National Marine Fisheries Service

Arctic Open Water Meeting Report

March 22-24, 2010

Anchorage, Alaska

May 2010

Contents

Acronym List

ABWC	Alaska Beluga Whale Committee
ADFG	Alaska Department Of Fish And Game
ADNR	Alaska Department Of Natural Resources
AEWC	Alaskan Eskimo Whaling Commission
ASR	Applied Socio-cultural Research
AON	Arctic Observing Network
ASRC	Arctic Slope Regional Corporation
AURALS	Underwater Recorders for Acoustic Listening
BASC	Barrow Arctic Science Consortium
BLM	Bureau Of Land Management
BOWFEST	Bowhead Feeding and Ecology Study
BWASP	Bowhead Whale Aerial Survey Project
CAA	Conflict Avoidance Agreement
COMIDA	Chukchi Sea Offshore Monitoring in Drilling Area
DASAR	Directional Autonomous Seafloor Acoustic Recorders
dB	Decibel
DWM	Department Of Wildlife Management
EAR	Ecological Acoustic Recorders
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
HQ	Headquarters
IAGC	International Association of Geophysical Contractors

ICAS	Inupiat Community of the Arctic Slope
IHA	Incidental Harassment Authorization
ISC	Ice Seal Committee
ISI	Inter-stimulus Interval
km	Kilometres
LGL	LGL Environmental Research Associates
LOA	Letters Of Authorization
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic And Atmospheric Administration
NSB	North Slope Borough
NSSI	North Slope Science Initiative
RL	Received Levels
RMS	Route Mean Square
SAON	Sustaining Arctic Observing Networks
SSV	Sound Source Verification
TEK	Traditional Ecological Knowledge
USARC	U.S. Army Reserve Command
USCG	U.S. Coast Guard
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey

Day One – March 22, 2010

Welcoming Remarks

Jim Lecky, Director, Office of Protected Resources, National Marine Fisheries Service

It is the National Marine Fisheries Services' (NMFS) responsibility to oversee the implementation of the Marine Mammal Protection Act (MMPA). The purpose of this meeting is to have a public discussion on oil and gas activities in the Arctic. The MMPA authorizes the take of marine mammals during activities. Gas activities are permitted by Minerals Management Service (MMS) and companies are asked key questions about incidental take associated with gas and oil activities to ensure negligible impact on marine mammals involved and to ensure no adverse impact on resources for subsistence use. The NMFS takes these issues seriously and looks forward to bringing traditional and scientific knowledge together to bear on these issues and to keep tabs on anticipated and real issues. The NMFS needs to know that the monitoring being proposed in association with activities is designed to detect what we need to watch for. This workshop is important and has grown over the years. It provides an opportunity for us to hear about activities and operations in the open water season, to hear public concerns, and to bring good science into the discussion to help refine the monitoring programs and mitigation activities. We are trying a different approach this year by separating the peer review and public comment sessions. We are having, over the next three days, a public discourse about activities and will hear questions and input. This will be followed by a peer review by the science panel to ask detailed questions with the purpose of issuing permits in line with the NMFS goals. I encourage openness and the bringing forth of questions. I encourage the peer review panel to listen to the public questions and carry that information into their review and weigh it in relation to their recommendations. Thank you all for coming and I encourage you all to participate over the next few days.

John Goll, Regional Director, Alaska Minerals Management Service

Welcome to Alaska those who came from outside and welcome also to those who reside in communities outside of Anchorage. Thank you to the NMFS for organizing the meeting. This meeting has changed through the years, from the first one at which there were 12 at a table in Sand Point, Seattle to now. Slowly the meeting has grown to the point where it's been held at the Egan Center the last several years. I compliment the NMFS on the organization of the meeting and providing the opportunity for attendees to hear from all the different groups followed by a peer review.

NMFS and MMS have worked closely together and are currently working on an Environmental Impact Statement (EIS) on seismic and exploration. On Wednesday's agenda there will be presentations on some of the partnering research being done. Both NMFS and MMS are regulatory agencies and must follow Congressional laws and regulations. Procedures must be followed as laid out in the regulations. MMS Alaska, under the ESA, consults with NMFS and the United States Fish &

Wildlife Service (USFWS) on species you will be hearing about over the next few days. We assist with MMPA authorizations that must be implemented. In the end, NMFS and USFWS are the experts and have the responsibility to come to decisions on MMPA. MMS follows and implements them. We are under litigation with a number of groups represented here today. We hope there is still a good discussion and that we are not hindered by that issue. There is a broad array of views on how and if offshore oil and gas should be developed in the Arctic. A lot is as stake – concerns over whales, climate, continuing subsistence, marine mammals, and economy, on a local, state wide and national basis. We will discuss the mix of fuels that may need to be used over the coming decades. We believe this can be done safely and within the context of regulations. Also there are a number of researchers from non-oil and gas functions that will be presenting. We need to respect and understand each other as discussions go forward. I think we all need to welcome each other, no matter what views they hold on the matters we will be discussing. I'm looking forward to the presentations over the next few days and hope it presents an opportunity to learn and understand each other while assisting NMFS with their goals as they review their MMPA. Welcome to Alaska, Anchorage and this meeting.

Introductions and Housekeeping Items

Lisa O'Brien, Alaska Training & Consulting, and Ron Felde – Facilitators

Lisa introduced herself and Ron as the meeting facilitators with the responsibility of keeping the meeting on time and on track. She asked the group to be responsive to requests to return from breaks and lunch, etc., to keep the meeting focused. Many thanks were given to ConocoPhillips for bagels and to StatOil for coffee & tea. She introduced two key people: Brenda Johnson, meeting recorder, with Professional Administrative Services, and Stephen Robey, URS Corporation, working with IT to ensure presentations and audio work throughout the meeting. She then asked participants to introduce themselves by name and organization (See Appendix).

Ron reviewed the Ground Rules designed to help the meeting flow smoothly while allowing opportunities for clarification and input:

- Honor the agenda
- Respect others, valuing professional, individual and cultural differences
- Communicate from a commitment to develop a shared understanding of the subject, the issues, concerns and ideas.
- One person speaks at a time
- When you speak, be concise and allow time for all speakers
- Share knowledge
- Listen with the intent of seeking to understand the content and the underlying context that shapes people's perceptions
- Allow presenters to present. Save questions or intentions to discuss for the appropriate time on the agenda.
- Be open to new possibilities
- Stay on the subject; park other issues
- No cell phones and be sensitive to the use of computers

Parking Lot Process: Last year the sheer number of issues brought forth for discussion brought the meeting to a grinding halt. This year, the meeting has been redesigned to help address this within the three days allotted for public comment and presentations, which will then be followed by two days of peer review. The purpose of the parking lot is to move items that are outside the agenda to a "parking lot" for later discussion. For those who were here last year, we may ask you to be part of a small group to present the different perspectives. The small group's task is to break out from the larger group and determine if the parking lot topics fall into certain themes. Participants will then be able to vote on the laundry list of topical themes to identify the top three issues for discussion.

Candace Nachman, NMFS, provided some context and framing of the meeting agenda. The agenda will start out by providing updates from NMFS and affected subsistence communities, and then move into topics on the Chukchi Sea and 2009 activities. The agenda then leads the group to operations and monitoring plans for the 2010 season. Tomorrow's agenda will move on to the Beaufort Sea 2009 activities and then on to 2010 planned activities. Tuesday afternoon and Wednesday are scientific presentations on marine mammal studies that are currently going on. One change is that Willie Goodwin, Chairman Beluga Whale Committee, could not attend and Robert Suydam, North Slope Borough (NSB) will be presenting on that topic. The time allotted for parking lot issues has been tripled over last year to ensure ample time to discuss issues.

For presenters, a yellow light/red light process will be used for timekeeping purposes. A yellow card represents five minutes remaining time; a red card represents the needs to wrap up the presentation within one minute.

NMFS Incidental Take Program Updates

Michael Payne, Chief, Permits Division, Office of Protected Resources, NMFS

This meeting could not have happened without Candace's efforts; many thanks to her. EIS effects of oil and gas activities (seismic and exploratory drilling) in the Arctic Ocean updates are as follows: Several applications were received last year. In October, we went out with a new intent to develop an EIS and our hope is that it will be completed in 2011 and will be looking at environment effects in the Arctic including seismic and exploratory drilling. Proposed action includes: authorized incidental takes allowing industry the incidental, but not intentional, taking of small number of marine mammals within the Chukchi and Beaufort Seas. If activities go forward where there are marine mammals, we will discuss whether the activities will affect or "take" – i.e., disturb or harass. Both agencies must understand the consequences of this action: a) effects on marine mammal species or stock, and b) effects on communities and subsistence stocks to subsistence users.

<u>Scoping Meetings:</u> Scoping meetings have occurred over the past three weeks allowing for public input. Meetings were held as follows:

Feb 18 – Kotzebue
Feb 19 – Pt Hope
Feb 22 - Pt Lay

Mar 9 – Wainwright
Mar 10 – Barrow
Mar 11 – Nuiqsut
Mar 12 – Kaktovik
Mar 23 – Anchorage

Issues/Concerns: Major concerns and issues that have been raised throughout the process

- Protection of subsistence resource and Inupiat culture and way of life
- Disturbance of marine mammal migration patterns (bowhead, beluga, etc.)
- Impacts on marine fish, reproduction, growth, and development
- Oil and gas activity impacts on marine mammal and seabirds, including noise, movement operation
- Threats to endangered species and impacts to polar bear, walrus, etc.
- Incorporation of traditional knowledge in the decision-making process
- Effectiveness and feasibility of marine mammal monitoring and other mitigation measures
- Provide adequate lead time for communities to understand activities and respond
- Issues and perspectives vary by community
- Issues involving mitigation of potential effects are likely community/regionally specific
- Focus will be expanded to include other species
- Many concerns beyond scope of proposed action but will be part of cumulative analyses.

NMFS is considering a long-term planning process under MMPA for five-year regulations rather than the annual Incidental Harassment Authorization (IHA) process:

1. Industry will submit petition
2. Implementation goal is 2012
3. EIS would provide National Environmental Policy Act (NEPA) compliance with either annual IHAs or five-year regulations

2009 Meeting Comments: Comments included:

- *NMFS needs to consider other species (to which there is agreement).* This year the beluga whale commission is involved. We will look at three species – ice seal, beluga and bowhead – and will work with USFWS. There are key concerns around walrus in the Chukchi Sea – they are looking carefully at subsistence species.
- *Can dead animals be marked?* Dead pinnipeds floating in oil and gas areas and not knowing the reason why is a concern. It is not a high priority currently, but NMFS and the NSB are looking at this.
- *NMFS Headquarters (HQ) should have increased involvement with communities other than just the Open Water Meeting.* Headquarters has enjoyed being involved in communities – the scoping meetings were part of this effort. They will be involved more as partnerships developed with tribal council and oil and gas entities. Since the program is run out of HQ it is important for them to step up.
- *Mitigation measures and monitoring need to be reviewed.* The heart of the environmental impact statement is being worked on and environmental assessment is being developed.

We are doing our best to do an environmental analysis. Mitigation and monitoring are the target of peer review and the focus of discussions over next few days.

- *External review of IHAs prior to issuance was requested*. This has not been done, largely because of the timetable to complete and get it published to have action going forward. Not sure if it will be in EIS. IHAs are often issued the day before they are due and there is opportunity for public comment throughout the process.
- *Peer review of monitoring.* This is the first year. In response to comments received last year, we are trying the two-prong process with the two-day panel review to discuss monitoring plans in place for 2010 and make recommendations to NMFS if adequate or identify ways to improve.
- *120 decibel (dB) Workshop*. This workshop is to discuss merits of monitoring and whether it should occur out to the 120 dB range. This will be looked at in the EIS rather than having a separate workshop and subcontractors.
- *EIS should be initiated*. It has been.
- *Stakeholder versus peer view*. The new meeting format was established for this year.
- *Meeting should be longer to allow for more discussion.* The meeting has been extended to three full days for public discussion and two days panel peer review discussion.

Thank you for participating and welcome to the 2010 meeting.

Questions/Comments:

Harry Brower, Alaska Eskimo Whaling Commission (AEWC) Chairman: Thank you for your presentation. In regards to the content, it was a lot of information to absorb in a short time. If you could provide copies of the presentation to allow for questions and comments, it would be extremely helpful. Thank you for putting on this meeting. Last year I had posed a question regarding the language being used in issuing permits as being too broad. There needs to be more specifics around species and the issuance of permits to harass a small number when it is the entire population that is being subjected to this activity. It is a larger number, in my opinion, that is being subjected to activity that is occurring.

Michael Payne, NMFS: I have a copy of the presentation that I will make available and agree with some of your comments.

Earl Kingik, Pt. Hope: You mentioned protection of wildlife and the subsistence way of life. Could you explain how you will protect wildlife and our subsistence way of life?

Michael Payne, NMFS: I remember you from Pt Hope. I don't know the answer to your question. I do know the issue of food chain was a big issue. The best answer I have now is I would really like to try to develop alternatives that work best for each community while allowing oil and gas activities to continue. I would like to try to find a way for both to happen. I learned that each community has a way that they want to address their concerns, so I would rather try to do it on a community-by-community basis.

George Ahmaogak, Ahmaogak Associates: In one presentation you touched upon mitigation and I hope there is a process that will be there to make improvements and offer suggestions, and not only

with MMS and NMFS. It is clear we need a process for mitigation discussion for improvement. I would appreciate time to discuss this. Thank you.

Alaska Eskimo Whaling Commission Subsistence Harvest Updates

Harry Brower, AEWC Chairman

For the 2009 harvest for whales taken, there were 11 communities from St. Lawrence to Kaktovik in which 32 were landed for 2009 with struck and loss reports of seven. These are circumstances that we have to deal with in hunting activities in spring and fall time. Conditions are not the same as five to ten years ago. We're going through changes in ice conditions during the spring hunt which are more dangerous. The warmer winters delay the freezing of ice and its thickness. There is a big difference in ice conditions. Observations this winter confirm the ice is much thinner than last year. I see broken ice oscillating offshore. These observations are conditions we are dealing with when hunting bowhead whales. There were minimal conflicts with industry and hunters due to conflict agreements. Although there were minimal occurrences, there was barge traffic and vessel traffic near Wainwright. There were also communication problems as communication centers weren't in place. Because of this, the communications had to occur after the fact.

Questions/Comments:

Michael Macrander, Shell: You said there were 32 whales landed, correct?
Harry Brower, AEWC Chairman: 32, yes.
Michael Macrander, Shell: Is there a breakdown by village?
Harry Brower, AEWC Chairman: Yes, there is a breakdown by village but I wanted to make the discussion shorter.
Michael Macrander, Shell: Can I get that sometime?
Harry Brower, AEWC Chairman: Yes.

John Goll, MMS: The barge that you mentioned near Wainwright, what were the circumstances?
Harry Brower, AEWC Chairman: It was before a hunt that was occurring between spring and summer transition. Vessels were coming up north.
John Goll, MMS: Do we know who and what?
Harry Brower, AEWC Chairman: No, we don't have that information.
John Goll, MMS: Is there a representative from Wainwright here?
John Hopson, Olgoonik Corporation: Barge activity was stuff that our company had bought and offloaded. That was the activity we had but it wasn't in conjunction with hunting. It was in July and August. It didn't interfere with beluga hunts.
John Goll, MMS: The first day, yes.
Jolie Harrison, NMFS: Were there communications related to the fact?
Harry Brower, AEWC Chairman: The communication centers were up and running. There were minimal communications going on but Pt. Hope wasn't on. The only one I can remember is Wainwright having the communication center.

John Goll, MMS: Harry, last year there was activity in the Chukchi Sea. Was there any interference on those?
Harry Brower, AEWC Chairman: In regards to Barrow, the communication was after the fact. The operator operating in the dark at night time that is what we were observing in Bethel.
John Hopson, Olgoonik Corporation: The communication center was operating, but they were not subject to signing the Conflict Avoidance Agreement. Industry does use the communication center when we have traffic. The incident (Crawley and bowhead) aren't subject to this rule when they are hauling up from Anchorage.
Harry Brower, AEWC Chairman: I was referring to industry activity.

Earl Kingik, Pt Hope: MMS had a question on seismic. In Pt. Hope we're abundant with seals and during the last few years, after seismic operations up north, we are noticing that tomcod aren't coming back. The nursery for Bristol Bay fisheries are up north and we are losing lots of fish, maybe due to the seismic activity.

Harry Brower, AEWC Chairman: In regards to plans for 2010 whaling, we're preparing to conduct the spring hunt from St. Lawrence up north to Barrow. They are out in the whale boats as we speak.

Alaska Beluga Whale Committee Subsistence Harvest Updates

Robert Suydam, NSB; Scheduled Presenter, Willie Goodwin, Alaska Beluga Whale Committee (ABWC) Chairman, absent
The first open water meeting I went to was in 1997; 13 years ago. There were only a few people in the room at that time. Things have changed a lot and one thing that has changed that is positive is the discussion about belugas, ice seals, etc. Not only is industrial activity expanding but discussions on species are expanding as well. Willie Goodwin is disappointed he couldn't be here today. He's a champion of hunters throughout the state and I will try to fill in for him.

The goals of the committee are to maintain healthy populations of belugas in northern and western Alaska, provide for adequate subsistence harvest and whales, and protect hunting privileges for Alaskan subsistence hunters. The committee was formed in 1987/1988 and incorporated Cook Inlet as well. Over time, the Cook Inlet area formed its own committee. It originally included Canadian counterparts as well, but now consists only of western and northern Alaska.

The ABWC is comprised of hunters, managers and scientists. Its management plan was adopted in 1995 and accepted by tribal organizations in 1996 and 1997. A Cooperative Agreement for the co-management of the western Alaska Beluga Whales was signed with NMFS in 1999. The scientists meet annually and discuss harvest takes, genetic studies or clarification of stock structure, document harvest on an annual basis, conduct bio sampling for a variety of studies (health, natural history, etc.), and conduct population assessments and satellite tracking.

There are five recognized Alaska beluga stocks – Cook Inlet stock, Bristol Bay stock, eastern Bering Sea stock, eastern Chukchi Sea stock and eastern Beaufort Sea. They migrate through the Bering Straits and come up to western and northern Alaska. They summer in Canadian water. Bristol Bay

and Cook Inlet stock stay in their areas. In regards to the inherited DNA, Cook Inlet is much different from other stocks in Alaska. There are similarities between stocks, but there are also noted differences. Kotzebue Sound stock was thought to have moved into Kotzebue Sound and then Pt. Lay. Kasiguluk Lagoon stocks' DNA shows they are, in fact, different. Pt. Hope hunts in spring (April and May) and we thought they moved into Mackenzie River. There are similarities between the two stocks which confirm this hypothesis. In 2007 there was an article on hunts in Kotzebue Sound on belugas that were sampled. They were similar to Mackenzie Delta animals. Something interesting is going on in Kotzebue as samples were not the same as in previous decades. Belugas were always present in Kotzebue but there is no knowledge on where they come from or go after they leave the Sound.

Harvest information includes: Beaufort – Little Diomede, Pt. Hope, Barrow, and Kaktovik from 2005 to 2009. The average harvest is 25.8 per year. In Canada, from this stock, it is about 100. In the Eastern Chukchi Sea - Kotzebue Sound, Pt Lay and Wainwright, the average is 94.2 per year. The number is higher because of hunts in Kotzebue Sound. In the Eastern Bering Sea - Norton Sound, Yukon and Kuskokwim Deltas the average is 181.2 per year (Kuskokwim is 11.8 per year). Bristol Bay averages were 20.8 per year. The total for western and northern Alaska is 320 per year, which shows its importance as a subsistence resource for villages.

