle River Flats Impact Area, Fort Richardson, Alaska, September 2009

Final Integrated Natural Resources Management Plan, 2007-2011 ([external website](#))

KNIK ARM BRIDGE AND TOLL AUTHORITY: KNIK CROSSING

NMFS letter to the Federal Highway Administration about the Essential Fish Habitat Assessment in the Knik Arm Biological Opinion, November 2010

ESA Section 7 Consultation Biological Opinion: Knik Arm Crossing, November 2010

75 FR 54599, September 8, 2010. Notice of a request from the Knik Arm Bridge Toll Authority, in coordination with the Department of Transportation Federal Highways Administration, for authorization to take marine mammals incidental to construction of a bridge across Knik Arm, named the Knik Arm Crossing, Alaska, over the course of five construction seasons; approximately spring 2013 through autumn 2017. Comment period through October 8, 2010.

Knik Arm Crossing Project ([external website](#))

Beluga Reports ([external website](#))**Final Environmental Impact Statement**, December 2007 ([external website](#))**EPA comments on Knik Arm Crossing Project**, March 2008**NMFS memo on FEIS**, February 2008**NMFS comments on FEIS**, January 2008**NMFS comments on Draft EIS**, November 2006

71 FR 49433, August 23, 2006. NMFS has received a request from the Knik Arm Bridge and Toll Authority (KABATA) for an authorization to take small numbers of marine mammals, by harassment, incidental to construction of the Knik Arm Bridge at the Knik Arm Crossing in Alaska during the period 2007 through 2012.

KNIK ARM FERRY

State of Alaska, Division of Coastal and Ocean Management letter on closure of project review file, (ferry construction application withdrawn from US Army Corp of Engineers), June 2009

Knik Arm Ferry Project (removed from <http://www.matsugov.us/>)**NMFS letter to U.S. Army Corps of Engineers**, February 2009**NMFS letter to U.S. Army Corps of Engineers**, May 2007**NMFS letter to Anchorage Port Director**, January 2007**NMFS response to the U.S. Army Corp of Engineers Public Notice**, November 2006**NMFS letter to Federal Transit Administration on the Supplemental EA and EFH Assessment**, October 2006**NMFS letter to Port Director**, September 2006- **Matanuska-Susitna Borough response to cancel the public boat launch**, October 2006**NMFS letter to the Federal Transit Administration**, April 2003Environmental Assessment (removed from <http://www.matsugov.us/>)**NMFS review of Supplemental Environmental Assessment**, October 2006

U.S. Army Corps of Engineers Permit

NMFS letter on potential impacts, November 2006**ORPC ALASKA TIDAL ENERGY PROJECTS**

ORPC Fire Island Tidal Energy Project

NMFS Letter to DOE re: reinitiating informal consultation, May 2012**DOE Letter to NMFS re: reinitiating informal consultation** for the ORPC passive hydroacoustic monitoring project in Cook Inlet, Alaska, April 2012

Status Reports:

2010: **Annual Report, October, September, August, July, June, May**2009: **Annual Report, November, October, September, August, July****NMFS letter to the DOE** on DOE funding for hydroacoustic studies near Fire Island, August 2010**NMFS letter to Federal Energy Regulatory Commission** on ORPC Alaska's license application, May 2009

ORPC East Foreland Tidal Energy Project

Application for Preliminary Permit: East Foreland Tidal Energy Project**PEBBLE MINE****Pebble Project Technical Working Groups and Steering Committee, NMFS letter**, April 2009**Pebble Partnership** ([external website](#))**Letter of Confirmation** for aerial surveys of Cook Inlet, February 2009**PORT OF ANCHORAGE EXPANSION**

Endangered Species Act, Section 7 Consultation

Biological Opinion on Cook Inlet beluga whale critical habitat and the Marine Terminal Redevelopment Project at the Port of Anchorage, Alaska, August 2011**Biological Opinion** for the Marine Terminal Redevelopment Project at the Port of Anchorage, Alaska, July 2009

Beluga Studies

Distribution, Habitat Use and Behavior of Cook Inlet Beluga Whales and Other Marine Mammals at the Port of Anchorage Marine Terminal Redevelopment Project June – November 2011, Scientific Marine Mammal Monitoring Program 2011 Annual Report, December 2011

Distribution, Habitat Use and Behavior of Cook Inlet Beluga Whales and Other Marine Mammals at the Port of Anchorage, June-November 2008, APU, January 2009

Distribution, Habitat Use, and Behavior of Cook Inlet Beluga Whales in Knik Arm, Fall 2007, APU, January 2008

Temporal-spatial Distribution, Movements and Behavior of Beluga Whales near the Port of Anchorage, Alaska, LGL Alaska Research Associates, Inc., February 2007

Noise Studies

Acoustic Monitoring and In-situ Exposures of Juvenile Coho Salmon to Pile Driving Noise at the Port of Anchorage Marine Terminal Redevelopment Project Knik Arm, Anchorage, Alaska, Hart Crowser, Inc./Pentec Environmental and Illingworth and Rodkin, Inc., October 2009

Port of Anchorage Marine Terminal Development Project 2008 Underwater Noise Survey During Construction Pile Driving, SFS, Inc., January 2009

Port of Anchorage Marine Terminal Development Project Underwater Noise Survey Test Pile Driving Program Anchorage, Alaska, URS, December 2007

General Information

Port of Anchorage Intermodal Expansion Project ([external website](#))

Predicted radii of underwater sound levels from proposed impact and vibratory pile driving associated with the POA marine terminal redevelopment project (4 MB)

Map of Port of Anchorage Phasing Plan, December 2007

Port of Anchorage Marine Terminal Development Project, Underwater Noise Survey Test Pile Driving Program, Prepared for Integrated Concepts & Research by URS, December 2007

Distribution, Habitat Use, and Behavior of Cook Inlet Beluga Whales in Knik Arm, Department of Environmental Science, Alaska Pacific University, Fall 2007

Summary of Beluga Whale Monitoring Activities - Port of Anchorage, November - July 2005 ([external website](#))

Port of Anchorage Draft Environmental Assessment

NMFS Response to Draft EA for the Port of Anchorage Marine Terminal Redevelopment Project, December 2004

NMFS Review of the Draft EA for the Port of Anchorage Marine Terminal Redevelopment Project, September 2004

Incidental Harassment Authorization (IHA)

76 FR 39386, July 6, 2011. Notice that NMFS has issued a Letter of Authorization to the Port of Anchorage and the U.S. Department of Transportation Maritime Administration, to take four species of marine mammals incidental to the POA's Marine Terminal Redevelopment Project. Effective July 15, 2011, through July 14, 2012.

75 FR 38465, July 2, 2010. Notice that NMFS has issued a Letter of Authorization to the Port of Anchorage and the U.S. Department of Transportation Maritime Administration, to take four species of marine mammals incidental to the Marine Terminal Redevelopment Project. Effective July 15, 2010, through July 14, 2011.