The bio-sampling goal is to beef up the health assessment on belugas. Understanding changes in ice, climate, oil and gas activities, commercial shipping, commercial fishing and body conditions now will help us understand the impacts of these changes. Factors reviewed include health (body condition, exposure to disease, immune function, hearing, and contaminates) and age, growth, reproduction and diet.

There is concern about understanding the number of animals in the Chukchi Sea. The committee is trying to figure out how to better count animals in that stock. There is use of satellites to track belugas in Pt. Lay and we are beginning to understand that the whales use a huge amount of the Arctic and a lot of the Beaufort and Chukchi seas. There are a lot of animals using the areas where seismic and drilling is occurring.

[Presented slides on locations of tagged whales in July and August]. In September, the animals are still in Beaufort and moving into Chukchi. In October, they move to the Chukchi.

There are concerns about offshore industrial activity. The Pt. Lay hunt occurs in late June or the first two weeks in July. There is concern about activity before the hunt that prevents whales from entering the area. That area gets about 40 belugas per year. The Wainwright hunt occurs in late July or early August. Besides the incident in Wainwright with the barge, in 2007 there was an industry barge that interrupted a hunt as well. Deflection away from coastal areas (a vessel interrupted a beluga hunt in 2007 and 2009) impacts beluga health and prey items. There is concern about cumulative impacts; what may all the impacts be doing to beluga populations and how that may impact hunters.

Mike Payne talked earlier about NMFS trying to use traditional knowledge and science on the EIS. This is very laudable and positive. However, I want to comment about the peer review panel on Thursday and Friday. They are scientists that are meeting and they will have good information that will be helpful, but the peer review process could be improved if hunters were included in this group. They know more about the animals; more than the scientists may know. They have observed them their entire life and the peer review panel is excluding the experts by not including the hunters that can provide the most information and insight on these animals. One recommendation I would make for the future is to include them as participants.

Questions/Comments:

Caryn Rea, ConocoPhillips: I just want to request that unless you know something different, your last slide indicated that industry vessels interrupted a hunt in 2009. I'd like that clarified to determine if it was in fact industry.

Robert Suydam, NSB: It would be interesting to know what was going on with the barges. Was the activity in support of the villages or industry? Was it an Olgoonik or Crowley barge? Your point is well taken.

Caryn Rea, ConocoPhillips: I believe it was stated that it was not associated with industry and would appreciate it if the slide was amended.

George Ahmaogak, Ahmaogak Associates: Good presentation. The bowhead whale is one that is protected by science using traditional knowledge. Your statement about using traditional knowledge about the peer review process is true. It is necessary and often we get left out. Based on traditional knowledge and watching migration and population, we can contribute to the peer review process. We want good science from the oil and gas community, but we hit a brick wall. Please make your presentation available.

Robert Suydam, NSB: The Beluga Committee is comprised of hunters, scientist and managers and is a good opportunity for traditional knowledge to be incorporated.

George Edwardson, Inupiat Community of the Arctic Slope (ICAS): You were talking about cumulative impacts. Do not leave out science which says (unable to hear) 50 miles apart and they were in operation when polychlorinated biphenyls were legal. If you want to talk about cumulative impacts use it at Dewey sites where the chemicals are moving due to climate warming.

Robert Suydam, NSB: Cumulative impacts need to look at all activities.

John Hopson, Olgoonik Corporation: One thing we have requested from committees that represent our communities is to come see what we are doing. A lot of Beluga commission meetings are in Anchorage, not on the North Slope. We need you to come to see what we're doing. You have a hunter on your committee, but he is only one of 600 hunters. The committees need to come to the communities that interact with the marine mammals.

Robert Suydam, NSB: I will take that message back. The problem is there isn't a lot of funding and it is economically easier to bring people into central locations. It doesn't mean a subset of the committee cannot visit the communities (or the executive committee).

Ice Seal Committee Subsistence Harvest Updates

John Goodwin, Ice Seal Committee (ISC) Chairman

As we all know, ice seals for centuries have been an important resource for Alaska Natives; they harvest and trade with the Interior for their resources. There are ring seals year-round and bearded seals come in spring, but not in the fall. We don't know the way they go back. In the fall, when the herring come in, they bring in the spotted seals. Ring seals are local and come into our bay (Kotzebue area). As we know, the ice seals are an important resource for the native communities and the harvest are probably in the thousands each year. We are getting less now, but there was more when there were dog teams. The blubber was important for the dogs' diet.

We at ISC have a co-management approach to the management of ice seals where scientists, agencies and hunters work together. For example, in Kotzebue last spring we had scientist who came and the hunters went out and captured about three seals and put satellite tags on them. I've been doing this for six years and in Kotzebue. We tag seals and capture them with nets. We weigh them, get blood and core samples, measurements and then tag them (those that are mature enough). This also happens with ring and young bearded seals. We get eight sometimes; last fall we were able to tag 12 ringed seals and 11 bearded seals that are all out right now. We try to get students involved in the seal tagging project. We let them observe the tagging process—it is educational. The students follow them through the computer all year long. The ISC is concerned about the impact to seals from the oil and gas activities and we need more information about the seals and impacts from oil and gas.

Peter Boveng from Marine Mammal Laboratories in Seattle will be presenting later. I've worked with him for about seven years. He will give you more detail at that time. I'm open to questions.

Questions/Comments:

George Edwardson, ICAS: For your information, a baby seal was tagged by USFWS in the early 1980s and seven months later the seal was caught and eaten in Northern Labrador. This is how far they travel and could be impacted.

John Goodwin, ISC: For as long as we've been tagging seals, within the last seven years, one has been caught in Shishmaref out of the 44 and one was caught in Russia.

John Hopson, Olgoonik Corporation: Which communities are included and who is representing them?

John Goodwin, ISC: Bristol Bay, Yukon-Kuskokwim Delta, Norton Sound, North Arctic and one from Arctic Slope Regional Corporation (ASRC). Harry Brower is representing NSB, Mollie Kospic, BP, Sam Mark, Bethel and Sandy Core from (unable to understand). We are just being recognized you should be hearing more from the committee.

Shell 2009 Monitoring Results for Chukchi Sea Site Clearance and Shallow Hazards Surveys

2009 Overview and Proposed 2010 Open Water Activities – Beaufort and Chukchi Seas
Susan Childs and Michael Macrander

[Susan presented an operational overview on the site clearance and shallow hazard survey in the Chukchi Sea.] Shell arrived in the theatre in late July. Work started August 3rd and concluded on October 2, 2009. Shell remained in the area for approximately a week due to bad weather. The survey vessel was the Mt. Mitchell. There was a communication center in Wainwright that went online August 15, 2009, and did not close until November. The cost for the communication center was shared with ConocoPhillips. Subsistence advisors were located in Pt. Hope, Pt. Lay and Barrow. Shell was unable to secure a subsistence advisor in Wainwright, but the communication center was active. The advisors were: Dorcas Rock, Earl Scottie Wood, and Bobby Scirence. The advisors for Shell were patterned after ConocoPhillips and the purpose was to have someone in the community to talk back to the company to advise them of any activities in the area. The 2009 shallow hazard surveys in the Chukchi Sea were in the Burger prospects. Caramel, Snickers and Ulu are on the Cracker Jack ridge and were surveyed along with Burger. Last was the Honey Guide. All the work was completed and there is no plan to return in 2010.

Questions/Comments:

George Edwardson, ICAS: When you were doing seismic we heard there was a whale that got caught and wouldn't leave area.
Susan Childs, Shell: We did not conduct a seismic program – it was very shallow. No one on the team can answer that question.

Robert Suydam, NSB: Thanks for the clarification on seismic. What equipment did you use?
Susan Childs, Shell: We had four 2x10 cubic inch guns.
Barbara Bohn, Shell: We did have some very small air guns associated with operations. 40 cubic inches total.

John Hopson, Olgoonik Corporation: My question is when thinking about operations you need to monitor ice; are you seeing the ice leaving the area earlier, like in early July or late June? Wouldn't it be better to do it in better weather, i.e. June or July?
Susan Childs, Shell: We'd love to start earlier so we can get out of the way of the hunt. We have difficulty pulling behind vessels when there is ice present. It is less of a problem when drilling, as there are ice management vessels and the vessels can get off site quickly (drilling). There was more ice in 2008 than in 2009. I do think here is a trend that there is less ice to deal with over time. Michael will review in more detail than I did.

Earl Kingik, Pt. Hope: The question that comes up in Pt. Hope is do you have the required permit to do seismic in 2009? And after seismic operations, do you monitor the animals?
Susan Childs, Shell: We didn't do a seismic; we did a shallow hazard survey. We never operate without permits. If there is a requirement for a permit, we acquire them before we start working and we get more than is needed. We always have the required number and opt to have more to ensure we're not interrupting subsistence.

John Goll, MMS: As I recall, with regard to site clearances and such, they get site clearance from MMS. We told Shell to shut down for a couple days as there was a lapse between permits. They did shut down for a few days – it wasn't their issue, it was the timing of government permits.

Michael Macrander
Monitoring Results – Chukchi Sea
[Dr. Macrander provided an overview of monitoring and studies program, followed by Craig Reiser presenting the results of the Sound Source Verification (SSV) and observer program. David Hannay presented on acoustics overwinter and summer programs. Mike Macrander led the summary and Questions/Comments section.]

Overview (Michael Macrander): Susan showed you where Shell was operating in the Chukchi Sea in 2009, which was around the shallow hazard and site clearance activities at locations shown by the blue circles on the graph presented. Shell also participated in a number of scientific investigations. The distinction between required mitigation and monitoring and the studies we are implementing in part with a whole lot of entities is that the studies programs are not required – it is an investment in helping to characterize the Chukchi and improve the information that is known.

Components of the monitoring program (Shell's science program) included: a) marine mammal observer (MMO) on source vessel with five on board at all times, b) sound source verification, c) acoustics monitoring – a joint program with ConocoPhillips as part of the ecosystem characterization which has been in place for the last two years, and d) other studies.

The onboard MMO monitoring included five MMOs on the source vessel and a joint contractor program. Shell has worked a dual program with LGL Environmental Research Associates (LGL) and AES. In the past, the two programs have shared training but weren't unified. In 2009 Shell took the opportunity to explore the possibility of implementing one program or delivering all of the MMOs. We have sincere appreciation for ASRC and LGL coming together and delivering a one-operation program. It operated a lot better this past year than in 2007-2008 and going forward we hope it will get better and better.

Mitigation measures included the timing of operations (August 1 through October 9); participating in the Wainwright communication center; clearance of area prior to power up and ramp up; no ramp up during low visibility; power downs and shut downs (190 dB for pinnipeds; 180 dB for cetaceans and walrus); and, investigations and reporting of all carcasses that were found.

Other studies not reported here include:

1. Overwintering acoustics since fall 2007 which included ecological characterizations. ConocoPhillips operated this study in 2008-2009 but it was jointly funded. The study was prospect specific and focused on Klondike/Burger and consisted of oceanography, chemistry (fishes) plankton, nutrients, benthos, birds, and mammals.

2. University of Texas et al (Chukchi Sea Offshore Monitoring in Drilling Area [COMIDA] Chemistry and Benthos) with addition of fisheries to lease area characterization and intensive sampling at historic well sites. MMS had a high quality team onsite and Shell was able to add a few components to sampling that was being done. Where the program with ConocoPhillips was focused on prospective sites, the University of Texas study was more widely distributed through the lease area offshore.
3. Funding contributions to tagging studies.
4. Ice and oceanography studies. John, you will notice that you mentioned that ice is clearing earlier and more frequently. On the other hand, what we see over the years, when the ice clears in the Chukchi, is that there is still a remnant in Hanna Shoals (which includes the Burger prospect and other areas) that stays well into August. The earliest cleared was by August 2nd in 2007. Generally there are remnants until mid-August, so that does push Shell for seismic and other operations to later in the season than we'd like.

SSV and Observer Program (Craig Reiser): Shell 2009 Chukchi Seas Shallow Hazard Survey Sound Measures. Shell deployed down to the sea floor to record and measure sounds at various distances from the source. The full array was utilized; four single 10 cubic inch airguns. The mitigation gun was a single 10 cubic inch airgun.

First of August Ocean Bottom Hydrophone location—2nd SSV at Burger on August 16th. Two SSVs were completed for sight specific measurements. Hydrophones were perpendicular to the lines at 25 m. No differences in directionality were noted. Two SSVs were conducted at each site and we noticed differences between the sites. At Burger the seismic pulse was different; they propagated more strongly than at Honeyguide at 10 km away from the hydrophone.

Burger		
Received Sound	4 airguns	1 airgun
>190	39	8
>180	146	34
>160	1770	569
Honey Guide		
>190	41	21
>180	99	52
>160	597	278

With two SSVs we came up with two different sets of radii to allow for safest sight mitigation. Mt. Mitchell vessel had five MMOs on board. Objectives of the visual monitoring are: a) provide MMOs to monitor occurrence and behaviour of marine mammals near shallow hazard survey operations, b) implement appropriate mitigation measures, c) collect data on current distribution

and abundance of marine mammals on Chukchi Seas during open-water season, and d) use MMOs to estimate exposures of animals to seismic sounds and estimate takes.

NMFS IHA watch requirements include:

1. At least one MMO on site during daylight seismic operations and during night time power ups. Shell met this requirement plus had at least one MMO remaining on watch during all night time and for79% of total night time periods.
2. Two MMOs on site 30 minutes before and during all full ramp ups and as much as possible during other survey operations. Shell met this with an additional two MMOs on watch for 32% of total night and 1% of total day.

In looking at the presentation slide illustrating vessel effort and survey sites, if you think back to two SSVs that were conducted, the one at Burger and Honeyguide, the Honeyguide had smaller sound but we used the more conservative radii at other intermediate sites.

Cetacean Sightings

Species	**July – August**	**Sept – Oct**	**TOTAL**
Bowhead	1	0	1
Gray Whale	3	0	3
Harbor Porpoises	2	1	3
Unidentified Mysticete Whale	10	2	12
Unidentified Odontocete Whale	0	1	1
TOTAL	16	4	20

Exposure Level in dB	**# of Individuals Exposed**		**Exposures per individual**
	Non-Seismic Densities	Seismic Densities	
>160	2	0	5-6
>170	1	0	2-3
>180	1*	0	1
≥ 190	1*	0	1

*Indicated under was between 0 and 1

Seal Sighting

Species	**July – August**	**Sept – Oct**	**TOTAL**
Bearded Seals	17	0	17
Ringed Seals	20	18	38
Spotted Seals	1	1	2
Unidentified Seals	25	8	33
Unidentified Pinniped	8	1	9
TOTAL	71	28	99

Potentially Exposed Seals

Exposure Level in dB	# of Individuals Exposed		Exposures per individual
	Non-Seismic Densities	Seismic Densities	
>160	28	16	5-6
>170	16	9	2-3
>180	7	5	1
≥ 190	3	2	1

Ice broke up and moved offshore in mid-to late August in both 2007 and 2009. We encountered many walruses heading south, presumably to shore. In a week to 10 days, we observed them on on-shore haul out. The pattern was noticeable in both years.

Potentially Exposed Walruses

	Based on non-seismic densities	Based on seismic densities	Exposures per individual
>160	19	12	5-6
>170	11	7	0
>180	6	3	0
≥ 190	2	1	0

No polar bears were seen.

Exposure estimates were based on density. The actual numbers within threshold radii:

Cetaceans	≥180 = 0
Seals	>190 = 0
Pacific Walruses	>180 =2 (which led to shut down on air array where all guns were shut down)

Mitigation Measures implemented included:

- Power Downs: September 13th for a one Pacific walrus. Distance to airguns at first detections was 322 meters. Reactions to vessel were categorized as LO - look at vessel. The water depth was 51. Full array - 180 dB safety zone = 146 meters. Single mitigation gun >180 dB safety zone – 34 meters.
- Shutdowns: August 24th for one Pacific walrus at 130 meters at a safety zone of 146 meters. No detectable reaction to vessel. On September 7th for one Pacific walrus at 102 meters. The animal did look at vessel and then dove.
- Marine mammal carcasses: seven were observed; one unidentified mysticete whale, three unidentified pinnipeds, two unidentified seals, and one Pacific walrus. MMOs worked to help identify them. NMFS reports were submitted immediately and all carcases were older

than 72 hours. Dates observed were: August 9th – seal; August 12th - Pacific walrus; August 19, 21, 22nd - unidentified pinnipeds; September 2nd – unidentified mysticete whale; and, October 5th – unidentified seal.

Acoustics (Dave Hannay JASCO Applied Sciences): [Mr. Hannay presented on the Shell and ConocoPhillips Joint Acoustic Monitoring Program in the Chukchi Sea 2008-2009]. The impetus behind the program is that oil and gas companies wish to understand the importance of work locations on marine wildlife habitat to understand the effect of industrial activities. Uncertainty exists, though it is decreasing, regarding spatial and temporal distribution of many species in the Chukchi Sea. Shell and ConocoPhillips are supporting joint baseline studies to help fill data gaps.

Some ask "why acoustic monitoring?" Marine mammals make sounds and listening for them is a good way to know they are present. Modern acoustic records can listen for very long time periods, i.e., nine month period. The summer program started in 2006 and continued each summer through 2009. Winter was started in fall 2007 and recorders are deployed in early October and retrieved in late July 2008. I will focus on the winter 2008-2009 and summer 2009 efforts.

For the winter 2008-2009 seven aural recorders were deployed mid-Oct 2008 and retrieved August 2009. Sample 16384 Hz set at 1/6th duty cycle of 40 minutes on every four hours. In the summer 2009, 46 recorders were deployed early August 2009 and retrieved mid-October. Sample rate was 16000 Hz and continuous recorders were deployed in four line arrays and two cluster arrays closer to Shell Burger and Klondike.

Data acquired in the summer 2009 program included 13 terabytes of acoustic data, representing 90 months of cumulative recording time. We had to use a combination of partial manual analysis with automatic processing systems. Manual analysis of 5% of the data for species present only with more detailed review of 1% of data to characterize every received call (spectrally and temporally). In winter, over 16,000 manual detections were by bearded seals and bowheads. 26 recorders in summer 2009 were bowhead and walruses.

[Mr. Hannay then focused on three species and presented results for beluga, bowheads and walruses only including examples of audio recordings, daily presence and call detection index movies. Samples of beluga calls were played for the audience. Belugas have high frequency calls. Presence plots were displayed illustrating few beluga detections in the fall (Oct 1st 2008-2009), but recorders didn't operate through entire period. Fall migration may be outside the monitored area. Spring detection on April 12-June 15 – very few detections were captured in summer months except near Barrow canyon in August. The call detection index movie showed the representation of calls detected each day from April – June.]

Bowhead Results: a bowhead moan call was played. The call was low frequency, about 100 Hz, which are difficult to detect. An interesting finding in 2007 was that the calls became more complex starting in late September through December. In December, the calls were more "song like." In winter 2008 -2009 the fall migration was underway when recorders were deployed and calls were detected immediately upon deployment. There was a similar departure time from central part of

study area in late November. At Cape Lisburne detections started one week later and ended five to six weeks later than other stations. Late detections also occurred in fall 2007 off Pt. Lay. Spring detection started April 16 but there were fewer detections than in the fall. The reason may be animals are closer to the coast. The first detection off Barrow occurred on September 7th. Except off Barrow, bowheads appeared to move in pulses across the Chukchi. In the west, there was similar detection timing but fewer detections than at the south western stations. The late August detection at Cape Lisburne 20 mile station could represent an early migrant or a whale that summered in the Chukchi. The detection calls index movie shows the location of calls.

Walruses: A grunt measured June 25th 90 miles off Wainwright was played. Walrus also make distinctive knocking sounds. In winter 2008-2009 there were only sporadic detections in the fall with the latest detection off Wainwright on December 30th. Detections started in early June 50 miles off Wainwright and were recorded up to two weeks later at other stations. Walrus detections continued through the start of summer deployments (first week of August at the eastern stations with a consistent presence through late September). In western stations, they start two to three weeks later and have few detections as the distance increases. There were very few detections after the end of September, as walruses have most likely left the areas. The index illustrates detections from June 1 – September 30, 2009.

Summary: a) species acoustically detected in winter include bearded seals, bowheads, walruses, ribbon seals, belugas and gray whales. b) In summer detections included walruses, bowheads, bearded, seals, belugas, orcas and fin whales. Belugas were primarily in the spring. c) Bowhead detections peaked in mid-September to late November. d) Detection of bowheads during spring started in mid-April but few detections occurred in spring and walrus call detections peaked from early June to late September with detections through December. The highest detections were in Wainwright in mid-August to mid September.

Questions/Comments:

George Ahmaogak, Ahmaogak Associates: Thanks for the presentation; it is appreciated. I want to comment on the brief monitoring results that were presented. I have questions and it is what I expected from the brief report. There is a lot of scientific jargon. In regards to negligible impact, can you safely say in your report that you had negligible impact to the animals under the permit you received? There was no mention of that and that is what the permit is all about.

Michael Macrander, Shell: There were several indications of negligible impact. There is strong indication from work over the last several years that species self protect and with the mitigation measures in place that call for shut down, etc., there is no evidence of impact to the animals themselves and so it meets the criteria.

George Ahmaogak, Ahmaogak Associates: They should be listed as negligible impact and the scientific findings don't list that and should be part of report. Under MMPA there is not mention of unmitigable towards subsistence toward marine mammal protection – could you tell me why?

Michael Macrander, Shell: The judgement on subsistence impact is two-fold – one is that the question, to an extent, goes back to the community on whether they report impact to their hunts. That is the reason for the communication center to document things of that nature and we should include a report out from the communication center and advisors.

George Ahmaogak, Ahmaogak Associates: There again, it should be mentioned as part of your report.
Candace Nachman, NMFS: Michael, I'd like to respond to that. Documenting unmitigable adverse impact is not a requirement of the report. The report looks at the affect on the species and records level of take, but doesn't require it to be included in the report.
George Ahmaogak, Ahmaogak Associates: We'd like to see that whether it's required or not. There is no mention of traditional knowledge and I know you have MMOs onboard and it is music to my ears when they ordered the power down. The point is this, there is no mention of traditional knowledge mentioned in the report. If you use that, you should mention that and it is totally disregarded and totally disconnected. Use it.

George Ahmaogak, Ahmaogak Associates: In the monitoring report for 2009, does it mean that it is a measuring gauge of the success on the other agreement with the AEWC and whaling association on the conflict agreements? Can you say the monitoring report is a good gauge or measurement to say you have a conflict agreement using your report?
Michael Macrander, Shell: That is not the purpose of this report. This is specific to the IHA and monitoring required under the IHA. The Conflict Avoidance agreement (CAA) includes a requirement for presentation to the AEWC and participation in their annual meeting. The presentation was not intended as such. On the other hand, there was mention of the Wainwright communication center and observation of timing of activities, etc. that were directly put in place because of the CAA. There were components that reflect that.

George Ahmaogak, Ahmaogak Associates: The monitoring report is to measure the success of your CAA to measure mitigation, use it as a measurement that you have a successful season that you had monitored and measured right. Last question – why don't you mention cumulative effects?
Michael Macrander, Shell: As you know we're working on this as part of our long term data collection. We didn't talk about it specifically, but it is part of what we're talking about here. The acoustic program does many things and in the Chukchi to date there is a lot of analysis that is still preliminary. The information seems to indicate the majority of marine mammal movements we're seeing is explained by seasonal activities and with the additional consideration of trends of ice and weather, but particularly ice. We are seeing and reporting on those types of activities and we couldn't jump too deeply into that but that is part of what we're doing and you will see reports on that. The report posted last week on the web was for 2006-2008 and we're working on the 2008-2009 report as well.

Brad Smith, NMFS: I wanted to talk about SSV efforts and the two sites that were so different. Do you think the characteristics of the sites are explained or unexplained? Did you capture the one sight that was the loudest you encountered? And, would you recommend a third be taken and how loss characteristics might have changed over the course of operations?
Michael Macrander, Shell: I defer to Dave on that but going into the season we had some SSV from 2008 equipment we felt was valid and combined what we had for the three SSV for the Chukchi. And, if my memory serves, we chose to implement the more conservative of the efforts from the Burger prospects on 2009.

Dave Hannay, JASCO Applied Sciences : As relates to whether we think the Burger site is the worst case, we went in afterwards and looked at data and we used it to use to get to the bottom characteristics at the site. Burger was more reflective and we are now accumulating a database of multiple sites. We've compiled this in the 90-day report; a comparison of the differences. Burger is the most effective for propagation and these are the most conservative levels to apply for these sites.

Jeff Childs: I compliment you on the information presented. In viewing your graphics, particularly the maps of animal distribution, I have a recommendation. We're talking context between habitats and it would bring context and be helpful to bring lease block information to the graphics. Without those outlines it is difficult to bring context to what the distributions are relative to your activities. I would recommend adding a polygon to identify activities to balance that to animal distribution.
Michael Macrander, Shell: I agree 100% and asked that. The idea for animations came up late and they did a good job putting them together. That is definitely in the "to do" column.

Harry Bower, AEWC: Thanks for providing the report, although it moves a little too quick for me. You generated the depiction of sound in the water, but what is it doing on the surface? It would be a bit more useful to many to know that. I can understand the water movement or sound travelling in the water, but it doesn't show what is happening on the surface.
Michael Macrander, Shell: Are you asking for sound of different depths?
Harry Brower, AEWC: Right at the back of the boat. You have a depiction of what is happening on the water as well, over large areas. In terms of your measurements, it's great to see the sound propagation, but how do you compensate for poor weather to make observations? Are you able to clear these areas? How do you apply this when you are limited to visually seeing marine mammals off your vessels? I think visibility gets cut down greatly when it's raining or snowing or lower lighting in the evening in night operations. I appreciate in the information; I'm learning like you are. I know what's happening on the surface, but I don't stick my head in the water. The differences of sounds on the surface and underwater are different.
Michael Macrander, Shell: You raised the issue of sightability on the operational vessel. We were fortunate with the shallow hazard activities that the contours of the ice propagation were close to the vessel in terms of $\geq$180 and $\geq$190 dB range and increased sightability in potentially most conditions. In high weather conditions, sightability goes down and with wind events and storm events that produce more sound levels in the environment may dampen the sound in the environment. This has been an issue of discussion over the last several years and when Shell does full 3D seismic it has added to the number of observers by providing chase vessels to track along with the source vessel to increase the area of monitoring around that. There is data from chase boat vessels how well seals in particular are self-protecting. Not to say it's the perfect system, but by adding vessels, MMOs and increased training we're doing a good job and doing everything we can.
Harry Brower, AEWC: In regards to the recording and the discussion, it was commented that the whales weren't recorded in the spring time. I was trying to remember why. Was there unusual weather in 2008-2009? I recall that migration was further offshore and what was harvested were those that migrated at a slower time and a lead system was not having a presence.

Robert Suydam, NSB: This is really a NMFS question. In Shell's presentation they indicated they are using the 90% level to establish the safety radii. They are not using the peak measurements. In my approach, I think about how I'm influenced by how I hear things. The point of the safety radii is to avoid permanent damage and perhaps using an average of the peak value would be more appropriate. Why do you allow for a 90% peak value to be used?
Jolie Harrison, NMFS: This came up last year. It's something that a decision has to be made on. We just haven't made a decision yet and haven't justified it yet. It is something that has to be worked on. We haven't decided what we want to use.
Robert Suydam, NSB: We talked about this last year and we will talk about it this year, but hopefully we could make progress on this. In the past we've asked for sightability curves and certainly for ≥180 and ≥190 safety radii, MMOs see most animals, but for behaviour ≥160 and bowheads at ≥120, which wasn't presented and that bowheads react to and because of their heightened sensitivity to sound, they will move away from boats where MMO can't see them. It seems like data from the MMOs are biased and when used to estimate take in the NMFS reports, then the take estimates are low and negatively biased at least for the disturbance Craig talked about.
Michael Macrander, Shell: There is an important point to make. One is density. On observations made when no activity occurs and airguns are not operating to cause deflection and accumulated over a period of time that the vessel was in the theatre. The density numbers are compared to other density numbers and that is why there are multiple components to the program to see several different information sources and see if they are in concurrence with each other.
Robert Suydam, NSB: The mere presence of a vessel itself could cause whales to deflect, and, therefore, you're not seeing them and data from MMOs are negatively biased. My suggestion is to come up with other means of observations – acoustics is one, aerial surveys are another. This would provide broader monitoring of an area. Incorporating something like that would be worthwhile. In the past, Shell and ConocoPhillips had acoustic arrays to look at whale movements and impacts. Is that presented in the 90-day report or someplace else?
Michael Macrander, Shell: It will be in a combination of several reports and analyses are on-going. We just picked up the recorders and it is labor intensive. It is our intent for ConocoPhillips and Shell to issue an acoustical report sometime in the next three weeks and comprehensive report for 2009 will be coming out shortly thereafter.

George Edwardson, ICAS: I'm glad you are recording animal noise and learning about the animals especially and combine it with traditional knowledge. For example, when a mother whale makes three loud sounds real quick, it tells her young to get off short and swim fast. She talks to her babies. As hunters we can make walrus go into the water and come after us. When you are doing your baseline, instead of just hearing and learning difference between animals, once you start learning their language, the baseline becomes proper. You have to know what they are saying to play and work in their environment and if you can't do that, you are doing them harm.

John Goll, MMS: At the beginning you mention research studies aren't required by permit. We do require industry to provide a series of information in connection with the sties that you need and ConocoPhillips and Shell are collecting that information, and we will be hearing about that tomorrow. My questions are how far out were the animals and second, on the indexes, were they

normalized for density of collection especially the dense arrays at Burger and Klondike? Were you counting the same animal twice?

Dave Hannay, JASCO Applied Sciences: Regarding the distance we can detect, it is dependent on species. Bowhead low frequencies carry further than the higher sounds of belugas. The background noise level also is a factor. In high wind, we get a lot of background noise. We haven't corrected for that specifically in these results. In the Greeneridge results, if we can safely get out to ten kilometres we should get bowhead. Beluga and walruses are higher in lower source, with a maximum out to ten km and five km lots of times. About the locations, the bubble plots were number of calls. We tried not to cluster them too close and we might have gotten duplication on the calls.

Shell 2010 Operations and Monitoring Plans for Chukchi Sea Offshore Exploratory Drilling Program

Susan Childs and Michael Macrander

Drilling will be executed in the Chukchi or Beaufort Seas from July 10 through October 31, weather and ice permitting. We would like to start in the Beaufort and have it completed before the whaling season. We will exit the area and then return after hunting is complete. The ship will be in the Beaufort or Chukchi Sea with the vessel Discoverer. This will not be simultaneous.

The science program for baseline studies in the Chukchi and Beaufort Seas will run July through October. Shell has spent time on the North Slope in discussions on this.

Secondary activities to support exploration and development feasibility include:

- Drilling in Chukchi Sea – there is a conditionally approved plan by MMS being litigated in the 9th Circuit Court. Oral arguments are scheduled for May, but depending on the outcome the three prospects in the Chukchi are Burger, Crackerjack and Shoebill beginning in July and running through October 2010. The priority site for 2010 is Burger. This presentation slide emphasizes the distance from the communities in which the drilling program will take place.
- 2010 exploration plans demonstrate a significant decrease in Shell's planned drilling program. We have heard the concerns about pace and developed and submitted a proposal that is significantly smaller than the 2007 proposed plan. In 2010, one drill ship, the Discoverer, and support vessels in Chukchi and Camden Bay are proposed. There will be no simultaneous drilling and no 3-D seismic. This new plan reflects a significant reduction in Shell's activities in the region. There are three support drill vessels: an anchor handler, ice management, personnel transfer, re-supply support vessel. Personnel transfers will occur by vessel and helicopter. Ice management will be doing recon to manage ice and protect personnel.
- The sea plan and oil spill contingency plan has been approved by MMS and the State to ensure Shell can respond immediately if oil is released to the surface. The exploration program isn't to bring oil to the surface, it is to insert the tools into the reservoir to see what is in the reservoir to make decisions on the next steps in drilling. However, it would be

irresponsible if Shell wasn't completely ready to respond to any elements on the surface, i.e., oil or diesel spill which could occur from a ship-to-ship transfer. About $100 million has been dedicated to the oil spill contingencies vessels.

Additional updates include:

- We have developed a comprehensive Plan of Cooperation. We commit to a 2010 CAA process which is currently under review for signature. We had a good meeting in Barrow February 12 and February 13 and we believe we are close to accepting terms. We will continue to invest in collecting data, subsea, sea floor, water column and coastal and offshore aerial surveys.

- The 2010 Cooperation Plan includes a communication plan for avoiding conflict with subsistence users; collaboration and communication with whaling associations; commitment to hire subsistence advisors based in Beaufort and Chukchi Sea Villages, Kotzebue, and other coastal villages identified as needed; MMOs on all energy source vessels; robust marine mammal monitoring protocol; and, an oil spill response fleet on standby 24/7 near drilling location, no further than one hour from activities. There will be real time ice and weather forecasting to manage proactively to stay on sight and not have issues with weather or ice. Ice will be observed through satellite and ice vessel, crew change by helicopter and collaboration on routes to and from shore based, and no transmitting with communicating. There will be communication centers in every village if there is a decision to drill. It is about having good solid plans so that no emergencies occur.

Shell heard the message of "Too Much – Too Soon – Too Fast" and as a result is cutting its drilling activity in half.

Questions/Comments:
Lisa Rotterman, NMFS: I have a question related to the previous presentation. My comment is that it would be useful in the reports if you could bring all the environmental factors together to evaluate the detectability during the boat surveys due to darkness, sea state and weather both when surveys are occurring and when they are not occurring. For example, the issue around sea state: you don't know if it is during day or darkness. If you would bring them together, we could try to understand what your detectability was; it would start to get at it. My question is for JASCO... on the noise level radii 120 dB looked like it was 10 km from the Burger prospect. Can you confirm that?
[Unable to Identify Speaker - Acoustic Slide Presented]: The 120 dB radius was at least ten. I think it was 12 or 13 km.

Catherine Berchok, NMFS: My question is for David. With your big arrays did you pick up the shallow hazard work from last year?
Dave Hannay JASCO Applied Sciences: Yes, we did. I didn't present that because I didn't have time. Most of the recorders are within 30-40 km from the site.
Michael Macrander, Shell: In the past and until now we presented the SSV dedication as a point of time. It was brought up if there was variability through time that would be useful. We embarked

upon actually using array recorders at various distances to get ideas about SSV and wide spread arrays and how it has varied through time. We are working on the data for presentation.

Robert Suydam, NSB: That's good to hear. I have the 90 day report open to that page and the preliminary radii was 30.8 and final 31.3 km. My question for Susan is a simple one: how many ships are going to be operating in the Chukchi?
Susan Childs, Shell: The plan covers the oil spill assets – three vessels – and then ice management vessel, resupply vessels (possibly two vessels), and that's it for the drilling program.

George Edwardson, ICAS: My question is that I have trouble understanding how we can continue talking about planning for physically doing drilling. How can the U.S. continue this without a baseline? You can't talk about what you are going to do unless you know what's out there. The saying is having the cart before the horse. You are the cart and way before the horse.

Susan Childs, Shell: We are here for the next week. If you have questions or concerns, please don't hesitate to come talk to us. I won't know your concerns unless you talk to me.

Monitoring Plans – Chukchi Seas 2010
Michael Macrander
In regards to Shell's hopes and intents for drilling in 2010, whether we drill or not, components of the Monitoring Program 2010 will go forward and consist of having an MMO on drill rig and support vessels. We have committed and plan to have MMOs on all vessels out there whether they are a sound source or not. The number varies from one per vessel to three on any vessel that will be regularly transiting and up to five on ice management vessels and the drill rig itself. There will be a lot of MMOs constantly watching operations, with SSV and sound monitoring during operations. In addition to SSV, there will be an additional sound monitoring program that will go on during all drilling related activity. We'll have hydrophones deployed around the drill rig and reporting data in real time and we're exploring the possibility of making a data stream data available. A big part of the reasoning for the additional sound monitoring is to identify what the sound levels and activities on and around a vessel that contributes to the highest level of sound are and how it can be mitigated. It will give us a large amount of information of what needs to be done in years to come, i.e. special motor mounts, operating instructions, etc. Acoustic monitoring will be a joint program with ConocoPhillips as part of ecosystem characterization. It is usually a shared program between operators, but it has been a joint program as of 2009. JASCO was the contractor. In 2010, there is a strong likelihood other industry partners will join in. There were 44 recorders with dense arrays on the Burger prospects and other prospects, as well as a distributed array across the Chukchi. This will allow us to identify issues close to the prospect and detect specific and larger movement of marine mammals across the Chukchi. The larger array will occur whether drilling occurs or not. The saw tooth aerial program will be re-implemented in 2010. It started in 2006, but did not occur in 2009; and will occur whether drilling occurs or not. Information on the specific reactions of marine mammals to ice recession, identification of walruses coming ashore in low ice years, etc., came from the saw tooth program, generally between Barrow and Pt. Hope, with aircraft flying 20 miles offshore and onshore and along the coastline. Drilling monitoring and effects of discharge is not a specific part of program under the IHA, but is mentioned for completeness. It was requested as part

of the CAA this year that if Shell drills and discharges affluence, that there was a monitoring program around that. Shell is in the process of developing a detailed monitoring product. There will be an ecological characterization study as in the last two years. As part of the ecological characterization project it provides for marine mammals and marine birds observations on the Burger and Klondike prospects, since those activities would be going on during drilling and it would add additional capabilities of capturing marine mammal behaviours from drilling.

Other studies include:

a) Overwintering acoustics
b) An ecological characterization. In 2008, 2009, the eco-characterization focused on Burger, it will be expanded to other prospects in 2010.
c) University of Texas (as they go about doing work for MMS to conduct contaminants). Shell will be adding personnel to the vessel to add personnel and capture fisheries, bird and mammals and provide a larger ship.
d) Funding contributions to tagging studies
e) Ice and oceanography studies

Questions/Comments:

Ben Greene, NSB: I'm interested in the fate and effect of discharge studies that are being put together right now in case of drilling. Will this study be subjected to scientific review, specifically the effects side? Does that imply you will be monitoring for contaminants in subsistence foods and what would be the time period? Finally, as this study design is put together, will that be made available to NSB? As you are aware, the borough is actively engaged in studying marine discharges.
Michael Macrander, Shell: It is the intent that eventually all the science will undergo peer review either by publication or before. We want to get it internally at 90% before we bother the NSB but anticipate that somewhere in mid-to late April we will come to you with the study plan. My hope and anticipation will be that it will be small negotiation, rather than large. The focus on fate and effect is looking specifically in the vicinity of the rig and looking at atrophic levels to see if there are any indications of bio accumulations. One factor that needs to be established is whether there is potential for complete pathway. The focus will be the animals near the rig that don't move much, as well as the food items themselves and looking to see indications of bioaccumulations. From that you look at potential for upper transport to higher level strata which represent the subsistence resources.