74 FR 35136, July 20, 2009. Final Rule to issue regulations to govern the unintentional taking of marine mammals, by harassment, incidental to Phase II of the POA's Marine Terminal Redevelopment Project for the period July 2009 through July 2014. Effective July 15, 2009.

74 FR 18492, April 23, 2009. Notice of receipt of an application from the Port of Anchorage and the U.S. Department of Transportation Maritime Administration for issuance of regulations governing the take of small numbers of marine mammals incidental to the Port's Marine Terminal Redevelopment Project, Anchorage, Alaska. Construction activities which have the potential to harass marine mammals include in-water pile driving and demolition of the existing dock. Comments and information must be postmarked no later than May 26, 2009.

73 FR 77013, December 18, 2008. Notice of a request from the Port of Anchorage and the U.S. Department of Transportation Maritime Administration for authorization to take marine mammals incidental to the Port's Marine Terminal Redevelopment Project for the period of July 2009 through July 2014. Comment period through January 20, 2009.

73 FR 41318, July 18, 2009. Notice of issuance of an IHA to the Port of Anchorage and the U.S. Department of Transportation Maritime Administration, to take small numbers of marine mammals, by Level B harassment, incidental to the first year of construction of its Marine Terminal Redevelopment Project at the Port, Anchorage, Alaska. Effective from July 15, 2008 – July 14, 2009.

Incidental Harassment Authorization, July 2008

Environmental Assessment on the Issuance of an IHA and Subsequent Rulemaking for Take of Small Numbers of Marine Mammals Incidental to the Port of Anchorage Terminal Redevelopment Project, Anchorage, Alaska, July 2008

Finding of No Significant Impact, July 2008

73 FR 14443, March 18, 2008. Notice of proposed IHA and receipt of application from the Port of Anchorage to take small numbers of marine mammals by Level B harassment. Comment period through April 17, 2008.

Corps of Engineers Permits

US Army Corp of Engineers Environmental Assessment (EA) Anchorage Harbor Dredging & Disposal, and Finding of No Significant Impact (FONSI), August 2008

Public comment period through September 15, 2008.

NMFS letter to the U.S. Army Corp of Engineers on NOI to Issue Permit, August 10, 2007

NMFS letter to the U.S. Army Corp of Engineers on Phase II of the Port of Anchorage Marine Terminal

Redevelopment Project, March 4, 2007

NMFS letter to the U.S. Army Corp of Engineers to advance discussions on the mitigation for the Port of Anchorage Marine Terminal Redevelopment Project, January 2007

NMFS Response to the Port of Anchorage's Permit Request, March 2006

Corps of Engineers Dredging

Port of Anchorage Intermodel Expansion Project Phase II Permit to Discharge Dredged Material in Waters of the U.S., Including Wetlands, Necessary for the Expansion of the Port of Anchorage, 2007 ([external website](#))

Characterization of underwater sounds produced by bucket dredging operations, Dickerson, C., Reine, K. J., and Clarke, D. G., 2001, DOER Technical Notes Collection (ERDC TN-DOER-E14), **U.S. Army Engineer Research and Development Center** ([external website](#))

PORT MACKENZIE

Expansion and Projects

NMFS letter to the Federal Transit Association about the proposed ferry landing, June 2011

NMFS review of US Army Corp of Engineers' public notice, May 2008

NMFS letter to US Army Corp of Engineers about potential impacts to beluga whales, April 2008

Port MacKenzie ([external website](#))

Underwater Measurements of Pile-driving Sounds during the Port MacKenzie Dock Modifications, August 2004

Rail Line Extension

NMFS Letter to Surface Transportation Board re: Biological Assessment, March 2010

Biological Assessment, November 2009

Surface Transportation Board Petition for Exemption to Construct and Operate a Rail Line Extension to Port MacKenzie, November 2009

SEWARD HIGHWAY

Monitoring beluga whale (*Delphinapterus leucas*) distribution and movements in Turnagain Arm along the Seward Highway Final Report

SHIP CREEK

NMFS comments on Swan Bay Holdings, Inc. proposed construction along Ship Creek, January 2007

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Exhibit 2

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Passive acoustic monitoring of Cook Inlet beluga whales (*Delphinapterus leucas*)

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The endangered beluga whale (*Delphinapterus leucas*) population in Cook Inlet, AK faces threats from a variety of anthropogenic factors, including coastal development, oil and gas exploration, vessel traffic, and military activities. To address existing gaps in understanding about the occurrence of belugas in Cook Inlet, a project was developed to use passive acoustic monitoring to document the year-round distribution of belugas, as well as killer whales (*Orcinus orca*), which prey on belugas. Beginning in June 2009, ten moorings were deployed throughout the Inlet and refurbished every two to eight months. Despite challenging conditions consisting of strong tidal currents carrying debris and seasonal ice cover, 83% of mooring deployments were successfully recovered. Noise from water flow, vessel traffic, and/or industrial activities was present at several sites, potentially masking some signals. However, belugas were successfully detected at multiple locations. Detections were relatively common in the upper inlet and less common or absent at middle and lower inlet locations. Killer whale signals were also recorded. Some seasonal variability in the occurrence of both belugas and killer whales was evident. © 2013 Acoustical Society of America. [<http://dx.doi.org/10.1121/1.4816575>]

PACS number(s): 43.80.Ka, 43.80.Ev [AMT]

Pages: 2497–2504

I. INTRODUCTION

Beluga whales (*Delphinapterus leucas*) are one of two cetacean species in the family Monodontidae occurring in Arctic and sub-Arctic waters; the narwal (*Monodon monoceros*) is the other species. Belugas occupy a discontinuous circumpolar distribution in waters ranging from 50°N to 80°N latitude, primarily along the coasts of Alaska, Canada, Greenland, and Russia. A genetically distinct population of belugas occurs in Cook Inlet, a 300 km-long estuary in south central Alaska that stretches northeast from the Gulf of Alaska at 59°N to Alaska's largest city, Anchorage, at 61°15'N. The

land surrounding Cook Inlet is home to nearly half the state's human population and the waters are subject to myriad anthropogenic activities, including coastal development, oil and gas exploration and extraction, commercial shipping, recreational boating, and military activities.

The Cook Inlet beluga whale population has declined from an estimated 653 animals in 1994 to 345 in 2011 (Allen and Angliss, 2012). It was listed as “endangered” under the U.S. Endangered Species Act in 2008, and has shown no signs of recovery since the primary cause of the decline, over-harvest, was sharply curtailed in 1999 (Lowry *et al.*, 2006). The Cook Inlet population is currently the smallest in Alaska and population viability analyses indicate a relatively high risk of extinction (Hobbs *et al.*, 2006). As a result, state and federal regulatory agencies are evaluating management and conservation strategies, and a recovery plan is being

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drafted. To establish an effective recovery program, substantial gaps in understanding about the population will need to be addressed, including these principal information needs: quantifiable measures of seasonal beluga presence in Cook Inlet, temporal and spatial patterns of habitat preference, and the occurrence of animals in areas impacted by, or considered for, industrial development and military use.