Todd Stormo, NSB: Also on fate: would these studies be conducted on the ship or sent out?
Michael Macrander, Shell: Sent out?
Todd Stormo, NSB: Will these be done on the ship.
Michael Macrander, Shell: This is a study that is not part of the IHA, but I will answer the question. The intent is to have a dedicated vessel that will have a wide variety of chemistry of oceanography, chemistry and biological people on board. They will be transported back to labs for analyses and data will be available for review.
Todd Stormo, NSB: So this will be over several days.

Michael Macrander, Shell: There will be no on-board analyses. It will be done through the period when the rig is on and we will be taking periodical samples, approximately six weeks and then samples will be taken to shore for analysis.

Brad Smith, NMFS: For the intensive array at Burger, will there be local capability and what are the error margins there? Active measures - have you looked at that as adding to your arsenal?
Michael Macrander, Shell: So again, I'm not sure what you're talking about. There are three components to our acoustics: SSV, wider arrays and now intensive monitoring around the rig. The intensive monitoring is dedicated to sound from drilling related activities. We won't ignore any marine mammal recordings, but it isn't the main focus. The same goes for SSV. The disperse array and highly focused array on prospects do have capacity for localization and that is what will be used. We're working on 2009 data, but it is not quite ready. We did that with Cornell in 2008. Yes, there will be the capability to localize and we can pull additional information on the sound and array.
Brad Smith, NMFS: Will that have resolution to (unable to hear) movement on a small scale?
Dave Hannay JASCO Applied Sciences: It will, if they are in the array within a few 100 meters. Further away, you lose resolutions. Bowheads inside the array will have good resolutions.
Brad Smith, NMFS: Anything about active measures?
Michael Macrander, Shell: There's promise there, but we haven't embraced it as yet. We're interested in the passive acoustic things. There are possibilities of testing, but not part of plan as yet.

Earl Kingik, Pt. Hope: Who's going to be doing enforcement? Is the Environmental Protection Agency (EPA) going to be on ship when doing water discharge? Is the USFSW going to be monitoring? Enforcement – who's going to be enforcing the law in case you did a "no-no"? Will the USFWS be helping monitor?
Michael Macrander, Shell: I will defer to John on this.
John Goll, **MMS**: For the exploration activities, there will be an inspector on board. That person will be there fulltime. The track record is to have someone on board all the time. If the inspector sees something out of the ordinary connected with NMFS or MMS, we would report this to the Service. NMFS, MMS, USFWS will have a weekly review report to see what is going on.

Marine Mammal Monitoring
Dale Funk, LGL
Objectives: To document marine mammal distribution and activity near drilling operations of estimating exposures and collect data on marine mammal occurrence and distribution relative to vessel based MMOs (five on drilling rigs; three to five on support vessels). MMOs will watch for all daylight hours up to a 12 hour maximum. MMO data collection will include vessels underway to and from drilling operations utilizing standard data recording procedures used during seismic surveys and on vessels on standby or within localized areas. There will be nine vessels total with a range of one to five MMOs depending on the vessel function.

Modelled sound radii : Drilling source levels = 175 dB. Level B harassment threshold for continuous sounds is 120 dB with radius of 1.4 km or 13.1 km^2 monitored from drilling vessels and during route

in support vessel activities and results used for estimation of Level B takes. No operation shutdowns are planned. SSV to determine actual radii is to be monitored.

Modelled Sound Radii

Location	Received	Model	Used
Burger	120	1.35	2.04
Shoebill	120	.51	.77
Shoebill	120	.57	.86

Aerial surveys will be conducted from July through October. Two to three surveys per week will be conducted while in the theatre. It takes two days to complete a survey. Surveys will be done at 1,000 foot altitudes, 100-120 knots survey speed, with three to five observers, and will collect data on distribution and relative abundance of marine mammals in the near shore area. Aerial surveys will be flown at a saw tooth pattern about 20 km offshore and a coastal survey will be conducted along the coast. These surveys were flown in 2006, 2007 and 2008.

The 90 Day Technical Report will address requirements of permits and agreements, monitoring efforts, marine mammal sightings, and analysis of factors influencing detectability of marine mammals. It will estimate exposure of marine mammals to industry sounds, provide analysis of effects of drilling operations on sighting rates, sighting distances, behaviours, movement patterns and a detailed analysis of SSV measures.

Questions/Comments:

Mike Payne, NMFS: I have a question on the analysis of effects of drilling options. In an earlier presentation it was 120dB to 1.4 km. How are you going to compare what you see from the rig to what is around the rig?

Dale Funk, LGL: There will be vessels around the rig that will have observers as well. Some of the observers will be present on site throughout the program

Mike Payne, NMFS: But they aren't doing transects so you can compare 2 km to 10 km of the rig.

Michael Macrander, Shell: That's part of the dedicated monitoring program that is being operated in conjunction with ConocoPhillips. It does involve every 2 km on the prospects. It will be done multiple times during the season including the drilling program. Add to that the acoustics program will allow for localization. We're looking at multiple streams to get us to that point.

Craig George, NSB: About the work off Barrow, visual data is not adequate alone. Acoustics alone also have problems. But, integration of the two gives a good picture of what is going on. I'm not seeing a good mixture of the two. Can you comment on this?

Michael Macrander, Shell: You aren't seeing much acoustic? The aim is to integrate the acoustic and the visual. Over the last several years we've done that. The acoustic data, aerial surveys and on-vessel observations has given us insight on walrus behaviour. The intent is to pull multiple streams and incorporate it.

Craig George, NSB: Can the integrated data be used to estimate takes, for instance?
Michael Macrander, Shell: Yes, the take has been based on the MMOs from the vessel. We'll have to take a look at how the other data streams can inform that. With the aerial, observations around rig and vessel based observations and from prospect-specific programs and MMOs onboard the widely distributed lease area. So there are several sources of distribution and abundance information which will all be pulled together. I don't anticipate it in the 90-day report, but it would be included in the comprehensive report.

Harry Brower, AEWC: Regarding the third bullet about marine mammal sightings around age/size/gender. In terms of subsistence harvesting, we were able to identify those, but you must know something I don't know if you can see the gender as they are swimming by.
Michael Macrander, Shell: Clearly we won't be able to do that. When you can tell something like that, you don't want to ignore it. In some cases, we'll get some of that.

Robert Suydam, NSB: The issue Mike Payne brought up and monitoring around drill: the 120 dB was at one point 4 km. In 1986 when drill operations occurred at Hammerhead at 15 km, the rec'd was 105 to 130 dB and whales were a zone of avoidance of 15 km. This happened again in 1992. I think similar things happened in 1993. Perhaps in the Beaufort Sea some of the sounds from support ships were included in sound measurements and I would like clarification if 1.4 km is just drilling or if it includes support vessels. If the zone is out to 20 km, it seems unlikely that MMOs can provide much information at all.
Michael Macrander, Shell: Going back historically, some of that was inclusive of the full fleet as well. The 1.4 we talked about is the drill ship and operation only. I'm not making a comment on the sound signature of other areas. When we look at the model data for the vessel, that's why we do SSV. We verify and then adjust accordingly, but sound levels aren't anticipated to get to 180 dB around drill rig or support vessels.
Robert Suydam, NSB: One was model and the other if zone is larger. If zone of influence is considerable, monitoring onboard MMOs won't provide information needed for estimating takes.
Michael Macrander, Shell: There will be multiple data streams as mentioned earlier—three MMO data streams—if we take all of those together, it will give us a better ability to estimate density around the entire area of operations as well as acoustic programs and its ability to localize will give us a strong capability to interface with the data. As you will see tomorrow, there are limits to virtually every way to collect data. If the animals don't vocalize, they are invisible to acoustics. It's another data stream to monitor.

Robert Suydam, NSB: Since 2006, Shell has said we don't want to fly offshore. Shell has reconsidered since they are anticipating utilizing helicopters out to the rig. It seems like Shell is willing to risk human safety to get people out to the rig, therefore an alternative is to do aerial surveys around the rig to visually monitor where onboard MMOs can see.
Michael Macrander, Shell: Interesting you should say that. As I've said, more data sets clearly do better at monitoring. What it comes down to is rather than Shell take a hard position around seismic, I think that my preference is to present the data and then allow us as a group and regulators to look at risk that is being asked for, look at data realistically being anticipated and make a cost benefit ratio judgement. So Robert, your comment about Shell re-evaluating, and it's been our

intent to fly helicopters in an offshore drilling program, but not our intent to fly in support of monitoring. That is still our position. That said, it's time, and as you've asked for, to ask for a rational as to why.

Helicopter Risk
Michael Macrander
There are large differences in the industry oil and gas producers average accident rate. For offshore helicopter flying the accident rate is 5.7 fatal accidents per one million flying hours. Fixed wing accident rates are 30 fatal accidents per one million flying hours. All helicopters used for offshore have full redundancy. The ability to function long term isn't guaranteed with a fixed wing. Additionally, flying time for a helicopter offshore to the rig is one hour and they are never 35 miles or ½ hour from landing. Fixed wings can be up to 130 nautical miles offshore to set down and upwards of an hour. Estimated flight miles for helicopters versus fixed wing running five resupplies per week for six weeks would be a total of 7,500 nautical miles. Conversely, looking at 40% of days for aerial, it would be 25,000-30,000 nautical miles in a year with about one-half on prospect. Relate this to 30 fatalities per million hours of flight time and it begins to add up. Survey aerial over flights are 15,000 in elevation. Required evaluations for helicopters would allow for response time with their auto-rotation capabilities. Aerial observation sightings over the last year or two and the number of individual animals observed at 1,000 km per flight does not show many observations weighed against the risk. Resupply routes are designed to minimize flight times and exposure to overwater flight. It would consist of narrower corridor transverses and simpler search and rescue in case of ditching.

Robert Suydam, NSB: We have been talking about this for a while. It is not the entire case for or against and it needs to be discussed further. I think NMFS needs to be in the room to evaluate and if they think they are appropriate and needed offshore beyond where drilling occurs. There is need for further discussion and if not, identification of another source of data to process quickly for development of future monitoring programs.
Michael Macrander, Shell: Agreed, and that's why we are investing in the unmanned aerial survey. My effort has been to develop as much redundancy as possible so that we might not have to do this.

Jeff Childs: As some of you know, there are numerous surveys done offshore in Chukchi and Beaufort. Looking at data presented on helicopters versus aircraft it is a bit unsettling. What comes to my mind, with respect to the fixed wing data presented, is what is the composition of aircraft that you incorporated into that data set? Is it aircraft in Alaska, west coast, east cost, commercial, just aircraft doing offshore, single engines, twin engines? It is important to characterize the increased risk of doing fixed wing surveys as we've done them. Could you elaborate more on the details of the data set?
Michael Macrander, Shell: The analysis wasn't mine. It came from Shell aviation. It is my understanding that it is dedicated to doing offshore surveys required to fly an offshore grid maximizing time spent offshore. My assumption is that it incorporates equipment used for offshore work. There is an industry norm that you don't fly too much offshore in a single engine aircraft. We

need to look at it more carefully. As a first look, neither is it fair to say that if you are willing to fly a helicopter, you're willing to fly a fixed wing. It's not the same.
Jim Lecky, NMFS: We need to take a look at it and consider it. We have rigorous standards for our people who fly offshore. We do it occasionally. I don't have enough information and certainly I would expect industry to present information if they will be using it as a monitoring tool.
Jeff Goll, MMS: If we could get permission from Federal Aviation Administration (FAA) to fly out in the Chukchi, that will go a long way. There are a number of efforts that will make that happen.

StatOil 2010 Operations and Monitoring Plans for Chukchi Sea 3D Seismic Survey

Martin Cohen
I'd like to describe the activities planned for the open water season. We have already visited the North Slope Borough, Fish & Wildlife Department and the villages but welcome the opportunity to address the Open Water meeting and inform you of our plans for this summer. StatOil is a global Norwegian energy company. In Norway, we operate nearly 40 offshore oil and gas fields. We are now a major acreage holder in the U.S. Gulf of Mexico and have Arctic experience in Norway, Russia, Greenland and Canada. We are leaders in carbon capture and storage, and offshore wind technology.

2010 Chukchi Sea Seismic Survey: StatOil operates 16 leases in the Chukchi Seas; 14 with partner ENI. We plan a 3-D seismic survey in 2010 with contractor Fugro GeoTeam. We submitted permit applications at the end of 2009 and are currently conducting stakeholder engagement assisted by ASRC Energy Services. We are beginning to recruit MMOs through ASRC and LGL which allows access to traditional knowledge. The 3-D survey encompasses approximately 915 square miles over StatOil's leases. The 3-D area is largely > 100 miles offshore with a small number of 2D lines also planned, if ice conditions and weather allows. The purpose of seismic is to enable us to image the subsea geology. Existing seismic data in the Chukchi leases is old, sparse and of inadequate quality. Modern data is required to understand the complex geology and will be used to make decisions on further exploration. Vessels that will be used are the Geo Celtic, a modern seismic vessel, which will be the main vessel, and two smaller vessels for equipment handling, marine mammal monitoring and crew changes. The surveys will be early August through early October 2010 and will arrive in Dutch Harbor. A safety program will be held on both vessels and sail through the Bering Sea reaching leases in early August. Data will be made available to all interested parties as soon as it is available. One crew change is planned through Nome, with one vessel transiting to Nome in September. Once in the area, there will be little interference or transit between activities and the coast. If there is reason to make contact with the coast, it will be done through the Wainwright communication center. Seismic methodology will be a sound source towed behind the vessel. Airguns fire compressed air into the water. Behind each source is a streamer with a steerable hydrophone, with a total of 12 streamers used to reduce survey time and solid streams used to avoid pollution.

Monitoring and Mitigation Plans: Measures to reduce impact will consist of marine mammal monitoring, mitigation procedures, environmental baseline monitoring, and communication and call centers. The plan is to work in conjunction with Shell and ConocoPhillips with procedures and processes already in place. StatOil is looking forward to enhance the vessel based monitoring with the sea based data.

StatOil will be following regulations required and MMOs will be employed on all three vessels. An additional third vessel has been contracted primarily to assist with MMOs. There will be scientific and Inupiat MMOs with five on SSV until mid-August and then down to three or four. There will be two to three on support vessels. Procedures to mitigate impact including using SSV to use to establish safety radii distances. If marine mammals are observed or in approaching safety radii, seismic power down or shut down will occur.

Stakeholders Engagement & Plan of Cooperation: The North Slope Borough visited Norway in March 2009. In October and November 2009, NSB Planning Commission and Wildlife Department and Village leadership meetings were held. In January 2010, village public point of contact meetings and in February conflict avoidance agreement meeting was held with the AEWC. In April 2010, there is the Open Water Meeting and Nanuuq, Ice Seal Walrus and Beluga Co-Management groups.

Timeline: Permit applications were made in December 2009; stakeholder engagements from October 2009 and onwards; acquisition early August to early October 2010 and a 90 day report after activities occur.

Questions/Comments:

Mike Payne, NMFS: If good weather, how many days in two months will be actual shooting?
Martin Cohen, StatOil: 60 days to carry out the model. In the area where we are surveying there may be ice.
Mike Payne, NMFS: One issue that came up is cumulative effects that NMFS will undertake with EIS and permits. I don't know exact proximity; it is the same time period with Shell surrounding you. It would be helpful to have the two of you tell the effects of yourself individually but to collaborate with the effects.
Martin Cohen, StatOil: Shell will be drilling at Burger.
Mike Payne, NMFS: It will be out to 60 miles. You add a drill ship and it would be helpful to see what the effects would look like.

George Ahmaogak, Ahmaogak Associates: Cumulative effects ...dare not to forget this. My question to you is you went through vigorous meetings with AEWC and I'd like to hear if the agreement has been accepted and where are we with that.
Martin Cohen, StatOil: We were at the meeting in Barrow last month and we were very encouraged how the meeting went and the spirit of compromise. At the moment, StatOil is looking at the revised agreement from AEWC and we have also been partners with ConocoPhillips so we've been talking with them and finding out their views and concerns. Internally, through our processes, we haven't come to a final decision and are at the moment putting together a response to AEWC. There is a section on drilling and discharge, so we feel have a particular interest in that aspect. One issue is

how/what goes into the CAA as to what goes into discussions with the regulatory authorities. We're not there yet. The response to AEWC is to have another round of discussions with them and see which is the best way to move forward.

Robert Suydam, NSB: Are you going to present details of monitoring plans for this year?
Martin Cohen, StatOil: I wasn't planning on going into it in detail but there can be more discussion at the peer review on Thursday.
Robert Suydam, NSB: Monitoring the zone of influence and understanding your plan and the details is important. Shell has always done really good with that with locations and distances. Having some of those details will be needed for the peer review.
Martin Cohen, StatOil: If you have particulars on how you want to see the information, we can provide those details.

Harry Brower, AEWC: There is a lot more interest in the Arctic Ocean than in the past, and indicating working with ConocoPhillips, that they will take some of the traditional knowledge into plans and have them drive some of that as well, particularly in the CAA discussions.

John Hopson, Olgoonik Corp: When you talk about the CAA and discharge issue, what has power over what? Does AEWC have power to say you can't have discharge or the federal government says this? Where is the line drawn there? What are you going to say if AEWC says zero harmful? Will you sign?
John Goll, MMS: The EPA is the regulatory authority on discharge into the ocean.
Jim Lecky, NMFS: The CAA is the instrument that AEWC and industry use to agree upon operations to resolve potential conflicts; the government doesn't require or necessarily rely on it. If AEWC and oil were to agree to not discharge, that's the agreement within entities. The government won't weigh in. We would look to the EPA to guide any discharge issues and the effects it may have.
John Hopson, Olgoonik Corp: Thank you. The discussion hasn't occurred in any meetings and there hasn't been anyone to comment on that question.

TGS 2010 Operations and Monitoring Plans for Chukchi Sea 2D Seismic Survey

Michaele Cerf and Jacqueline Rose
TGS is proposing a 2D seismic survey in summer 2010. Some of the information is the same, but some is very different from other operations in the Chukchi Sea. TGS is a very small company. It is a geophysical company with focus on multi-client seismic data. It is our data, and we license it out to people as interested. It is related to the oil and gas industry. Our main offices are in Houston and Norway, and we have offices throughout the world. The company has 630 employees and is traded on the Oslo Stock Exchange. TGS's core businesses consist of geophysical data, geological data, and imaging services. The values are responsibility to clients and customers (promise quality and service), employees (our number one asset), communities and environments (where we live and work) and shareholders (profit and growth).

Proposed 2D seismic survey includes a regional baseline survey for Chukchi using a 2D seismic vessel with one source array with one streamer. The source is 3,400 cubic inches with streamer = 6-8 km (3-4 miles long) and is ice dependent; 5,000 km of seismic lines (3,100 miles) with data belonging to TGS to license to multiple customers. With 2D we shoot in mostly straight lines. We're imaging in a line, not an area. The first issue is the critical habitat area. We tried to keep lines 50 miles offshore, but feedback from communities is that it may still be too close. We are going to reassess. The lines are extremely long. With no obstructions, it would take two days to transit the longest line.