To address these information needs, in 2008 we initiated a collaborative research project based on a passive acoustic monitoring strategy to address the primary objective of examining the seasonal distribution of beluga whales in Cook Inlet. An acoustic approach was chosen because Cook Inlet is a notoriously challenging place for conducting traditional vessel and aircraft-based visual surveys on a year-round basis due to frequent inclement weather conditions, turbid silt-laden waters, and heavy seasonal ice cover that make the detection of belugas problematic. To date, these challenges have resulted in a paucity of information on the seasonal distribution of belugas, in particular, since the sharp decline in abundance that occurred in the late 1990s. Acoustic moorings are less limited by weather and surface conditions and are thus able to provide continuous observations of cetacean activity near a mooring site. Beluga whales are well suited for acoustic monitoring because they are notoriously vociferous animals with a diverse repertoire of signals (Sjare and Smith, 1986; Chmelnitsky and Ferguson, 2012). Acoustic monitoring also allows the investigation of the ambient noise environment that characterizes Cook Inlet, which is important for evaluating the potential effects of noise pollution on belugas. Further, acoustic monitoring can help document the presence of other marine mammals, such as killer whales (*Orcinus orca*), which are known predators of beluga whales. Here, we detail the methodologies being applied in this research project and describe the challenges, successes, and initial results from the first year (June 2009–May 2010) of the project.

II. METHODS

A. Acoustic mooring design

Cook Inlet is characterized by large, semi-diurnal tidal variations (as great as 10 m) resulting in strong currents that regularly exceed 3.6 m/s at their peak. In addition, vast quantities of sediment, glacial silt, and large debris are continually washed into the inlet through a network of rivers and streams originating in the surrounding mountains, which results in much of the inlet being characterized by mudflats and continually shifting bottom sediment under a turbid water column. The upper half of Cook Inlet is covered by seasonal ice from November to May, which due to the strong tidal currents is generally broken and free flowing across the inlet, converging in some areas and diverging in others. These conditions pose a significant challenge to the use of acoustic moorings due to the potential for entanglement with debris, entrapment by sediment, collisions with sub-surface ice, and excessive water flow noise on recordings that can mask signals of interest.

Beluga and killer whale signals span a broad range of frequencies. Social sounds, including calls, whistles, and buzzes generally occur at frequencies below approximately

12 kHz, although many sounds are broadband and have energy extending above 20 kHz (Sjare and Smith, 1986; Ford, 1989; Thomsen *et al.*, 2001; Chmelnitsky and Ferguson, 2012). Echolocation clicks, on the other hand, have considerably higher peak frequencies than social sounds. The clicks of beluga whales range in peak frequency between 40 and 120 kHz and have bandwidths between 20 and 40 kHz (Au *et al.*, 1985). Killer whale clicks have broadband bimodal frequency spectra with low and high frequency peaks between 24 and 108 kHz and bandwidths between 35 and 50 kHz (Au *et al.*, 2004; Simon *et al.*, 2007).

To account for the wide frequency range of both beluga and killer whale signals and to increase the likelihood of recording them under the difficult conditions present in Cook Inlet, two types of acoustic sensors were utilized in tandem: an ecological acoustic recorder (EAR) and a C-POD. The EAR is a computer-based recorder with a programmable duty cycle and bandwidth (up to 40 kHz) produced by Oceanwide Science Institute (Honolulu, HI; Lammers *et al.*, 2008). The C-POD (v.0) is a click logger produced by Chelonia, Ltd. (Cornwall, UK) that detects and classifies odontocetes echolocation signals. The EAR was used to record primarily the calls, whistles, and buzzes produced by beluga and killer whales, but also the lower frequency components (if present) of echolocation clicks. The C-POD was used to log and classify echolocation clicks exclusively. Here, we present the methods and detection results obtained using only EARs. A comparison and integration of the detections obtained by both instruments will be presented in a subsequent manuscript.

All EARs were programmed to record at a sampling rate of 25 kHz on a 10% duty cycle of 30 s “on” every 5 min. These settings were selected to maximize the EAR’s available data storage capacity and battery power, allowing for a deployment life of approximately 22–24 weeks. This duty cycle was assumed to be sufficient to capture the signals of acoustically active belugas milling or transiting within the EAR’s listening range over a minimum 10–20 min period. Although the EAR’s listening range was not empirically established for all mooring locations, an informal test using an artificial 15–20 kHz frequency modulation sweep projected with a source level of 140 dB re 1 μ Pa was conducted at two Cook Inlet sites: Port of Anchorage (61°13.5’N, 149°54.6’W, depth: \sim 10 m) and Chickaloon Bay (61°00.5’N, 150°11.7’W, depth: \sim 8 m). In each case, the EAR was suspended at a depth of 3 m from a stationary vessel while the artificial source was projected at a depth of 2–4 m from several distances off a mobile vessel. The maximum range of detection was \sim 2.2 km at the Port of Anchorage and \sim 3.3 km at Chickaloon Bay.

Two mooring configurations were utilized during this deployment period: a “standard” and a “sandwich” design (Fig. 1). Standard moorings consisted of a 70 kg sacrificial steel anchor and anchor line with anti-strum hair faring, an acoustic release (Push Off Release Transponder, PORT, ORE Offshore, West Wareham, MA), C-POD, and EAR all suspended linearly from a cylindrical syntactic foam collar. Sandwich moorings consisted of the same components in a standard mooring arranged in a lower profile cluster.

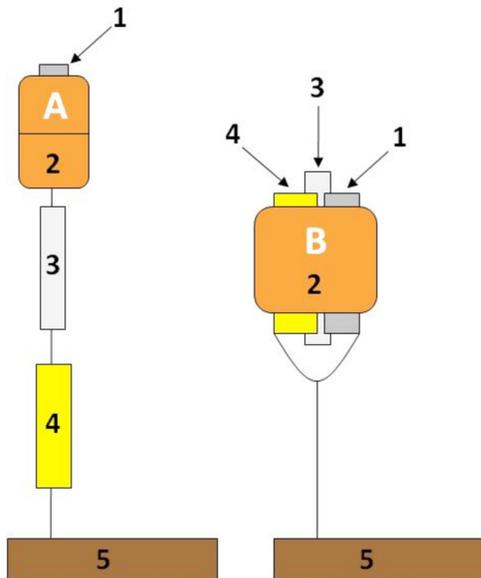


FIG. 1. (Color online) The two acoustic mooring designs used in the study: (a) “Standard” and (b) “Sandwich”. 1 = EAR, 2 = syntactic foam float, 3 = C-POD, 4 = ORE Push Off Release Transponder™ (PORT), 5 = sacrificial 70 kg anchor (railroad track).

B. Mooring deployment locations

Acoustic moorings were deployed at ten locations throughout Cook Inlet beginning on 4 June 2009 (Fig. 2). Deployment depths ranged between 10.0m and 28.3m at mean low low water. Upper inlet moorings (Beluga River to North Eagle Bay) were more readily accessible and therefore brought to the surface and examined several times during July–September prior to overwintering under the ice. Middle inlet (Trading Bay and Kenai River) and lower inlet moorings (Tuxedni Bay and Homer Spit) were not refurbished until early December. Following the spring thaw, all moorings

were recovered, refurbished, and redeployed again during May 2010.

C. Data processing and analysis

EAR acoustic data were analyzed using the MATLAB™ script Triton, developed by Sean Wiggins (Scripps Institution of Oceanography, La Jolla, CA) and adapted for use with EAR data. Triton was used to create long-term spectral averages (LTSAs) of the recordings for each deployment. LTSAs provide a visual representation of the acoustic energy across frequency and time over the deployment period. The LTSAs are a composite spectrogram made up of Fourier transforms averaged over a user-defined period. For this study, 10 s of recording time were used for each average. Beluga and killer whale encounters were located by visually examining the LTSAs for the presence of “hot spots” of acoustic energy in the frequency bands associated with whale signals [Fig. 3(a)]. The compressed nature of the LTSAs allows an analyst to rapidly scan hours of data and identify periods of possible whale presence. Suspected beluga or killer whale calls are confirmed by examining a 1024-point, Hanning-windowed spectrogram of the original recording [Fig. 3(b)].

A whale “encounter” was logged when calls, whistles, clicks, and/or buzzes were first detected. Subsequent signals were considered part of the same encounter if the time lag between them was less than 60 min. Signals separated by 60 min or more were logged as separate encounters. To quantify each encounter, two parameters were extracted from the data: encounter duration and relative signaling abundance. For each encounter, the duration was recorded by noting the start and end time of signaling. The abundance of signaling in an encounter was then quantified by assigning a scalar value based on the types of signals present (calls, whistles, clicks, and/or buzzes) and the signaling rate

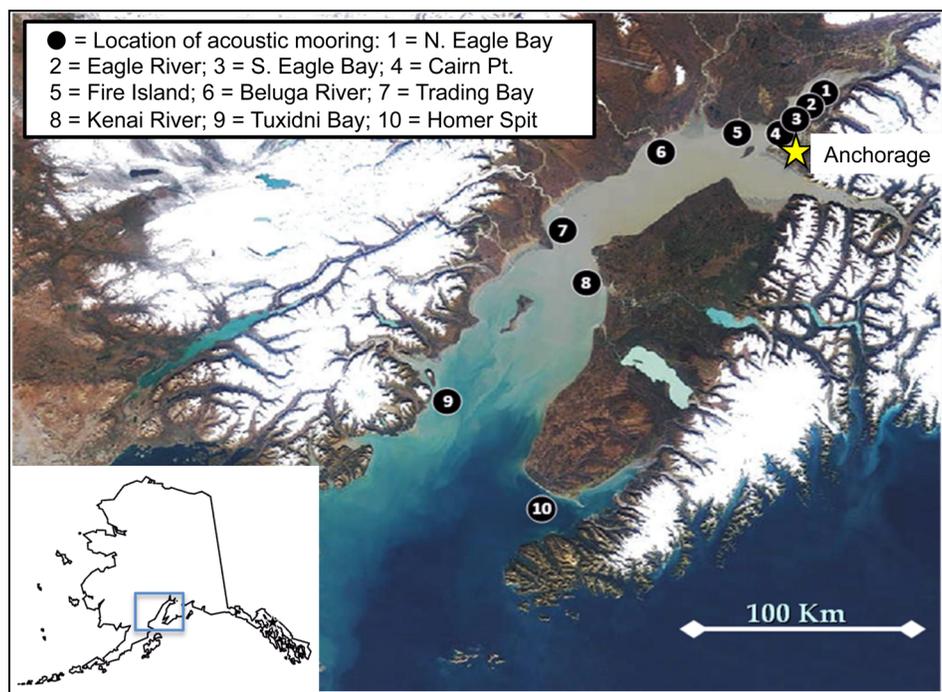


FIG. 2. (Color online) Satellite view of Cook Inlet, AK showing the locations of the acoustic moorings.

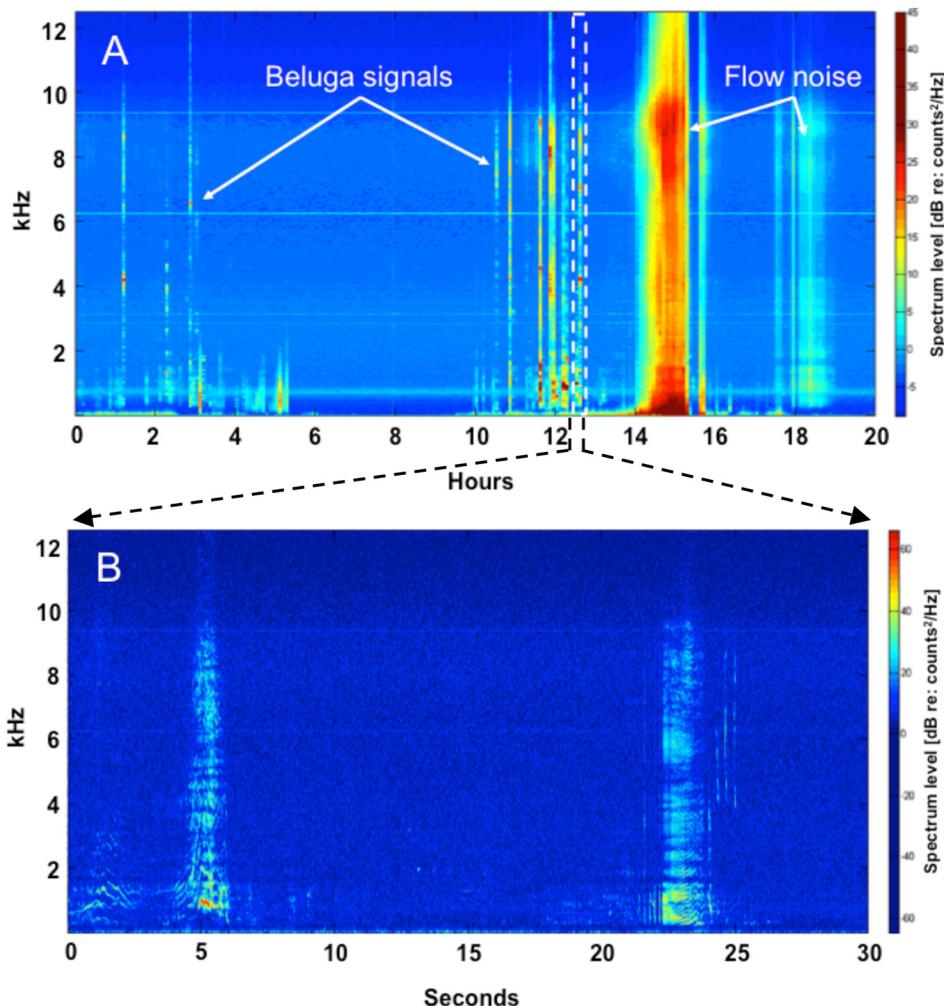


FIG. 3. (Color online) (a) Example of a 20-h LTSA window produced by Triton showing the presence of beluga calls and tidal flow noise recorded at Eagle River. (b) Expanded view of an EAR recording used to confirm the presence and identity of calls noted in the LTSA.