Operational Timeline: Start no earlier than July 22 and more realistically the first of August. Calculated length of surveys is 30-35 days. Variables that may be encountered are ice, marine mammals, simultaneous operations, weather, and equipment acquisition (planned) and is five to seven weeks from August to mid-September. We are acquisitioned (permitted) for three months through the end of October in case variables are encountered.

Operational Plan: Pre-survey in Nome lasting one week for fuel, supplies, and training and start-up meetings. Transit to Chukchi Sea is planned for two days and then will engage in data acquisition in the Chukchi for five to seven weeks. Transit back to Nome over three days where crew changes will occur over one to three days. Transit to a 'to be determined' location with the date and time depending on variables.

One of the major issues will be ice coverage. Most of the area is covered in sea ice, but June and July can still have severe ice issues. Mostly August and September is when ice is cleared and acquisition can occur with ice returning in early November.

SIMOPS: Simultaneous Operations – common practice, coordinate with other operators (prevent interference and maintain safe distances), and resolve conflict (time sharing and strategic planning in acquisitions timing).

Marine Mammal Monitoring & Mitigation Planning: Objectives are to minimize impacts; collect data on distribution and abundance of marine mammal in the survey data; document marine mammal occurrences and activity near seismic operations and base for real-time mitigation (power downs and shut downs of the airguns). We're pretty sure that the MMOs have a much better idea of what is going on than the crew. SSV will be conducted early in the survey, and we will revise safety radii as needed for implementation by MMOs. Vessel based observers – there will be five on source vessel and three on scout vessels. MMOs will be on watch for all daylight seismic operations, most daylight non-seismic operations and 30 minutes before and during ramp ups (two MMOs). They will ensure safety radii are clear of respective marine mammals for 30 minutes prior to and during ramp ups. There will be continuous monitoring of safety zones during daylight airgun activity and will power down to mitigation gun if a marine mammal is sighted within or likely to enter the full airgun array.

Oil Spill Response: On board oil spill response plan is the first line of defence. The crew on vessel will be charged to address any spills that occur. The team is assessing need for third party

contractor, discussing options with local contractors and no bunkering at sea! No refuelling at sea due to extreme danger and vessels will be transiting back to Nome to get fuel.

Next Steps: Modify survey lines as necessary, modify marine mammal monitoring and mitigation plans as necessary and lastly secure logistical support, i.e., port services, finalize MMOs, oil spill response and CAAs. We've just received the draft of the CAA and haven't had time to review. Still need to discuss a meeting in Barrow and need to talk to the participants at AEWC and operators in Chukchi to obtain plans.

Questions/Comments:

Candace Nachman, NMFS: In the application you submitted you were using a 4100 cubic inch array, but you also made a statement that was still in flux and didn't know when a final decision would be made. It's important to set negligible impact takes, etc. Will you finalize this soon?
Michaele Cerf, TGS: Oh, yes. 3400 will be the maximum. I left it open to see if we need to downsize, based on peer review and results from the Open Water meeting.

Robert Suydam, NSB: We need details of monitoring plans such as understanding how the safety radii is modelled and how it compares to previous results of SSV done in the past and understanding how monitoring is going. Having a relatively large air gun array, how are you going to monitor with chase vessels or shut down and provide information on how many marine mammals were exposed to sound or behavioural fashion? How are you going to monitor in inclement weather or darkness, fog, etc.? Those details are really important for the Open Water meeting and peer review.
Michaele Cerf, TGS: Good question. What do you do in these situations? We modelled our original source and we're doing work with ARSC and LGL. We made it smaller and remodelled. I received the report the day before I came here. I have the exact number but didn't have – how with a large source are you going to cover the ground and how to cover with chase vessel and in poor conditions? We're not using passive acoustic monitoring and we don't have any way to mitigate things from falling from the sky. We're between a rock and a hard space. Regarding the chase vessels, we are not doing aerial surveys. It's a safety issue for us, so the chase vessels will have a hard job. Hopefully we can give them a focus area.

Robert Suydam, NSB: Many folks have collected data on impact on marine mammals on industrial sounds and bowheads can be sensitive to sounds and having MMOs and only chase boats is going to bias the results and give lower estimate of takes than what is actually occurring. Also, my issue is cumulative impacts and I encourage StatOil to get together with Shell and come up with a monitoring program to look at impacts for multiple sounds and operations. Perhaps TGS could be a part of this too. Having passive acoustic monitoring for the broader array to help populate with more instruments might be a solution.
Michaele Cerf, TGS: To remove the bias, we're open ears minus the use of aerial survey. If you have suggestions let us know. With the passive acoustic monitoring, it only covers about one-tenth of what we're trying to do. It would be a huge cost. In regards to setting up a regional passive acoustic monitoring system at a huge cost...

Robert Suydam, NSB: I'm not suggesting you duplicate what Shell has done. This is a basin wide passive acoustic. Having TGS providing more acoustics would have more data on marine mammal distribution in the Chukchi and impacts in the multiple different sounds going on. Not doing aerial surveys is a problem, so coming up with other means is needed. With some efforts, photo rays and other methods are needed. It might be a technique that may be progressed and move forward.
Michaele Cerf, TGS: As an addendum/addition to that program, that would be interesting.

Earl Kingik, Pt. Hope: Do you have federal permission to operate this summer?
Michaele Cerf, TGS: No.

Earl Kingik, Pt. Hope: Are you going to villages to talk about 3D and 2D?
Michaele Cerf, TGS: Yes, I just got back from Barrow. We were up last week in Pt. Lay, Wainwright and Barrow. I'll be in Pt. Hope this week and incorporate a bit about 2D seismic is. Yes, we've been there and will be there and hope to something to talk about is how maybe we could go back to these communities to keep the effort going. We got great feedback and questions and pinpointed good ideas of what we need to go back to look at.

Earl Kingik, Pt. Hope: In your CAA, you haven't looked at it yet, but here are other animals that are ABWC, Walrus Commission and Bird Council and the Arctic Treaty Counsel. Have you talked to these people about CAAs?
Michaele Cerf, TGS: We have tried, but haven't received any feedback. TGS is hosting the Captain Cook Hotel, Club Room #2 at 5:30, and is open to all agencies and representatives that have questions one-on-one.

Jeff Childs: This is a comment to Shell, ConocoPhillips and anyone doing work there, NMFS, StatOil and LGL. As an ecologist flying over the area, I see an increase in exploration activities occurring and the opportunity to synergise impacts and it goes to cumulative impacts. We have a scenario unfolding where one seismic operation or exploration activity could alter the behaviour and drive them into another area where activity is occurring. This has a pinball effect. You really need to spend time to detail with cumulative effects—just a recommendation.
Michaele Cerf, TGS: Thank you, great idea.

George Edwardson, ICAS: To start off, you don't have leases in the Arctic, right?
Michaele Cerf, TGS: Correct.
George Edwardson, ICAS: And listening to you, you have no experience in the Arctic?
Michaele Cerf, TGS: That is not correct.
George Edwardson, ICAS: The reason why I say this is because you are asking questions from people about what they know, the groups, organizations, oil companies, like I said, you are on a fishing expedition and you want us to teach you.
Michaele Cerf, TGS: No, I'm not on a fishing expedition and I always want people to teach me. We have extensive experience in the Arctic in Greenland and Russian Chukchi Sea and Norway. As such, those areas aren't the same as here – this is a unique place, the concerns, ice, politics, people, etc.

As a first time operator in the Chukchi, I'm open ears. I want to hear what you have to say. As I told you, we're experts in gathering data in icy environments.
George Edwardson, ICAS: I would suggest that you get all your facts together and come back to us with more knowledge than you have.

Diane Sanzone, BP: You said you weren't going to do any underwater acoustic monitoring for marine mammals as it is cost prohibitive. Could you expand on that?
Michaele Cerf, TGS: Sure, if we were to put down an acoustic array. If you looked at Shells arrays, they are dense. How do you cover that large of an area?

Robert Suydam, NSB: You mentioned in one slide about minimizing impacts. The 2D seismic lines are pretty close with what StatOil's 2D lines are. If we are to minimize impacts, we shouldn't duplicate things. I encourage you and StatOil to talk and share data to reduce number of lines to shoot.
Michaele Cerf, TGS: I have heard this comment before, and it is a good idea.

Michael Macrander, Shell: These are not Shells' recorders or arrays. The acoustic programs have expanded with ConocoPhillips, GXT, etc., and lot of money has been put into that. We were first out of the gate to talk about them, but I don't want it misconstrued that it is Shell's.
Michaele Cerf, TGS: If it was affordable, the universities would have already done it.

Harry Brower, AEWC: I couldn't meet with you in Barrow and don't know what participation was in Barrow. How many people were at the meeting, and what is the nearest point you will be in Barrow at the start of our fall hunt? In terms of timing of operations and not wanting to shut down and costing you money, not knowing distance of operations and timing of hunt?
Michaele Cerf, TGS: I can't say the exact time we will be in Barrow. By end of September we hope to be 300 miles offshore.

Craig George, NSB: Could you display your shot lines again?
Michaele Cerf, TGS: (shows slide).
Craig George, NSB: With regard to needs for monitoring, we will see presentations tomorrow that will show monitoring tags, but I think your encounter with bowheads will be more extensive than we've seen closer to Wainwright. We really do need to see what is going on in the more northern areas.

Day One Wrap Up

Lisa O'Brien and Ron Felde
Look forward to seeing you tomorrow at 8:30 and have a good evening!

Day Two – March 23, 2010

Day One Recap

Facilitators Lisa O'Brien and Ron Felde provided some housekeeping reminders including: a) wireless is available; b) when you pose a question, please identify yourself by name; c) if you haven't signed in, please do so; d) if you haven't turned off your cell, please silence it now; and e) requests for materials from yesterday are on the reference table, with 30 available copies, and Stephen will get additional copies if needed.

The facilitators gave thanks for the Day One presentations and indicated the feedback and comments were done well. They thanked participants for helping stay on task with the agenda. A 7:00 p.m. Scoping Meeting was announced and there was a request to stay on task throughout the day to allow ample time between the end of this meeting and the start of the next. Reminders were given to pose questions and comments being mindful of the presenters and audience and to avoid run on comments/questions. Participants were asked to watch emotional triggers and tone when commenting and questioning and provide appropriate responses.

An announcement was provided that Shell was providing breakfast and lunch today and many thanks were given.

John Goll, MMS, provided a Safety Minute on evacuation. In case of emergency, the exits are clearly marked, go out the way you came in and meet across the street. Lisa O'Brien reminded the audience to watch the cords stretched across the floor.

Candace Nachman, NMFS, indicated that new maps will be put up today in the back of the room and that this morning's topics would be moving into the Beaufort Sea. There are a couple of IHA's for seismic and drilling that will be discussed. Science presentations will begin in the afternoon.

U.S. Geological Survey 2010 Seismic Cruise and Monitoring Plans for the Beaufort Sea

Deborah Hutchinson

Plans for the Beaufort Sea involve two ice breakers not related to oil and gas production. We acknowledge we are putting in a draft IHA with NMFS that was prepared by LGL. Questions on the IHA will be deferred to LGL. This work is collaborative between the U.S. and Canada. Primary collaborators are the Geological Survey of Canada, National Oceanic and Atmospheric Administration (NOAA), with recognition to the U.S. Department of State and Canadian Department of Foreign of Affairs and Trade.

The message we want you to take home is that the IHA application for incidental take of marine mammals by harassment during summer 2010 (Level B harassment) estimates are low and no lethal takes are expected. Potential sound sources include 3 x Sercel Airguns, multi-beam bathymetric Echosounder, Chirp Echsounder, helicopter operations and ice break.

Overview of Seismic Experiment: Data collection with ice breakers has been ongoing in 2008 and 2009. The Canadians were collecting data in 2007. This year, we are proposing to collect data in the U.S. between the Canadian border and Barrow and in the Chukchi border land. The two icebreakers will be the Healy and Louis St. Laurent. The Healy will depart August 2nd out of Dutch Harbor and return September 6th to Barrow. The Louis will depart August 4th out of Kugluktuk and return September 5th.

Joint Surveys: The United Nations "Convention on the Law of the Sea": a constitution of the sea that sets forth a comprehensive legal regime governing activities on, over and under the world's oceans. The extended continental shelf is the seafloor beyond 200 nautical miles where a coastal state has sovereign rights over the seafloor and sub-seafloor region. The surveys are designed to identify where to put this boundary.

The reason for collaborating with Canada in their 200 nautical miles and U.S. going north in their 200 nautical miles is that there is overlap there and we can collect and operate from one data set. The actual lines of concern for the IHA are between the border of Canada and Barrow offshore; 480 miles worth of tracks. The idea is that they will start 75 miles offshore and go north. The permit is to allow Canada to do seismic work inside the U.S. If conditions warrant, it is a two-ship operation, but we can't predict ice conditions. If open water, the Canadian ship will do seismic, and the U.S. ship will do the other work.

Regulatory Framework: The Healy operates under U.S. regulations. The Canadian vessel, when inside the U.S., abides by U.S. regulations. In international waters, vessels will follow Canadian regulations. We have secured a categorical declaration to ensure U.S. rules and regulations are followed. They will comply with any and all environmental mitigation measures required by the U.S. There will be MMOs and a science liaison on the ships, and they will be responsible to ensure the ship adheres to the U.S. regulations.

Seismic Source and Sound Levels: The ship goes out with redundant systems for all components because they are operating in ice—compressors, streamers, airguns, sono-buoy, navigation. Most gear is on the quarterdeck. Three airguns total 150 cubic inches and two 500 cubic inch airguns. They have plastic inserts to reduce noise with 1150 inch (cubed), 1 x 150 inch (cubed) and 2 x 500 inch (cubed) .

Sound Source Levels: 1) decay curves and 2) near field amplitude. Two experiments: calibrated hydrophone hung vertically of stern of vessel while operating airguns. Analyses are ongoing.

There was an attempt to record with the airgun down 500 meters and guns were fired repeatedly to close the gap. It turns out that there were complications, and the IHA is a draft as we're trying to

sort that out. In the location where the experiments were run, there is a low velocity channel about 300 meters thick and we suspect there are some interference patterns. The acquisition problem is that the weight is directly on the ship so the ice is caught on the airgun. We're probably getting a large reflection off the ship as a result. These complications may mean the model doesn't apply exactly but will use the model to determine what the safety radii will be.

Safety Radii based on Route Mean Square (RMS) values

SSV	Estimated Distance in meters	
	190 dB	**180 dB**
150 in3 mitigation gun	20	62
1150 in3 (3-gun array)	68	216 (<2 ship lengths)

Safety radii still to be refined and proposed. These numbers are more accurate than can be ranged while on the ship.

Inventory of Odontocetes and Mysticetes: The clearly important whale is the bowhead; while fin and humpback are considered rare in this area. The seals are the bearded and ringed seals for the ESA. To look at take, we have to consider type and density of the animals. Information was taken from published and unpublished information. Given an average and maximum for both open water and ice water condition, the take uses the expected density times the area of water ensonified by >160 dB safety radii = take. Using 75 degree north ice front, the take estimate for bowhead is about 25 average or 50 maximum which is less than 1/2 of 1 percent of the Chukchi population. Latitude for 2008, there were Louis tracks of over 1,000 km and one sighting of beluga and three sightings of seals. In 2009 there were no sightings of any animals.

Other impacts on the natural environment include:

- Icebreaking, which alters ice conditions around the vessel and are highly variable at this time of year. The ice recloses and refreezes.
- Habitat Modification, only small portions of the available habitat are ensonified. Ice is expected to be <2 meters thick and could be in open water. We haven't seen ice greater than two meters in the past. Heavy ice makes their efforts too risky.

Subsistence Hunting: Information gathering through trips to Barrow in 2008, 2009 and 2010, and meetings with AEWC, whaling captains, North Slope Borough scientist, mayoral staff, and the Barrow Arctic Science Consortium (BASC). We also attended Open Water meetings (2008-2010). We've had a community observer on Healy from Barrow for last two years. Louis had three MMOs (indigenous Inuvialuit Canadians). Also the airgun technician is an indigenous Inuvialuit. Key areas to address as part of the subsistence hunt is to avoid the fall bowhead hunt in September and October, coastal hunting and fishing and crew exchange on September 6th in Barrow on the Healy vessel.

Plan of Cooperation: a) time of survey at beginning of two-ship operations (avoid timing of hunt); b) connect lines to existing seismic lines (stay >110 km (68 miles) offshore, well away from coastal area of concern; c) plan for community observer on Healy 2010 (primary communicator with SAR and

Barrow); d) plan to include Inupiat MMOs as much as possible; e) shutdown for 5 km radii for fishing and hunting activities; and, f) helicopter disembark with Barrow coordinator.

Monitoring: There will be six MMOs as part of the experiment, three on both vessels. Two MMOs from Healy will join the three from Louis for tracks in U.S. waters. For two-ship operations, 24 hour VHF communications. Also, observations every 1/2 hour or upon seeing an animal and observations continue when no seismic activities occur as well. U.S. MMOs aboard Louis have full authority for start up, ramp up and power down/shut down for U.S. waters, and there will be a 90-day report to NMFS.

Mitigation: In addition to normal mitigation efforts as presented by other oil and gas organizations, the **U.S. Geological Survey (USGS)** offers these additions: we are surveying at time of maximum daylight to avoid hunt, we will have the Canadian agreement to abide by U.S. regulations, and we will be able to change speed or course without compromising safety. Technology includes night vision devised, laser ranging binoculars. Ice analysis and ice observing will be conducted on both vessels. Helicopters used will be minimized in U.S. waters, and there will be an Inupiat communicator for return to Barrow.

Coordinating Research: a) 2007-2009 - MMO data made public through reports to DFO and published cruise reports; b) 2010 MMO data will be reported to NMFS and to DFO as well as published; c) Support non-interference oceanographic, biological and ice observation studies along cruise tracks (2008 & 2009); d) Non interference science will also be supported in 2010; e) Funded Greeneridge to analyze Shell data from Directional Autonomous Seafloor Acoustic Recorders (DASAR) for propagation of sound over long distance; f) Funded Shell/ University of New Hampshire analysis of sonobuoys for ship and background and provided ship time for recovery and deployment of hull and riser mooring program moorings.

Questions/Comments:

Chris (Last Name, Organization not Identified): Did you consider having a standard 10 inch mitigation gun?
Deborah Hutchinson, USGS: It was not possible. The array is ice strengthened with the air and trigger hoses. We would have to take out one of the current guns and it would compromise us collecting the data from the seas.

(Unidentified Speaker): Do you have SSV for the 150 gun?
Deborah Hutchinson, USGS: That was collected in 2008, so we have that information. I don't have the information and haven't looked at it for a while. We did not collect in 2009.

George Edwardson, ICAS: When you are out there in the open water if you could get a couple of launches operated by 4-stroke engines to the outer limits of seismic information, five to six miles out, travelling on the side of your boat you will increase the species contact by four-fold; you will see the animals running from you.
Deborah Hutchinson, USGS: I don't know if that would go to Coast Guard regulations, but thank you. That's a good suggestion.

George Edwardson, ICAS: You will find the animals when you get there.

Robert Suydam, NSB: You talked about sonobuoy and deploying. How many? What is the range?
Deborah Hutchinson, USGS: Every eight hours or so; roughly 15 within the U.S. and 12 for the work outside. In general they have been consistent in putting out every eight hours. That's a rough estimate. We do not put sonobuoys off the front of the ship. With two ships, there is a second ship.
Robert Suydam, NSB: The range?
Deborah Hutchinson, USGS: Range is out to about 30 km, 35 max. For us, that gets us crustal arrivals and lower crustal arrival.
Robert Suydam, NSB: A way to listen and see what marine mammals hear in front of the ship and that is something to consider especially in open water.
Deborah Hutchinson, USGS: There is ongoing discussion with Canada on passive acoustic monitoring and using monitors in place to listen. One of the challenges is if the airgun array is in water for too long without firing, things start to freeze. We are exploring with the equipment we have.
Robert Suydam, NSB: Are observations being made every ½ hour?
Deborah Hutchinson, USGS: Continuous observations, but entries are made in the log every ½ hour.
Robert Suydam, NSB: You mentioned Greeneridge funding for sonobuoying sounds. What were the results?
Deborah Hutchinson, USGS: They are recording Louis shots from large distances (600 km). The level of received signals is about ambient or just above ambient. I would need to defer to John Childs for additional clarification.

Charles Greene, Greeneridge: A report has been submitted in draft to John and is close to being finalized. I can't give numbers involved, but they are low level from 900 out to 1300 km. They come from a long way and are quite subdued.
Robert Suydam, NSB: NMFS, in the IHA application you estimated takes out to 160 dB level. If data show bowheads are responsive to sounds at lower levels, what is NMFS going to do with 160 vs. 120 with bowheads specifically?
Jolie Harrison, NMFS: We use 160 as our harassment threshold, including seismic. We recognize the potential for response at 120 and take into consideration when considering monitoring and subsistence impacts. We use 160 for take but consider 120 for responses.
Robert Suydam, NSB: When estimating takes at 160, it shows bowheads are excluded or nearly excluded out to 120 so it seems like to reasonably estimate whale take from any operations (scientific or industrial) to understand how many whales are being deflected, especially cumulatively, we need to know the biological significance at lower levels. We need to use the data we have to use the right estimate.
Jolie Harrison, NMFS: We agree and are doing that qualitatively, but not attaching a number to it.

Catherine Berchok, National Marine Mammal Laboratory (NMML): How fast do you go when shooting guns?
Deborah Hutchinson, USGS: No faster than four knots and often slower depending on ice conditions.

Catherine Berchok, NMML: You are getting about two to three hours out of each buoy. You aren't listening continually?
Deborah Hutchinson, USGS: No, we are. We use a non-directional antenna which boosted noise level and received almost eight hours of recording. I have been part of operations in Maine where finback noises have observed. We haven't seen any evidence of songs on buoy noises.

Jeff Denton, MMS: I understand with tandem two-ship operations only Healy will use airguns at that time?
Deborah Hutchinson, USGS: No, the Louis has the airgun and the Canadian system with 1250 inches total. The U.S. Langseth is not part of the operations at all.
Jeff Denton, MMS: Thanks. For NMFS, for clarification of take, how do you define take with duration and exposure?
Jim Lecky, NMFS: I hate this question. Take is a harassment and also harm and injury, but generally harassment; a potential for deviation in normal behaviour, a response. It is hard to define. Is it a deviation or normal? We try to estimate this from estimated exposure and exposure to take. We know that 160 and 120 problem is out there, but we are looking for significant response that may have a biological response. When we get into a court of law, this wouldn't stand up. We need causal and responsive evidence. It is a tough issue to deal with. We try to come up with a likely number of take because we have to authorize. What do we think the response is and what is the unmitigable impact.

Chris (Last Name, Organization not Identified): You mentioned you have a concern for habitat modification. What is your definition and only a small portion is being ensonified, what is your definition of ensonified?
Deborah Hutchinson, USGS: What is a habitat is being addressed in the ice area. I might also suggest we talk offline with LGL, but are we altering the ice condition where animals may live. We've talked about potential for altering denning environment by ice breaking. It's not considered a big issue for us this time of year if they are offshore and not in their dens. In terms of area ensonified, if we took the 160 dB safety radii at two km, if you look at the grand scheme of the entire Arctic basin, the areas is small.

John Goll, MMS: We get a request to get an understanding of ice operation versus open water. You mentioned the two meter thickness. Do you have restrictions for percentage of ice for data collection?
Deborah Hutchinson, USGS: We leave the decision to vessel personnel. It depends on ice compression and closure behind the ship and can we get the gear out of the water safely. In heavier ice, progress is slow because the ice breaker has to back and ram. It's a judgement call of when to pull the gear. The threshold is probably not far from two meters.

Harry Brower, AEWC: I want to ask a question in regards to what I've learned about beluga tagging efforts. They were travelling up into the 80 degree north range and through the satellite research. That is where they were spending time in the summer month. In 160 dB mitigation, I was trying to figure out how you make those observations? It would be difficult with ice around you. There are different structures of ice and trying to observe to mitigation, I am trying to figure out how this

comes to play with regulations and the visible problems with ice conditions when the animals are in 0-80% ice areas.

Deborah Hutchinson, USGS: I can't answer the question per se, how we monitor out to the 160 dB visually. I think there are situations where height of structures above sea surface, I don't know if you could identify these animals. I would defer to the MMO experts. In the 2008 cruise, the Healy was out on a mission and I went out on the bridge with the MMOs and the one guy could see the Healy, but he could easily find it. That convinced me that the MMO pick up from large distances as the bridge couldn't see the Healy.

Chris (Last Name, Organization not Identified): If I understand the answer of habitat...

Deborah Hutchinson, USGS: That's how I answer the question, but I propose we work with LGL on this.

Chris (Last Name, Organization not Identified): I would propose to enter the environment of an acoustic habitat and then ensonification. You implied that we defer to 160 dB area as being defined, is that right?

Deborah Hutchinson, USGS: For mitigation purposes and certain situations, I don't know if that is the ultimate correct number to use but that is the one NMFS uses.

(Unidentified Speaker): The 2008 DASAR has picked up separate signals.

Chris (Last Name, Organization not Identified (may have been Christopher Putman, FWS??): This is the difference between (unable to hear), where 160 above is not good, but below is okay versus what is actually happening in the habitat.

Deborah Hutchinson, USGS: But when the signal is very low so at some point someone has to make a decision on what is significant. Noise bothers some of us more than others, and we don't know what that is particularly in marine mammals, and that is what NMFS is here for.

BP 2009 Monitoring Results and BP 2010 Operations and Monitoring Plans for Northstar

Bill Streever

Marine mammal and acoustic monitoring of the Northstar Offshore Production Facility: This is the (unable to hear) year of Northstar. We've had the same typical activities since production started. There have been high seal counts, airgun and unknown sounds present and recorded, typical bowhead call counts, etc. We are moving forward with data.

Northstar Background: Northstar is a six acre island about six miles north of Prudhoe Bay. The first oil was produced in 2001, peak oil during 2003-2004 at 800,000 barrels per day, with 22,000 barrels per day currently. 670,000 compared to pipeline. A brief history document of the Northstar marine mammal project has been compiled. The timeline shows we have come a long way about how to do these studies and more about the whale in general. Another thing we realized is in past when measuring sound, we've measured drilling and heavy equipment noises, but when putting together petitions for new regulations this year, it was hard to answer the simple question of what is lower than what? When understanding underwater acoustics, it gets complicated. Currently we're going back to different sounds and making flashcards to help summarize the sounds from different

activities. There will be two page documents with a variety of information. The concept of source level, for most things it just doesn't make sense. It is not a meaningful index.

Activities: 2009 was the same traffic levels as in previous years; nothing out of range with prior years. More seals were observed than in previous years.

Year	Total # of Seal Sightings	Total Observation Days	Mean Number Seals/Day	Max Number Observed	Standard Deviation
2008	415	54	7.7	63	15.1
2009	811	61	13.3	87	26.7

We are recording island noises and whale calls and isolating the calls by triangulation.

2009 Field Season Acoustics: The island field noises recording did not show anything out of the ordinary and was fairly typical. The key thing to note is that it is typical, as expected. With the data, we can take the recording at Northstar and Location C and can plot the sound levels. Once again, you see the boat peaks from the boats coming and going. The red line shown is further offshore and also captures boat noises, but there are fewer of them. Farther offshore, you no longer see the sharp peaks. In Location C, you might expect a reasonable area where whales would hear the sounds. If you look at the red line, Location C, you will see a boat peak where there is no corresponding transit at Northstar, so that is a boat that probably went through the array. Most of the day, the red line is lower than the black line, which we think is primarily when you see the weather noise accentuated as opposed to different machinery. We think this is wave and water noise versus equipment noise.

2009 Airgun Sounds & Unknown: In 2008 we deployed a full array. In 2008 we couldn't do the whole analysis; that would make it untrackable. This year we had airguns but only from two directions. Air gun sounds carry a long way. How loud are they? The difference between 2009 and 2008 airgun issue is that 2009 is much simpler, from east and north and no airgun noise at all, which wasn't the case in 2008. There is a distinct difference in the black airgun representation in 2009 which were lower, at about 6 dB, and lower received levels than in previous years. BP is funding an effort through the University of California to develop a methodology for assessment of underwater cumulative effects. This is a big issue and we're trying to come up with a method guideline for assessing cumulative effects.

Northstar Unknown Sound 2009: This is a popping noise "mystery" sound. This is a persistent recording unlike previous years. We're not sure if it comes from the island itself. It seems the sound is more prevalent on windy days versus calm days. We only pick it up on the near shore recorder, not on the array. Levels vary and it is described in more detail in the annual report.

Bowhead Call Data in 2009: There were 6,859 total calls. The length of the DASAR recording season was 33 days and mean number of calls per day was 206. We also looked at the timing of the calls and in 2009 you see a peak around September 13-14th. In the past we always had a peak around the

21st to 22nd of September and we tried to put MMOs out, but they didn't see any whales and there were very few recorded whales. The pilot efforts added to discouragement of having MMOs out.

Number of whale calls in 2009: 19,722 discrete calls (97,662 call detections); 16,825 calls localized. One thing that is normal is we're seeing more calls in the east than in the west. The cloud shape on the slide is unusual. The amount of calls is reasonable; not the highest or lowest in past years.

Whale call directionality in 2009: Bowhead have directionality, but with low frequency callers it's not clear if they would have directional calls. There has been some data and speculations about this. We looked at data and assumed the majority of whales were swimming west through the array, and we took data to determine if calls received were directional. A statistical test was run with the differences in whale call directionally and calibration directionality with a p value of $p<0.0004$ which makes it hard to argue that there is no directionality. We care about this issue in that it changes the distribution data. Changes in interpretation of changing distribution of detected calls may partly explain fewer calls to west seen in most years. If you have a SSV and it doesn't change its location or calls, we are hearing more calls as whales approach the array. As they pass, we pick up less and possibly because of this directionality issue. This footnote is an important finding in acoustic data.

Cross Island Hunt 2009: Was another successful hunt.

Lessons Learned: Prevalence of airgun sounds—the length and distant of sounds recorded and the presence of unknown sound(s). The "nuances" of recording methods and conditions render some comparisons of industry sounds to comparing "apples and oranges." There is a need for standard methodology. We are going out and measuring this, but everyone is doing it differently, and we need standard methods for some of the things we do. A standard method for doing vessel measurements has been issued by the Standards Institute for the U.S., which we should all look at closely and last, special care should be given to definitions in acoustics, such as sound reaches back and levels at x meters away. Chris alluded to the area of what is being ensonified—this is confusing as there are no definitions. What that company means with a particular issue is not necessarily what is meant by another.

Questions/Comments:

Harry Brower, AEWC: A comment I have is on how you structure background noise. What about addressing your objectives? Is that being considered within your lessons learned?

Bill Streever, BP: Yes, that will be part of the lessons learned. Are we deflecting whales or not? Yes, we are deflecting whales—it is a result rather than a lesson learned. How can whales be deflecting when below sound levels?

Bill Streever, BP: Another lesson learned, is we know whale call locations are not exact. We have always had each year a location that calls occurred where they can't actually take place, i.e., onshore. Obviously there was something wrong with the call and there are errors considered with the call locations. I think at a 90% confidence interval—you are 90% certain of the location of the call with a potential of 10% error on location. When we do our analysis, the call is weighted.

Comprehensive Report: We submitted the annual report about a week ago. The approach was similar to past years, but tentatively with east and north seismic with levels with 15 and 60 minute windows. It will include a factor for received levels based on an inter-stimulus interval (ISI) 5-band, tone and transient presence and received level near 5th quantile with 15 and 60 minute windows. We are dropping some of the time windows as well. In the end, the analysis will be the same as reported on in the past. The journal has been unusually slow in reviewing the article, and we hope to be published.

2010 Plans: a) Comprehensive Report every five years. b) Petition for new regulations – submitted petition for new five year regulations for Northstar, and a notification has been sent to the Register. We are asking to continue the same activities. c) Publications: deflection methods, deflection results, WIAM (what it all means), seals sometime this year and call directionality paper in the next week or so. d) Field effort with two locations near island record and DASAR C (as per 2005-2007). e) Construction work planned: new personnel module and replacing drill rig; moving gravel, pile driving and communicating with NMFS and NSB on work. We will not do work during the hunt.

Questions/Comments:

Lisa Rotterman, NMFS: I just want to make sure I understood about the airguns in 2008 and your ability to detect whales. You are trying to detect whales close to Northstar with the arrays you have, yet if I understand correctly, seismic operations far away have sufficient reliability to do analysis?
Bill Streever, BP: No, that is not what I said. We were able to detect and localize whale calls. The problem was determining how whales reacted to Northstar noise versus how they react to other airgun activity.
Lisa Rotterman, NMFS: I asked Bill if that is the correct interpretation. Thanks for clearing that up.

Robert Suydam, NSB: I think in the report the airgun sounds from Canada were from a BP seismic in the Beaufort.
Bill Streever, BP: I'm not 100% positive if they were shooting in the Canadian Beaufort. I am reasonably sure it was.
Robert Suydam, NSB: Are there plans for a shoot in 2010 in Canadian Beaufort?
James Hull, Imperial: There is no industry seismic in the Beaufort.
Robert Suydam, NSB: In 2009, there was a glob of points to the northeast of the array. Do you know what is going on there? Is it due to the geometry of the array or is something else happening?
Bill Streever, BP: I don't think it is due to the geometry of array. My guess is for some unknown reason there were whales calling in the area. Was it several whales or one? Who knows?
Robert Suydam, NSB: I would be interested to know if Bowhead Whale Aerial Survey Project (BWASP) had some calling whales in that area.
Bill Streever, BP: Good idea. Keep in mind that the glob may be a day off, but we could go back in the comprehensive report and look at BWASP data.

George Ahmaogak, Ahmaogak Associates: You mentioned in the presentation that bowhead calls have changed for a period of time. Through traditional knowledge, the peak of migration according to whales happens around September 10th and changes from there. Have you looked at correlating traditional knowledge to your data to look at peak of migration as they go through Cross Island?

Bill Streever, BP: We have done this through discussion with MMOs and one thing Charlie said when we showed the plot and said when we expect to see whales, was that he responded that's probably not the majority of the whales, that is probably moms and babies. They probably came through earlier. We need to keep in mind that this is calls and not actual numbers.

George Ahmaogak, Ahmaogak Associates: Your data is reflecting data as well about the migration and the variability in their travels. Last year, the data on DASARs near Cross Island showed there was a gap as they were coming through. The BWASP didn't notice the pinpoint of whales coming up and you picked them up on DASARs. Was there any research on why this occurred?
Bill Streever, BP: I don't think so. With what you see visually and acoustically, it's not surprising it doesn't correspond well. The BWASP gap was closer to Prudhoe Bay. I'm not familiar with the BWASP data.

George Ahmaogak, Ahmaogak Associates: Will we see the BWASP data as well?
Unidentified Speaker: It's important to realize when you see the BWASP data, if you just plot the data, you need to correspond it to the transects laid. That is a paper that is in review - looking at the survey design of the BWASP data and limits to special resolution. There are holes in the sighting in the database, but we need to be cautious in interpreting them.

Bill Streever, BP: We're like Sherlock Holmes working with data to interpret.

George Edwardson, ICAS: On loss data, could you correlate to seismic going on in the east being picked up over 200 miles away? What George and you were talking about with the lost data could the whales be re-routed by seismic.
Bill Streever, BP: BWASP data has been collected for many years - some with seismic, some without. The hole isn't present with or without seismic. We are treating the seismic data from the east and north. If the nuisance data turns out to be significant, we can interpret.

George Edwardson, ICAS: The impulses being picked up are 200 miles away from you?
Bill Streever, BP: That's right, from the Canadian side. We didn't try to localize it as it was in line with the transect.

George Edwardson, ICAS: Can you send me your report when you have the whale data?
Bill Streever, BP: I can give you one of those today.

James Hull, Imperial: I'd like to clarify my comments about 2010 plans – there are no seismic plans in the Beaufort, but there will be a 2D seismic which may take place.
Bill Streever, BP: It is my understanding that it is a joint program with Imperial and BP.

Craig George, NSB: I have a comment on the apparent whale hole. Jeff Gibbons has done a preliminary analysis and corrected for effort, and he thinks it is real. One interpretation is whales aren't lingering in that area and are moving through. Another point is about receiving seismic pulses in Barrow due to unknown factors - perhaps it is from Canada or deep sea work that Deborah Hutchinson described earlier.

Chris (last name/organization unidentified): This represents an extraordinary body of work and the conversation is moving toward a database and a need to understand what it means. It is a lesson learned that has to do with acoustic tracking to try to figure out how many whales are in this mess and are they moving through. I think that would be interesting to put in the record. There was a comment at a meeting several months ago about how much science can tell us versus some other type of knowledge.
Bill Streever, BP: That sounds like what I would say. I can't say if tracking is in our multipage document. We have played with it, but haven't made a formal effort. It is still something to look at with older data. The database comment is that is seems to have a value with a centralized database, but it is not a trivial exercise, and what do you do with it? With us, we've put in on hard disk and given it to NSB, a copy to Greeneridge, and one to Barrow.

Shell 2010 Operations and Monitoring Plans for Beaufort Sea Site Clearance and Shallow Hazards Surveys

Susan Childs – Operational Plans
Operational Plans: Operational plans in the Beaufort Sea will be from July through August 25th and include two efforts: 1) Shallow hazard assessment in western portion of Harrison Bay with an ENI, Repersol and Shell Joint Venture. This is a requirement of MMS before drilling. It will be offshore between Nuiqsut and Deadhorse. There is a mitigation line we will not cross after August 25th so as not to affect the hunt. 2) Also the fourth year of the marine survey at Strudel Scour Mary Sachs entrance to shore (three day duration). If we are successful in the drilling program and the reservoir is ready for development, we need to design and build infrastructure to withstand the ice. The program is short lived at three days. Survey is from Sivulliq to shore through the Mary Sach Entrance to measure soil strength and other factors. A responsible company collects data to build technology and have equipment in place to withstand Arctic conditions.

Plan of Cooperation: The plan includes a communication plan to avoid conflicts with subsistence users; collaboration and communication with whaling, walrus, Nanuq and Seal Commissions; a commitment to hire subsistence advisors based in Beaufort Sea villages; MMO on shallow hazard vessel; robust marine mammal monitoring protocol; real time ice and weather forecasting; and no transiting without communicating.

Questions/Comments:

Robert Suydam, NSB: Is there an IHA application for this year or last year?
Susan Childs, Shell: It is the one for this year.