(Table I). A scalar value was given to the five 30-s recording periods with the highest abundance of signals in the encounter. For encounters with fewer than five recording periods with signals, zeros were scored for the missing number of periods (up to four periods). The abundance values were then summed and divided by five to produce a normalized measure of the amount of signaling for each encounter, termed the encounter call abundance (ECA) metric. Finally, to obtain a measure of the amount of daily whale acoustic activity (DWAA), each ECA value was multiplied by the encounter duration, represented in fractions of the 24-h day (e.g., 6 h = 0.25 days) and summed for the day.

To characterize the ambient noise level occurring at each site (due to natural, anthropogenic, and/or mooring-related sources), the average root-mean-square (RMS) sound pressure level (SPL) of each recording was calculated for bandpass limited data between 0–2 kHz, 2–6 kHz, and 6–12 kHz using a custom MATLAB™ script. Factory calibrations of the EAR hydrophones (Sensor Tech SQ-26, Collingwood, Canada) and known hardware gain settings were used for these calculations. RMS SPLs were measured for a one-month period in summer and winter at eight mooring locations (Eagle River was considered to be representative of both North and South Eagle Bay, which were less than 2 km and 4 km away, respectively). To further evaluate the effects of masking on the detection of beluga and killer whale signals, the percentage

of time in a 24-h period was calculated when the power spectral density level on the LTSA was equal to or greater than the received levels of animal sounds encountered in Cook Inlet (typically between 105 and 125 dB RMS re 1 μ Pa).

III. RESULTS

A. Mooring recovery success

A total of 24 mooring deployments were made between June 2009 and May 2010. Of these, 20 were recovered

TABLE I. Scalar metric used to quantify the relative abundance of calling, whistling, buzzing, and clicking in a 30 s recording.

Signal type and frequency	Abundance scale
1–5 calls/whistles	1
<5 buzzes/click trains	1
1–5 calls/whistles, <5 buzzes/click trains	1
1–5 calls/whistles, >5 buzzes/click trains	2
6–10 calls/whistles	2
>5 buzzes/click trains	2
6–10 calls/whistles, <5 buzzes/click trains	2
6–10 calls/whistles, >5 buzzes/click trains	3
>10 calls/whistles	3
>10 calls/whistles, <5 buzzes/click trains	3
>10 calls/whistles, >5 buzzes/click trains	4

successfully and four were lost. The four lost moorings were from North Eagle Bay (early summer 2009), Eagle River (over winter 2009–2010), Cairn Point (late summer 2009), and Fire Island (overwinter 2009–2010). The moorings at North Eagle Bay and Fire Island were each later found on a beach several km from their deployment sites in the spring and fall of 2010, respectively, and the data were successfully recovered. Of the 24 mooring deployments made, 21 were standard design and 3 were “sandwich” design moorings. Of the four moorings that were not successfully recovered, three were standard and one was a “sandwich” design mooring. The cause of the mooring failures could not be established conclusively, but in the standard moorings it is suspected that debris and/or sediment may have become entangled with the mooring and prevented surfacing. The sandwich mooring is believed to have been destroyed by winter ice.

B. The acoustic environment and masking

The large tidal variations characteristic of Cook Inlet produced cyclical periods of strong water flow, during which EAR recordings were sometimes saturated by flow noise. This caused beluga signals to be partially or fully masked (Fig. 3). In addition, other natural and anthropogenic noises were also present in recordings. Natural noises originated predominantly from debris striking the mooring and, at some locations, pebbles or stones moving along the bottom with the tide. These did not generally interfere with the detection of beluga calls because their occurrence was low and/or because the predominant energy was in a lower frequency band. Anthropogenic noise originated from a variety of sources at the different locations including: vessel traffic (Cairn Point, Fire Island, Trading Bay, Homer Spit), industrial/construction activities (Cairn Point), and aircraft (Cairn Point, Eagle River, Eagle Bay). Some of these noise sources did overlap in frequency with beluga and killer whale signals and may therefore have contributed to masking. Table II summarizes the average daily percentage of time that partial or full masking occurred at each site in the winter and summer. Masking periods varied in duration between a few minutes to the majority of the 24-h day, depending on the location. In the summer, the duration of masking was relatively low at Tuxedni Bay, Trading Bay, Beluga River, Kenai River, and Eagle River. It was intermediate at Cairn

TABLE II. The average daily number of hours that beluga and killer whale calls were masked by flow/mooring noise, as well as other natural and also anthropogenic sound sources in summer and winter.

Location	Average (standard deviation)	Average (standard deviation)
	daily hours of masking in summer	daily hours of masking in winter
Eagle River	2.2 (0.4)	N/A
Cairn Point	3.7 (3.5)	0.9 (0.8)
Fire Island	9.9 (5.9)	16.3 (6.5)
Beluga River	1.3 (2.4)	9.3 (6.0)
Trading Bay	1.0 (1.4)	4.5 (2.3)
Kenai River	1.5 (2.2)	0.7 (1.8)
Tuxedni Bay	0.1 (0.1)	0.3 (0.7)
Homer Spit	4.0 (2.6)	2.3 (1.6)

Point and Homer Spit and was high at Fire Island. In the winter, masking decreased substantially in duration at Cairn Point and Homer Spit, increased by several hours at Trading Bay, Beluga River, and Fire Island, and did not change much at Kenai River and Tuxedni Bay.

Figure 4 shows a comparison of the summer and winter noise levels measured in three frequency bands at each site, representing contributions from all sound sources. In all cases, the 0–2 kHz frequency band had the highest RMS SPLs, the 2–6 kHz band was intermediate, and the 6–12 kHz band had the lowest levels. The highest ambient noise levels measured in the summer were at Cairn Point and Fire Island. The lowest were at Eagle River. In the winter, average levels mostly decreased or remained unchanged (+/–1 dB) in all bands, except at Beluga River and Fire Island, where RMS SPLs in the 2–6 kHz band increased by 2.2 and 2.0 dB re: 1 μ Pa, respectively. Of note is the substantial decrease in wintertime noise at Cairn Point, where the average level in the 0–2 kHz band decreased by 13.6 dB re: 1 μ Pa.

C. Beluga and killer whale detections

Beluga signals or killer whale signals were detected at all locations except North and South Eagle Bay (which were monitored for only 17 and 31 days, respectively). Table III summarizes the incidence of signals at the ten mooring sites. Beluga whales were recorded at Eagle River, Cairn Point, Fire Island, Beluga River, Trading Bay, and Kenai River. Killer whale calls occurred at Tuxedni Bay and Homer Spit. The majority of beluga detections took place at Beluga River. However, relative to the number of recording days, Eagle River had a slightly higher incidence than Beluga River, with 0.23 encounters per day versus 0.22, respectively. Both Beluga River and Eagle River also had the highest encounter durations.

Beluga detections did not take place with regularity at any location, but rather occurred as multi-day episodes separated by long intervals of absence (Fig. 5). Episodes of beluga presence varied in duration between 1 and 30 days. Belugas were heard at upper inlet locations in summer (Eagle River, Cairn Point, Fire Island, and Beluga River), fall (Fire Island and Beluga River), winter (Fire Island and Beluga River), and spring (Beluga River) and were detected in the middle inlet (Trading Bay and Kenai River) in the fall, winter, and spring, but not in summer. Belugas were not detected at any lower inlet locations, but signals produced by killer whales were recorded multiple times at Homer Spit (Fig. 5) and once at Tuxedni Bay (Oct. 28, 2009). Calls recorded at Homer Spit and Tuxedni Bay were tentatively identified as belonging to resident killer whales of the AB clan (C. Matkin, personal communication). Killer whale detections at Homer Spit occurred with regularity in the summer and fall and more episodically in winter and spring (Fig. 5).

IV. DISCUSSION

The results of this phase of the project reveal that investigating the occurrence and distribution of beluga whales in Cook Inlet using an acoustic approach is feasible, despite the challenging conditions. Eighty-three percent of the moorings deployed for longer than one month were successfully

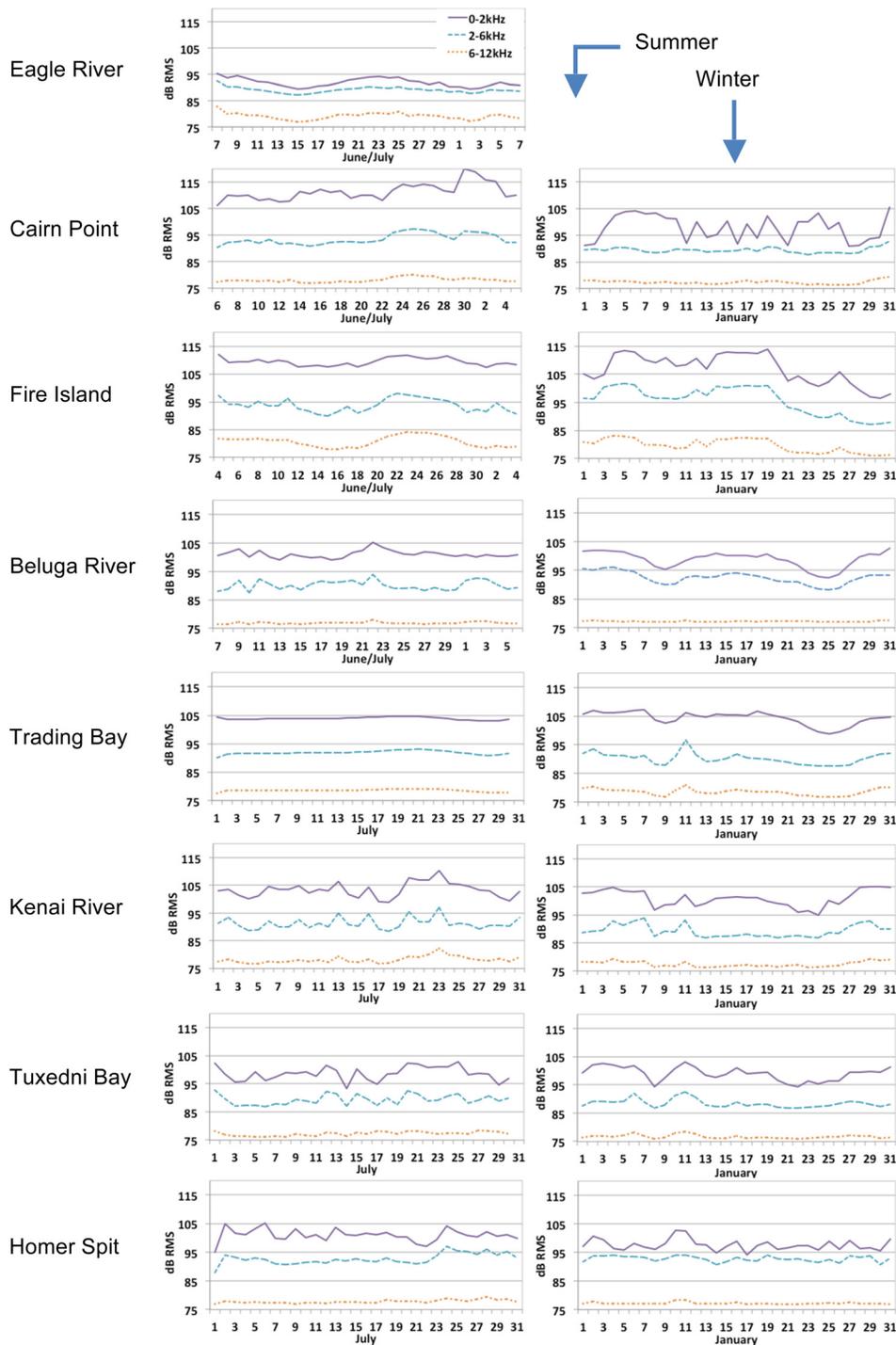


FIG. 4. (Color online) Average daily RMS SPLs in three frequency bands (0–2 kHz, 2–6 kHz, and 6–12 kHz) for eight mooring locations during one month in winter and summer. No wintertime data are available for Eagle River because the mooring was lost. All dB measures are re: 1 μ Pa.

recovered, which indicates that data can be obtained throughout the year to develop an understanding of beluga presence and habitat use in Cook Inlet. The primary challenge to the detection of beluga and killer whale signals comes from the effects of masking due to flow-induced noise and other natural and anthropogenic sources. The results of the masking analysis make it clear that some locations, like Fire Island, are poorly suited for acoustic monitoring using the methods described here. However, at most other locations, during at least 80% of the recording time, beluga and killer whale signals were at least detectable. This observation efficiency does represent an important improvement in the ability to monitor the occurrence of beluga and killer whales in Cook Inlet over

more traditional survey methods (e.g., vessel, aircraft, and shore-based surveys) limited by weather, tides, daylight hours, and/or distance. The analysis of acoustic energy recorded at the various mooring sites reveals that Cairn Point and Fire Island had the highest recorded levels in the summer, with elevated energy in the 0–2 kHz band. At Cairn Point, this was due primarily to industrial activities occurring nearby at the Port of Anchorage. These included noise from dredging, pile driving, construction activities, and transiting vessels. In the winter, many of these activities ceased or were reduced and, as a result, the recorded noise levels were lower. At Fire Island, on the other hand, noise levels remained relatively high in winter and even increased in the 2–6 kHz band. Noise

TABLE III. Incidence of beluga and killer whale encounters at the ten monitored locations. ECA refers to the encounter call abundance metric discussed in Sec. II.