Michael Macrander – Monitoring Plans
Agenda: Overview (Macrander); Description of Observer & Aerial Program (LGL); Acoustics Program (to be discussed this afternoon); and Summary Questions (Macrander)

Components: Components of the monitoring plan includes: MMOs on source vessel, SSV, acoustic monitoring and the aerial program. We anticipate sound levels around shallow hazard are fairly

small and there is no need for chase or support vessels. There will be SSV with all activities. We are beginning to understand the sound levels we're dealing with and are setting mitigation distances. The acoustics program will be discussed this afternoon, but the program that has been operating the last three years spans from offshore Kaktovik and flanking project areas. They will be deployed in early August to capture sounds emanating from the project and any marine mammals in the area. There will be an aerial program in Harrison Bay. We are anticipating conducting an aerial program whether drilling occurs or not. It is anticipated there will be one aircraft in the Beaufort and Chukchi in mid-July to late-August. In the Beaufort, it will visit areas in Camden Bay and Harrison Bay and conduct a near shore saw tooth pattern in the Chukchi. The aircraft will be there, but generally speaking, you can fly targets at one-third of the time and we'll be flying opportunistically to try to maximize targets. After August 25th after bowhead migration begins, aircraft is dedicated to Harrison Bay and Shallow Hazard and would only fly the Chukchi or other location when not being required in the Harrison Bay area. In the drilling scenario, there is a plan for a second aircraft to be able to dedicate to both shallow hazard and drilling program in Camden Bay. Two aircraft should be ample to fly when weather permits.

Marine Mammal Monitoring: Objectives are to minimize impacts, document marine mammal distribution and activity near seismic operations for estimating exposures, collect data on marine mammal occurrence and distribution relative to airgun activity, provide basis for real-time mitigation and provide a communication channel with coastal communities.

At the beginning of the survey, SSV will be conducted to verify safety radii and will be revised as needed for implementation by MMOs. Vessel based observers will include five on shallow hazard survey vessel and on watch for all daylight seismic, most daily non-seismic and 30 minutes before and during ramp ups with two MMOs. They will ensure safety radii are clear of marine mammals for 30 minutes prior to and during ramp ups at 180 dB for cetaceans and walruses, 190 dB for pinnipeds and polar bears. Start ups will only be performed when full safety radii are visible during daylight or equal or greater than 30 minutes.

MMOs will continuously monitor safety zones during daylight airgun activity, and we'll power down to mitigation gun if a marine mammal is sighted within or likely to enter full airgun array and shut down of all airguns if a marine mammal is sighted within or likely to enter the entire. If shut down for more than ten minutes, full start up is called for.

Aerial surveys in selected areas including areas of activity with dedicated surveys after August 25th at a 1,000 foot altitude at 110-120 knot survey speed with three to five observers. We'll monitor for aggregation for non-migratory whales and mother/calf pairs. Collect data on potential deflection from migratory path. A typical 90-day technical report will be presented after activities are concluded.

Questions/Comments:

Robert Suydam, NSB: What does the schedule look like for shallow hazard survey? Is it about the time the bowhead whale hunt is occurring?

Susan Childs, Shell: I showed we'd be there later in July to August 25th. We will be on latter side of July.
Robert Suydam, NSB: Will the ship totally clear out after August 25?
Susan Childs, Shell: No, it will be on the other side of the mitigation line.

Robert Suydam, NSB: Regarding aerial surveys ... in the past it was discussed how the surveys were conducted regarding circling versus linear. I was reading in the bowhead book that previously circling was required to identify calves as they were immediately visible. How do you plan to do aerial surveys? Are you flying transect or circling to identify calves at the surface?
Bill Koski, LGL: We've been talking with NMFS on how to proceed and we made minor modifications. We won't be circling all sightings but a portion of the sightings to accommodate for this.

John Hopson, Olgoonik Corp: Has Shell signed a CAA with AEWC?
Susan Childs, Shell: It's being reviewed, but I feel certain we will sign in the next week.

John Hopson, Olgoonik Corp: How will you get work done when it is so cloudy up there (i.e. 1,000 feet up)?
Michael Macrander, Shell: It is cloudy, and it will allow us to operate about one-third of the available time. Using one aircraft we can cover several potential areas of operations. We have been able to do this over the last several years in these conditions. It gets us below the normal ceiling, and if we were required to fly higher, it would shut us down even more.

Robert Suydam, NSB: Last year, or the year before, you showed some videos of acoustics and how they changed when seismic were operating. You gave me a revised comprehensive report yesterday, but I've been intrigued by those and wonder what the status is on a summary of that information in a more scientific way with methods and results. Where is it at?
Michael Macrander, Shell: It is in the revised report and will be updated in the 2006-2009 report in three to four weeks, and there will be a presentation on that this afternoon. This was the shortest period of time, so we put the acoustic piece in this afternoon's presentation.

George Edwardson, ICAS: I have a simple question about when you are flying over. Are you doing about 120 knots?
Michael Macrander, Shell: 110-120.
George Edwardson, ICAS: Whales, when diving, go down for 30-40 minutes. You will see only 10% of the whales. Will you bring another plane behind them to see them?
Michael Macrander, Shell: We're not going to see 100% of the population. We do see a broader area of the ocean and see tracks on the sea surface when a whale dives and improves potential for detection of animals. What we are looking for are trends in area usage and movement patterns and, as you point out, you won't see 100% but will see a sampling to draw conclusion on what the whole is doing.

Craig George, NSB: With the acoustic array and the fact you are flying surveys over it, it would be nice to integrate the two data sets. It would really help us interpret acoustic data. What do these call locations mean in terms of whale abundance?

Michael Macrander, Shell: We are going to present acoustics and then aerial this afternoon. Last year we had our acoustics arrays in Camden and Harrison and collected them simultaneously. Susanna has it on the slide and will comment that acoustics only capture bowheads if they vocalize and evidence from studies from a sound disturbance show bowheads seem to have decreased calling behaviour. We will see reduced calling behaviour but aerial data that indicates that there is a less pronounced deflection or avoidance of an area as documented by aerial.

Craig George, NSB: That is interesting and we've seen this in Barrow where calling rates dropped during hunting. I was looking at less than normal behaviour. How much survey will occur outside the calling of sound or when seismic is not underway to help interpret this acoustic data?
Michael Macrander, Shell: That is why we're using one airplane. If we are not drilling in Camden Bay, we will get about one aerial survey weekly along with acoustics so we'll be getting some of this information.

(Unidentified Speaker), NSB: I was confused by the last answer about the increase or decrease in sightings. So could you just...you want me to wait this afternoon?
Michael Macrander, Shell: You will see the information this afternoon.
(Unidentified Speaker), NSB: Is there an opportunity to compare the two modes of data?
Michael Macrander, Shell: Certainly, and our hope is that we'll drill in Camden Bay. A lot depends on timing of permits and activities that will occur but if we are operating out there we'll be doing aerial surveys over operations as well as acoustics.

George Ahmaogak, Ahmaogak Associates: A comment I have is that I have said this over many open water seasons. You mentioned you have a comprehensive report and a select few get a copy of that. But again, I'd like a copy of your presentation and it would be nice to have a copy of the presentation to take back to the villages. It would be nice to have this information given to AEWC, commissions, etc., and it would help to provide copies. If you can't give us the comprehensive report, at least provide copies of your presentation.
Michael Macrander, Shell: I won't respond on behalf of NMFS as this is their meeting, but there have been times when we have sent our 90 Day and comprehensive report to North Slope communities. That feels a bit wasteful with the paper. We've moved to emailing people with a site where the reports and presentation materials can be downloaded with the offer of delivering a hard copy. From our presentations the last couple of days, we're relying more heavily on animations and audio files as they relay more information, and it is difficult to provide animations in hard copy. If we send a report, we're putting audio information on CD with the report. We welcome any requests or suggestions to improve getting the messages out there.

Candace Nachman, NMFS: George, NMFS posts on its website 90 Day Reports from IHA holders, as well as the comprehensive report. We can't email because of the large file size.

Megan Ferguson, NMFS: Regarding the practicality of using one aircraft between the two seas - last year I was participating in the BWASP surveys and planned to do the same thing but in reality, the ceiling was very low, and we couldn't get out of Deadhorse; just something to keep in mind.

Michael Macrander, Shell: We're going to be based out of Barrow and it may make a difference in transit times.

Shell 2010 Operations and Monitoring Plans for Beaufort Sea Exploratory Drilling Program

Susan Childs and Michael Macrander
Susan Childs – Overview of proposed Open Water Activities July 10 – October 31 weather and ice permitting.

Operational Review: [Susan Childs introduced team member Doris Hugo, subsistence advisor.] Doris indicated that she is a UAA graduate and works in Stakeholder Relationships for Shell. They are the ears and eyes in villages. At each engagement they document all concerns, valid or not. They then find ways to develop an action plan to mitigate or incorporate them into Shell plans. The concerns are taken seriously. Doris indicated she was glad to have the opportunity to represent her people and Shell in this aspect and that part of her job is to make sure the Federal, state and local organizations have documentation on their information gathering.

Site Locations in Beaufort: There are two plans; both will run July thru Oct 31st. With one drill ship, they can't be in both places. To capture cumulative effects and potential impacts, we have to have two separate plans. The preference is to start in the Beaufort in July to start drilling. They will come around Pt. Barrow to Sivulliq to start. The other site is Torpedo. We would be very lucky to drill two wells before August 25th, but would like at least one completed. These are 62 miles from Kaktovik and 46 miles from Cross Island, and we're aware of hunts scheduled in late August and September. It is 257 miles from Barrow and 120 miles from Nuiqsut.

Drilling Update: 2010 plans include one drill ship in the Chukchi Sea and Camden Bay with no simultaneous drilling and non 3-D seismic. Exit is planned by August 25th. The Discoverer is the drilling platform with eight anchors that will be used. There are several assets that will be travelling with the Discoverer including ice management, anchor handler, personnel transfers and re-supply/support. Personnel transfers will occur out of Deadhorse. In Kaktovik there was concern about the helicopter travel along the coast, so we changed that to Deadhorse. We have captured impacts to inland animals in this plan. That is the traditional knowledge that we try to incorporate into our plans. It was a legitimate concern which was managed.

There will be oil contingency assets with us at all times. The offshore response is ASRC and is the same for the Chukchi (once completed in the Beaufort, they will be travelling to the Chukchi). The Nanook and Endeavor barge will be used to deploy mechanical tools to clean up surface spills. The purpose of exploration drilling is to insert tools into the reservoir to see what is there. There is no float testing. We will look to see what is in the reservoir; it's not to bring anything to the surface, but we have to be prepared.

We have developed a comprehensive Plan of Cooperation. We commit to a 2010 conflict avoidance process currently under review for signature and will continue to collect data on subsea, sea floor, water column, and coastal and offshore aerial surveys.

Plan of Cooperation: There is a communication plan for avoiding conflicts with subsistence users, Beaufort Sea shutdown and removal of drilling rig assets by August 25. There will be collaboration and communication with whaling associations, walrus, Nanuq and seal commissions. We will know what ice and weather is doing to respond timely rather than react (see previous Plan of Cooperation for Shell).

We've cut the program in half in response to concerns about too much, too soon, too fast. We do meet at least twice per year with other co-management commissions (Nanuq, walrus, seal, and whale). Please talk to their representatives on how Shell interacts with those commissions. We monitor our drilling satellite in several locations so we know what is going on so we can see it as it is happening. It allows us to see if emergencies will occur so we can shut down and avoid oil emitting to the surface.

Questions/Comments:

John Hopson, Olgoonik Corp: Yesterday there was talk of communication centers in each community or in Wainwright alone last year. Will there be communication centers available aside from the subsistence advisor in each community?

Susan Childs, Shell: We will participate in each communication center that is associated with our work. We would participate in the Kaktovik, Deadhorse and Nuiqsut centers. We will participate in communication centers where we would have impact to the closer communities and perhaps expanding to neighboring communities.

John Hopson, Olgoonik Corp: (unable to hear)

Susan Childs, Shell: Once online the communication centers are online until the whale hunt is over whether we are drilling or present in the area. It is not a start-stop date due to our presence; the commitment is until the hunt is over.

Robert Suydam, NSB: How long is it going to take to drill each well?

Susan Childs, Shell: Depending on depth, it should take about 35 days.

Robert Suydam, NSB: I heard a comment before that if you end up drilling in the Beaufort first then transporting into the Chukchi , there is a concern that the beluga hunters have about moving lots of vessels before the hunts are done in Pt. Lay and the potential for interference with the hunt.

Susan Childs, Shell: We won't go through the Straight until July 1st and into the Chukchi. We would be very much offshore and there would be the added support of the communication centers to let people know where we are at any time through transit.

Robert Suydam, NSB: You have it shown that you will be into the Chukchi in late July. The communication is good and appropriate but there is no evidence of where the belugas come from before entering the villages. Even if far offshore, you have the potential to interrupt the movement, or whalers show they get skittish when exposed to sound. Be cautious, as you can impact subsistence hunting resource.

George Edwardson, ICAS: 35 days drilling; does that include directional drill to take out eight miles?
Susan Childs, Shell: It is vertical drilling; there is no plan for directional drill. We are doing exploration right over the sight so we will do vertical drilling, not directional drilling. Thanks for the question.

John Hopson, Olgoonik Corp: Susan (or Robert S.) a few years ago, when Shell came to Wainwright to discuss CAA in earlier years, one most of the respected captains made the comment if working 70 miles out, the animals may move closer to shore. We don't know that.
Robert Suydam, NSB: I appreciate the comment. They would prefer that no ships are moving through the Chukchi until the hunt is done by the 15th.

David Dickson, AK Wilderness League: You say you would be lucky to get sites drilled in Beaufort. If you only do one this year, will you be back next year to do the second one?
Susan Childs, Shell: Let me be more definitive. In the Beaufort, if we are through with that well, we will plug and abandon and leave and then return back to that area from that point until nothing is left in the reservoir. In 2011, we'll complete the well or identify a more priority prospect but that would be included into another plan for MMS for approval.

Lars Nelson, BTS Prof Services: I want to suggest utilization of real time GPS technology so the public could follow ships in real time.
Susan Childs, Shell: We have blue sky which is real time GPS for any ship that travels in the summer.

Michael Macrander – Monitoring and Mitigation Plans
Beaufort Sea Drilling Plans for 2010: This information is relevant to assessment of monitoring program and moving forward.

Components of Monitoring Program: Components of the monitoring program include MMOs on drill rig and support vessels, SSV/sound monitoring during operations to help to target issues and mitigate issues around drilling operations , acoustics monitoring, aerial program (to include two aircraft based out of Deadhorse (if drilling in Chukchi, an airplane based in Barrow), drilling monitoring and effects of discharge (not a central study for the IHA but to address interest/concerns of the public and document impacts and make decisions going forward). Other studies not related to marine mammals include drilling specific acoustics and impacts investigations. Additional to IHA related studies include ecological characterization and ice and oceanography studies (see comments from Day One on subject of other studies). One change to program this year, with credit to ConocoPhillips and StatOil, they're coming together on the program to try to get the most information out of the monitoring programs while controlling costs and number of vessels in the theatre. One concept is to do all deployments, acoustic recorders in the Chukchi and Beaufort with one vessel - "the buoy boat". The National Science Foundation and other researchers are aware of this plan so within limits we'll have dedicated capabilities of deploying acoustic implementation this year and won't be piggy-backed on other activities. Also, there will be an expansion of Dunton / Trerey baseline studies in 2008-2009 continuing in 2010 in the drilling case and supplemented by

adding oceanography, plankton, nutrients, benthos, bird and mammals. This is dependent upon being able to drill; otherwise we won't bring the boat over there.

Marine Mammal Monitoring in the Beaufort Sea Drilling Program: Objectives are to minimize impacts, document marine mammal activities near operations to estimate exposure, collect data on marine mammal occurrence and vessel-based marine mammal observers. Anticipate five on the drilling rig and three to five on support vessels that will watch for all daylight hours. There will be 25 vessels total. MMO data collection includes while vessels are underway there will be standard recordings similar to seismic survey line transect methodology. When vessels are on standby, we will use data protocol with sampling rounds. The Modelled Sound Radii—drilling is at 175 dB, harassment is 120 dB monitored at 4.9 km and monitoring from drilling vessel and during routine support vessel activities. No shut downs are planned, and SSV will occur on site to determine actual monitoring area.

Exposure is based on >120 dB rms zone, with bowheads being the most concern. Aerial surveys will begin one week prior to drilling operations 40 km east and 60 km west of the drilling sites. There will be a 90-Day Report with specific components.

Questions/Comments:

Robert Suydam, NSB: In your presentation, the real time sound monitoring from the drill vessel will be used to support development of mitigation. What are you thinking here?

Michael Macrander, Shell: Development of mitigation—the idea is that by collecting real time data we can identify activities that may be more prone to produce higher sound and if opportunities to control and minimize those while operating, we would do that. More long term we're working with Houston engineers and reviewing the rig and looking for sound reduction opportunities. We need to know the sound levels and what activities produce those to mitigate, i.e., op controls, motors mounts, etc, where real time information is needed.

Robert Suydam, NSB: Would that include support vessel and operation of themes?

Michael Macrander, Shell: It could include that.

Robert Suydam, NSB: Dale, you mentioned the 120 zone around the drill rig, does that only count for drilling or does that include for support ships and then it would be presumably much larger?

Dale Funk, LGL: Yes, it does only include the drill ship. Each vessel would be its' own area so there would be other areas additionally as well.

Robert Suydam, NSB: The zone of near exclusion is near 20 km which is four times what is suggested here and we need to figure out what it means to monitoring and mitigation.

Michael Macrander, Shell: The monitoring will cover the entire area by aerial and acoustics. Estimation of exposure due to drilling was done at NMFS request to target but we recognize, however, the previous body of data and monitoring abilities around that.

John Hopson, Olgoonik Corp: I think this may be for all oil and gas, but on aerial survey, what about unmanned aircraft—less or more effective? Less or more noise?

Michael Macrander, Shell: Shell and ConocoPhillips have been working to consider unmanned aircraft. We debated hard about including it in this year's program. In 2008, we were able to acquire a certificate of authorization from the FAA to operate an unmanned aircraft. We did this and

demonstrated we have the ability to operate in this environment. NMFS has been at the forefront of looking at this issue and had a successful flight last year. We're taking steps in that direction, and new information out of California is available and may be presented by Bill Koski. FAA is hesitant, and we need to demonstrate safety. Shell has been collecting this aircraft traffic information that FAA has requested so we're moving in that direction. In 2010, we're informed by FAA that they would require six months to get a COA, and we're well within that window. We're not sure how much operations we're going to have. When more clarity is there, we'll push forward.

George Edwardson, ICAS: Glad a baseline study is being done 42 years after discovery. Is it downstream of the discharge?
Michael Macrander, Shell: It's in a general area that includes the downstream areas of discharge. A lot of studies have been done on discharge on exploration and on production. There are a lot of variables, including current water depth, but generally the vast majority of solids settle out of the discharge within 200-500 meters of the event so a baseline study that general over a large area, 20-30 km square area, which would cover downstream areas. There are interesting results from 2008. When in an offshore area there is a high degree of productivity in the Beaufort and surprising levels of biomass but with community structure there is not a high degree.
John Goll, MMS: MMS has data on what is in the sediments back to the 1980s in the Beaufort and such, and we will continue to update as years go on, so the information is out there.
George Edwardson, ICAS: I agree about the biomass being high but current takes the waters away from where discharge so it would be different – do you follow how discharge travels?
Michael Macrander, Shell: It is part of the program to follow the plume and deploying instrument into the plume where it can no longer be tracked chemically.