Location	Number of recording days	Mooring deployment depth (m)	Number of beluga encounters	Number of killer whale encounters	Average encounter duration (h:mm)	Average ECA
North Eagle Bay	17	13.7	0	0	N/A	N/A
Eagle River	47	10.0	11	0	3:48	1.55
South Eagle Bay	31	12.5	0	0	N/A	N/A
Cairn Point	185	28.3	3	0	0:20	0.47
Fire Island	295	23.5	5	0	1:38	2.40
Beluga River	246	18.0	53	1	3:48	1.14
Trading Bay	271	14.6	33	0	1:35	1.15
Kenai River	211	10.7	10	0	0:48	0.49
Tuxedni Bay	279	25.9	0	1	0:45	0.80
Homer Spit	271	18.6	0	15	1:20	0.83

at this site was primarily due to water flow and from ice during the winter months. Interestingly, a similar wintertime increase in the 2–6 kHz band was observed at Beluga River, suggesting that the two locations may have similar noise contributions from the accumulation and flow of ice.

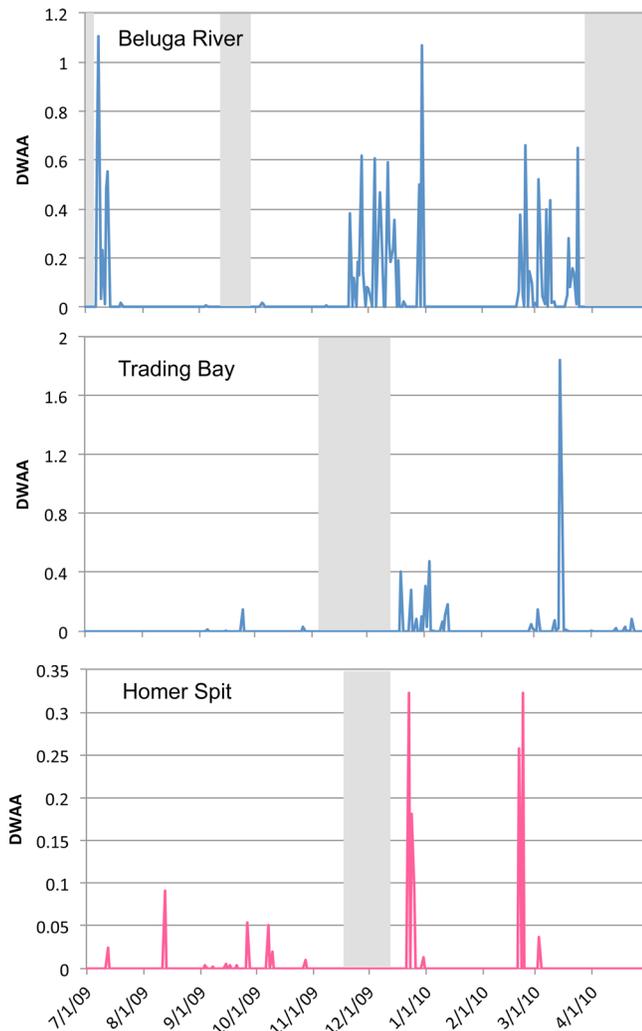


FIG. 5. (Color online) The DWAA measured at Beluga River, Trading Bay, and Homer Spit between 1 July 2009 and 30 April 2010. All detections shown for Beluga River and Trading Bay are of beluga signals and all detections at Homer Spit are of killer whale calls. Shaded areas represent periods when the mooring was not deployed or recorded.

In addition to the effects of signal masking, the behavior of belugas themselves may influence their detection. Belugas often produce few or no social signals during certain behavioral periods, such as during rest or when traveling (Karlsen *et al.*, 2002; Belikov and Bel'kovich, 2003). As a result, it can be assumed that some belugas may have been present in a monitored area at times, but were not detected. Simultaneous visual and acoustic observations are necessary to establish the extent to which this might have occurred. A detailed analysis of the incidence of belugas and other cetaceans in Cook Inlet will be presented in a subsequent publication on beluga habitat use that will include data from an additional two years of deployments, as well as C-POD detections. However, some initial trends have begun to emerge and are worth noting. Belugas appeared to restrict their occurrence to the upper parts of the Inlet during the summer months, with no detections made south of Beluga River until September. Their occurrence then shifted further south in the fall, winter, and spring, with increasing detections at Trading Bay and no presence detected north of Fire Island. The furthest south that belugas were heard was at Kenai River where they were detected until the second week of March, when the mooring stopped recording due to battery failure.

Of the sites monitored, Beluga River had the most consistent presence of belugas throughout the year. This finding is in line with results obtained during summer aerial surveys, which have identified Beluga River and the nearby Susitna Delta as the central core of the population's summertime home range (Hobbs *et al.*, 2005; Rugh *et al.*, 2010). Although only seven weeks of recordings were obtained at Eagle River, the high number of detections made during this time suggests that this is also an important part of the range. Average encounter durations were highest at Beluga River and Eagle River, suggesting that these are areas where belugas aggregate. Finally, Trading Bay had the third highest incidence of encounters relative to the recording effort. These mostly occurred in the December to March time period, suggesting that this may be an important wintertime area.

Very few beluga detections were made at Cairn Point even though it is a bottleneck in the transit that many belugas make on their way to Eagle River. The Port of Anchorage on the eastern bank of Knik Arm has undergone annual improvements (e.g., dredging, pile driving, etc.), which has

contributed industrial noise to the ambient sounds of Cook Inlet. It is possible that this noise could have masked the calls of some transiting belugas, however, it is unlikely that this alone would explain the paucity of detections. Another possibility is that belugas may have consistently transited 2 km away along the western bank of Knik Arm, and remained out of the EAR detection range. Visual observations made during this time suggest, however, that although there was a preference for the western bank, belugas did periodically transit near the mooring site (Cornik and Saxon Kendall, 2010). Finally, it is possible that belugas may have suppressed their acoustic behavior while transiting past this area of high anthropogenic activity. Belugas in other locations have been shown to modify their acoustic behavior in response to vessel sounds, which are common near the Port of Anchorage (Lesage *et al.*, 1999). Such modifications may represent a predator avoidance strategy (Karlsen *et al.*, 2002), a response to stress (Castellote and Fossa, 2006), or perhaps a response to signal masking by the noise.

There was no observed overlap in the EAR data between the distribution of belugas and killer whales. Resident killer whales are known to occur in lower Cook Inlet and were detected there (at Homer Spit). However, killer whales were heard only once further north at Tuxedni Bay. It is unclear why this is the case, but it suggests that fish-eating resident killer whales do not directly compete for resources with belugas in Cook Inlet. Alternatively, belugas may actively remain in heavily sedimented, high-current upper inlet waters to avoid predation by their main, non-human predators, marine mammal-eating transient killer whales. Transient killer whales are known to produce fewer calls, whistles, and echolocation clicks than residents, presumably to avoid detection by their prey (Felleman *et al.*, 1991; Barrett-Lennard *et al.*, 1996). Therefore, the relative lack of detected killer whale signals in the upper inlet is not necessarily an accurate indication of their absence from the area.

In conclusion, an acoustic framework for documenting the spatial and temporal distribution of belugas in Cook Inlet has been established. This effort compliments and adds to a growing body of information obtained during similar projects aimed at acoustically monitoring threatened beluga populations in other parts of the world (e.g., Simard *et al.*, 2010; Delarue *et al.*, 2011). The framework created here will help to advance the current understanding of beluga seasonal occurrence in Cook Inlet and will help monitor the population's use of designated critical habitats (76 FR 20180, April 11, 2011). Continued data collection efforts will also provide baseline patterns of occurrence to help gauge the effectiveness of management efforts over time.

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- Allen, B. M., and Angliss, R. P. (2012). "Alaska marine mammal stock assessments, 2011," U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS AFSC-234, pp. 1–288.
- Au, W. W. L., Carder, D. A., Penner, R. H., and Scronce, B. L. (1985). "Demonstration of adaptation in Beluga whale echolocation signals," *J. Acoust. Soc. Am.* **77**, 726–730.
- Au, W. W. L., Ford, J. K. B., Horne, J. K., and Allman, K. A. N. (2004). "Echolocation signals of free-ranging killer whales (*Orcinus orca*) and modeling of foraging for Chinook salmon (*Oncorhynchus tshawytscha*)," *J. Acoust. Soc. Am.* **115**, 901–909.
- Barrett-Lennard, L. G., Ford, J. K. B., and Heise, K. A. (1996). "The mixed blessing of echolocation: Differences in sonar use by fish-eating and mammal-eating killer whales," *Anim. Behav.* **51**, 553–565.
- Belikov, R. A., and Bel'kovich, V. M. (2003). "Underwater vocalization of the beluga whales (*Delphinapterus leucas*) in a reproductive gathering in various behavioral situations," *Oceanology (Engl. Transl.)* **43**, 112–120.
- Castellote, M., and Fossa, F. (2006). "Measuring acoustic activity as a method to evaluate welfare in captive beluga whales (*Delphinapterus leucas*)," *Aquat. Mamm.* **32**, 325–333.
- Chmelnitisky, E. G., and Ferguson, S. H. (2012). "Beluga whale, *Delphinapterus leucas*, vocalizations from the Churchill River, Manitoba, Canada," *J. Acoust. Soc. Am.* **131**, 4821–4835.
- Cornik, L. A., and Saxon Kendall, L. (2010). "Distribution, habitat use and behavior of Cook Inlet beluga whales and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project May–November 2009," Scientific Marine Mammal Monitoring Program 2009 Annual Report (United States Department of Transportation Maritime Administration, Washington, DC), pp. 1–99.
- Delarue, J., Laurinoli, M., and Martin, B. (2011). "Acoustic detections of beluga whales in the northeastern Chukchi Sea, July 2007 to July 2008," *Arctic* **64**, 15–24.
- Felleman, F. L., Heimlich-Boran, J. R., and Osborne, R. W. (1991). "The feeding ecology of killer whales (*Orcinus orca*) in the Pacific Northwest," in *Dolphin Societies: Discoveries and Puzzles*, edited by K. Pryor and K. S. Norris (University of California Press, Berkeley, CA), pp. 113–147.
- Ford, J. K. B. (1989). "Acoustic behavior of resident killer whales (*Orcinus orca*) off Vancouver Island, British Columbia, Canada," *Can. J. Zool.* **67**, 727–745.
- Hobbs, R. C., Laidre, K. L., Vos, D. J., Mahoney, B. A., and Eagleton, M. (2005). "Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic Alaskan estuary," *Arctic* **58**, 331–340.
- Hobbs, R. C., Shelden, K. E. W., Vos, D. J., Goetz, K. T., and Rugh, D. J. (2006). "Status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*)," AFSC Processed Report 2006-16, pp. 1–74.
- Karlsen, J. D., Bisther, A., Lydersen, C., Haug, T., and Kovacs, K. M. (2002). "Summer vocalizations of adult male white whales (*Delphinapterus leucas*) in Svalbard, Norway," *Pol. Biol.* **25**, 808–817.
- Lammers, M. O., Brainard, R. E., Au, W. W. L., Mooney, T. A., and Wong, K. (2008). "An ecological acoustic recorder (EAR) for long-term monitoring of biological and anthropogenic sounds on coral reefs and other marine habitats," *J. Acoust. Soc. Am.* **123**, 1720–1728.
- Lesage, V., Barrette, C., Kingsley, M. C. S., and Sjare, B. (1999). "The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River Estuary, Canada," *Marine Mammal Sci.* **15**, 65–84.
- Lowry, L., O'Corry-Crowe, G., and Goodman, D. (2006). "*Delphinapterus leucas* (Cook Inlet subpopulation)," in *IUCN 2012, IUCN Red List of Threatened Species*, Version 2012.1, <http://www.iucnredlist.org> (Last viewed 27 July 2012).
- Rugh, D. J., Shelden, K. E. W., and Hobbs, R. C. (2010). "Range contraction in a beluga whale population," *Endang. Species Res.* **12**, 69–75.
- Simard, Y., Roy, N., Giard, S., Gervaise, C., Conversano, M., and Menard, N. (2010). "Estimating whale density from their whistling activity: Example with St. Lawrence beluga," *Appl. Acoust.* **71**, 1081–1086.
- Simon, M., Wahlberg, M., and Miller, L. A. (2007). "Echolocation clicks from killer whales (*Orcinus orca*) feeding on herring (*Clupea harengus*)," *J. Acoust. Soc. Am.* **121**, 749–752.
- Sjare, B. L., and Smith, T. G. (1986). "The vocal repertoire of white whales, *Delphinapterus leucas*, summering in Cunningham Inlet, Northwest Territories," *Can. J. Zool.* **64**, 407–415.
- Thomsen, F., Franck, D., and Ford, J. K. B. (2001). "Characteristics of whistles from the acoustic repertoire of resident killer whales (*Orcinus orca*) off Vancouver Island, British Columbia," *J. Acoust. Soc. Am.* **109**, 1240–1246.