Susanna Blackwell, Greeneridge Sciences
We were not done with 2008 analysis, so I am presenting this information. The objective was to determine to what extent spatial and temporal changes in call distribution due to sound from industrial activities, airgun pulses in particular. Recorders were placed in all three years in the same locations in five different sites of several recorders. In 2008, five more recorders were added and the distance between sites one and five is 280 km. They are placed in water of 20 to 55 meters, and it increases in depth from west to east. Acoustic monitoring using DASARs only provides information on calling whales. If a whale is not calling, it is not visible to us.

<u>Airgun usage in Shell in 2007, 2008 & 2009.</u> 2007 and 2008 were generally in DASAR arrays. The distance between airguns and DASAR was 100-280 km. There were other seismic in 2008 that we ignored as we had a much closer source. In 2009, we had a control year with no operations but that was not the case and so analysis used information from two different operations: one in the north and one to the east. The distance varied between 300 and 1,400 km of known operations.

700,000 whale calls were detected over the three year period. In 2007, there were 141,323 calls with 100% manual analysis. In 2008, there were 420,130 calls and in 2009, 152,036 calls. In 2008, an automatic process was developed to help with this analysis and included six days of manual analysis. 2009 results were automated with eight days of manual analysis. In 2009, eight days of manual analysis detected 39,009 while automated analysis captured 35,755. Overall groupings were

similar. How do call locations compare to other techniques? Because ice affect where whales are, they used BWASP data from 1998-2004, 2007 and 2008 with only low ice years. [A movie was shown of call detections for 2009 in four-hour increments. It was not filtered and was fairly sparse compared to previous years.]

Effects of airgun sounds on call detection rates: In 2007 we used a different technique and found that Shell operations were more restricted in time and space in location, and we could look at before, during and after operations and compare close detection to farther away. We observed a drop of <30 km from airguns and no effect at >100 km from airguns. In 2008 and 2009, a new analysis was used. Between the two years there were 120 pages of reports. We took information on call rates and RLs of airgun sounds close to DASARs to model call rates and RLs away from DASARs. The analysis area was expanded around each site, and then we created a grid for each site and split the entire season into 15-minute periods. Modelling of received levels (RLs) of airgun sounds with response variables of medium sound pressure level (dB re 1 uPa2 s) and cumulative sound exposure levels. Other co-variants accounted for were full array versus mitigation gun, which vessel was used, cell water depth, water depth at airgun and minimum water depth between airguns and cells. This allowed us to predict received levels of sound from airguns pulses in the entire area for every 15 minutes.

Modelling of Spatial and Temporal Distribution of Whale Calls: RLs from airgun sounds modelled and calls/cell/15 min inside the racetrack. To predict the probability of getting a whale call for each cell-time combination with received levels, there were many variables: dates, background, sound, longitude and response variables, i.e., the presence or absence of whale calls.

The probability of getting a call in the cell was an effect of getting an airgun in the area. What this shows is how CSEL increases where there is a drop at about 125 dB. Effects of sound on calls are not new; there have been studies that have addressed this in the past. The number of when the effect takes place is the new discovery. We found no significant effects for 2009.

Model spatial and temporal distribution of whale call: With the information we can now model the probability of getting calls in every polygon of the study area every 15 minutes. If a whale comes along and is calling and operations starts and the result is the whale quits calling, we don't know if the whale deflects or continues on.

[2008 model movies based on real data was shown.] What does this mean? In 2008, JASCO data on the Gilavar with a full array and mitigation gun assuming 90 airgun pulse in a 15 minute period with 90 pulses during this time. The distance where cumulative sound drops below 125 dB would be 50 km. When using mitigation guns, the distance CSEL drops below 125 dB is 33 km. You may wonder where sound pressure limits are where sound drops to 125 dB.

Summary/Conclusions: There was roughly a three to one difference in the number of call localization during 2007-2009. 2008 had most calls and was the year with the most airgun intensity. There was a significant drop in call detections rates when CSEL went above 125 dB. There was no effect of

airgun sounds on call detection rates when seismic operations were distant. In all years, the distribution of calls was within the 10th and 90th percentile of the BWASP area.

Questions/Comments:

Robert Suydam, NSB: Thanks for all the work for the summary of the new way to analyze data sets. That involves a lot of work. From what I understand now, it seems like the results are consistent with the previous work on deflection. If call deflection is related to detection or visual sightings from work done in late 1990's it is consistent. Whales are kept outside the area of about 125 dB. Am I getting it right?

Susanna Blackwell, Greeneridge Sciences: We can't say anything about deflection. We can only address calling behaviour. There were parallels, although the aerial surveys showed there were whales in the area.

Robert Suydam, NSB: Can we get a copy of the movie?

Susanna Blackwell, Greeneridge Sciences: Ask Michael.

Lars Nelson, BTS Professional: I want to suggest perhaps a correlation with Craig George with the tagged bowheads and maybe firing up airguns when tagged approach to see if there is deflection.

Brandon Southall, SEA, Inc.: What nuisance variable and ambient noise; what measurements were made and how difficult would it be to make calculations that signals noise ratio for some of those calls? Is that possible?

Susanna Blackwell, Greeneridge Sciences: Where it is most important, the background noise goes up quite a bit because of reverberation. We are working on that. Even though we get the pulse level and background sound level, the background sound level becomes muddled at that point, and we didn't use the background sound taken right before the pulse but over hours to get a lower background sound level.

Brandon Southall, SEA, Inc.: We've been fixated on absolute levels for injury criteria, but contextual variables on behaviour won't be a nuisance but an important issue.

Brad Smith, NMFS: Had you looked or considered a statistical analysis possible on distribution of calling detections outside 100 km especially to the west? And, would it show displacement? If you say the calling rate was less effective out beyond 100 km...

Susanna Blackwell, Greeneridge Sciences: We saw no effect on calling rate whether guns were on or off.

Brad Smith, NMFS: Could you look at the pattern and infer? It seems if whales were displaced, they should bunch up beyond 100 km and have call detections.

Susanna Blackwell, Greeneridge Sciences: We haven't looked at that.

George Edwardson, ICAS: Did you contact the seismic boats and MMOs to see where higher concentration of whales or noise were to see if whales were there or did they move out of the way?

Susanna Blackwell, Greeneridge Sciences: We can't get the data until instruments are pulled after everything is over. We did know the location of seismic vessels and could match calls with vessels after the fact.

Michael Macrander, Shell: We took a hard look at this last year or year before. When we first saw animations there were calls that were occurring close to the seismic vessel. We had an interesting year where there were two shut down for bowheads within 180 dB range and without absolutely being able to match call with incident. We had interesting data that there were ~~a~~ few calls within the 180 range. Essentially there have been one to two calls within that 180 range; more in the 180 to 160 range and even more respectively in the 120 to 160 range. So again, given the fact that it appears there is suppression of calling behaviour at 120-125 dB, you will see with aerial over flights and chase vessels, they are seeing whales within the 120 zone. There is a graded response.

Chris (unidentified last name/organization): Fantastic. I have two questions – one you may defer to the next presentation because I'd like you to summarize comparisons between aerial and acoustic data.
Susanna Blackwell, Greeneridge Sciences: I'll defer.
Chris (unidentified last name/organization): Can you go back and stop the movie and show a single frame because I don't think we understand the difference between a blue cell and a red cell.
Susanna Blackwell, Greeneridge Sciences: A blue cell and red cell - the scale here is the probability of detecting a call within 1,000 of cells within 15 minutes. Red shows probability of 6% and is a function of how long you look. If you look at just one cell, the probability is much greater. It is constrained by choice of using 15 minutes.
Chris (unidentified last name/organization): This is a model based on data and predicts probability of something happening in the hexagon when a) sound is produced and b) you have to detect?
Susanna Blackwell, Greeneridge Sciences: Right. Data input into the model only includes data recorded at these arrays. DASARs are so spread out and we actually had real data and used this to model out between.
Mike Payne, NMFS: As I understand this, over 15 minutes probability of detecting call is 5% in each cell. If you were in a plane the detection would be almost zero.
Susanna Blackwell, Greeneridge Sciences: No, this is acoustic only. Aerial may still be able to see the whale. The probability of detecting a call here is very low. It doesn't mean there aren't whales there, they just aren't saying anything.

Jolie Harrison, NMFS: The movie moves fast and is difficult to see. What have you been able to find are how quickly whales vocalize after they move from the vessels.
Susanna Blackwell, Greeneridge Sciences: In 2008, as soon as an airgun shut down, calls started appearing reasonably close to where the airguns were. We suspect that the fact that there are no more calls is a combination of factors; we just can't address that with the data.
Jolie Harrison, NMFS: After guns are out of the area, some percentage of calls is seen. Is it a predictable percentage?
Susanna Blackwell, Greeneridge Sciences: In last year's report there is a plot where you see lines where guns were on and then you see calls. You can see the increase in call detection rate, but not always. It may be a moment when there were no whales present.
Jolie Harrison, NMFS: Has any direct comparison with distance and calling been done? Is there a context specific thing related to distance?

Susanna Blackwell, Greeneridge Sciences: I don't think so because received levels will be radically different depending on whether you are in deep versus shallow water. The Gilavar location showed this and has a lot to do with the depth at those locations.

Jeff Denton, MMS: I notice the pattern of detection is quite different from Northstar on directionality. Is there a reason for detections to be evenly balanced around arrays and if directionality enters bias into analysis?
Susanna Blackwell, Greeneridge Sciences: There is an obvious answer when looking at it. A lot of dots are on top of each other, and we are experimenting using transparencies to see the difference. The deeper you go it seems to have less bias with calls to the east which is obvious in the shallowest site. We haven't dealt with that.

Bill Koski, LGL
Occurrence of Bowheads – Near Seismic from Comprehensive Reports
Past studies indicate the responses of whales can vary depending on what is happening at the time. We have collected information over the last few years through aerial surveys which provide information. Three years of surveys in Beaufort before and after seismic have been conducted. 2006 was mostly non-seismic, as well as 2007. 2008 continued early and lasted throughout October. In 2006, there were 35 sightings; in 2007, there were 81 sightings; and, in 2008, there were 92 sightings.

2007 Bowhead Sightings: [A slide was shown depicting sightings at various dB's for August 22 through October 8, 2007.] Values are not verified, they are approximations. Because of the design, we were unable to obtain significant areas of sightings in higher exposure level categories.

2008 Bowhead Sightings: 2008 had the same survey areas and two different locations where seismic occurred. In particular, I want to point out that a group of whales were observed for a couple of weeks feeding just west of seismic operations while operations were ongoing. This area is also where there is a hole in the BWASP data where they haven't sighted many whales. Time period was August 19th to October 11th.

Depth of Water of Sightings per year: In study areas the data from 1982 through 2006 is from BWASP, which categorizes ice conditions. 2007 and 2008 were both light years, and sighting rates were generally consistent with BWASP data during light ice years.

Depth of Sightings versus Seismic Sound Levels: No significant differences between water depth at sighting locations with different seismic sound levels during either feeding or travelling periods. Generally within each 10 dB categories up to 150 dB there is less than 1,000 difference when looking at sighting rates versus sound pressure levels (rms) for 2007-2008. Comparison of sighting rates for sighting showed non-significant differences between periods with and without seismic. Sighting rates were not significantly different between periods.

Summary: Aerial surveys in 2007 and 2008 found significant difference between sighting rates and

depths of rates for feeding and travelling whales and no difference when seismic was present and when they were exposed to seismic sounds up to 150 dB. Indicators exist that they avoid seismic areas but that they would stay in the area if there is a reason, i.e. feeding.

Questions/Comments:

Candace Nachman, NMFS: Are the numbers going higher at the bottom of the sighting rates versus sound pressure levels?
Bill Koski, LGL: It goes up by 10 dB categories.

Brian Havelock, Alaska Department of Natural Resources (ADNR): Can you collate your plots of whales west of seismic feeding unusually with any plankton or other food distribution done in the same year?
Bill Koski, LGL: No. It would have been great if we could. It is not normal to see whales so closely aggregated to seismic and would be great to see this information and simulate it.

John Bengtson, NMFS: I understand you don't calculate 150 higher because of the low effort.
Bill Koski, LGL: That is correct. We didn't have sightings in those categories anyhow but typically don't categorize rates where they are so low.
John Bengtson, NMFS: Sighting rates to 140-150 is four times the sighting rate than the other. You might think they shifted out of the areas and stacked up there.
Bill Koski, LGL: It just happened to go through the feeding concentration pointed out on the map. I don't think so. It also represents whales moving over too, but I think higher levels of whales did move away. We saw very few whales close to the seismic areas, and it is consistent with past studies where 160 sound levels affect whales enough to move away from operations. This explains in part the wide range of distances that we see whales react, i.e., the food issue. I think that whales were feeding and until the gun got close enough...

Lisa Rotterman, **NMFS:** How do survey efforts compare to efforts in late 1990s?
Bill Koski, LGL: The effort is less because of moving around more. The effort wasn't less, but sightings were less, but it was based on two years of data where the earlier study was based on three years. We also collected the same information on earlier surveys and the one sighted was travelling. There is a big difference from what the whales were doing during the survey.
Michael Macrander, Shell: In the 1980 and 1990 study there were additional efforts in higher sound level areas with additional, more closely spaced transects to increase emphasis. One finding is while they documented a deflection, I recall the footprint wasn't sufficiently wide to see the return to normal distribution. We have deferred to wider placement to see return to normal behaviour which forced emphasis of sound source.

George Ahmaogak, Ahmaogak Associates: We remember the report on active seismic and we argued a lot of that where MMS brought it out on EIS using traditional knowledge on actual whaler input didn't agree with findings. Back to your report, at 150 dB and seismic with visual observations, aerial surveys, I wouldn't care if I was hungry, I'd eat; any apparent behaviour changes? From traditional knowledge we know that whales are skittish after being exposed to seismic or surfacing more – behavioural problems? Any observations of that?

Bill Koski, LGL: We didn't have time to do this. I have seen in the past when doing behavioural studies and can remember coming on whales that are skittish. They'd appear and then dive right away, but because these were such big survey areas, we didn't have time to circle a lot of the time. We did with some of those closer to seismic.

John Hopson, Olgoonik Corporation: I have the same comment as George about eating. Were there MMOs on vessels when seismic was happening when whales were there and at the rate of when do you pull the trigger to shut down? How come that didn't happen?
Bill Koski, LGL: The permits asked to shut down if within concentration within 160 dB when we saw whales were close, we relayed position down to vessel. During the period that feeding whales were there, we were relaying information to the vessel and plotting on map to see if they were within 160 dB or not. Even though aggregation stayed outside the 160, after we realized they were on the border, Shell moved further north even though outside the 160.

Earl Kingik, Pt. Hope: You do a lot of studies of bowhead, and I was told no seismic operation in the north, but I question if you collect data on the routines of bowhead and other marine mammals? You should have long term data on the food chain.
Bill Koski, LGL: We have information from earlier MMS studies in 1985, but not directly in this area. The study was in Kaktovik. There are studies underway in Barrow, but not in the area where we're studying.
Michael Macrander, Shell: Joint baseline studies particularity in Chukchi that will look at trophic levels in the area. We were doing shallow hazard, not 3-D seismic. We haven't looked closely, but curiously it doesn't appear to.

Robert Suydam, NSB: I was confused about the categories of sightings, i.e. exposed, no-exposed, no-detectable seismic. Are they defined in the report?
Bill Koski, LGL: They are.
Robert Suydam, NSB: It would be helpful to define and be consistent. Can it be plotted on the same map with the seismic vessel relative to the boat? The map with the sightings didn't have the location of the vessel. The sightings alone and plot relative to where the vessel was would be helpful.
Michael Macrander, Shell: The 2008 video of the aerial observation are on green stars. You can track it. The animations require about 50 viewing to really understand them. The graphic in the report breaks it down so they all don't appear at once. We're relying on animations these days.
Robert Suydam, NSB: That's nice to know what the green stars are.

ION Geophysical Corporation 2010 Operations and Monitoring Plans for Beaufort Sea Seismic Survey and Icebreaking Activities

Joe Gagilardi, ION Geophysical and Darren Ireland, LGL Alaska
ION Arctic – 2006 acquired program in the Chukchi in October and November: We returned in 2007, and spent 2006-2008 working in Canadian Beaufort to build experience in Arctic environments. We

have strong safety records in this time. We have experience with permitting seismic surveys in complex marine mammal environments and in dealing with ice management.

We took a look at what it would take to work in Alaska and how to acquire seismic data to allow us to get more information under the polar pack ice. We acquired the first streamer program off Greenland that did this. We took a holistic, redesigned approach – the unique approach to geophysics meets objectives by defining image requirements and then working backwards through the seismic workflow.

Operations proposed is a two-boat operation, but in a new sense than what is typically used. There would be an ice breaker in front and seismic behind. There is no timeframe when the ice breaker will operate independently. It will work in conjunction 24-7.

The method of seismic acquisition:

Survey operations – ice escort operations. This is the 10/10th ice environment is the one that we have permitted for this year [a movie was shown with samples of activities with ice breaker vessel followed by seismic vessel emitting airgun shots].

For 2010, the proposed program is the Talagy, Ice Breaker, and Geo—6,811 km and proposed parameters of streamers and source arrays. What is unique is we will acquire program in October and conclude in mid- to late November with ice being the major factor on timeline.

The process of any survey in Arctic with a traffic-ability study to look at: a) the weight of steel sufficient to operate safely in the ice regimes, and b) crew and design is what is the probability that we will encounter ice? In the spring we're looking at ice at less than 3/10 concentration. In the fall it is 8/10 ice at less than a foot thick. This determines when activities will occur. We have plotted out all the ice for the year round in past 15 years. This allows us to determine August will have 40-50% ice coverage and then improve from that point. The best time to operate is October and November based on this analysis. We proposed this timeframe with the intent to start after whale hunts are completed.

Stakeholder Outreach: We met with NSB wildlife dept in December 2009. We attended the AEWC captain's mini convention in February 2010 and leadership meetings in March. We've also met with NSB Mayor Itta. Nuisquit and Kaktovik was scheduled but then had to be rescheduled.

CAA: ION is interested in signing a CAA with the affected villages. ION will not participate in the open water. The CAA has been drafted and distributed to the 2010 operators. We instead are looking to sign a CAA tailored to our survey and timing and scope. We drafted a CAA to meet their specific programs for consideration.

Marine Mammal Monitoring: Objectives are to a) implement mitigation measures, b) document marine mammal occurrence and activity near seismic operations, and c) collect baseline data on marine mammal occurrences within the study area. Our primary mitigation measure is timing,

starting October 1st and ending late November or December. This way we avoid the October bowhead migration and hunt in Barrow and most migrating whales by working east to west.

SSV is planned and will take place prior to or early in the survey. We've revised safety radii as needed for implementation by MMOs. The plan includes two vessels with most MMOs on ice breaker and one on source vessel. MMOs will be on watch.

Ensure safety radii are clear of respective marine mammals for 30 minutes prior to and during ramp ups; 180 dB for cetaceans and walrus and 190 dB for pinnipeds and polar bears. Start up will occur only when full safety radii are visible during daylight hours. Continue monitoring during daylight air gun activity. We will power down to mitigation gun if marine mammal is sighted or likely to enter full gun array. MMOs are to implement any additional mitigation measures, big eye binoculars for use during daylight and infrared camera on ice breaker for testing during darkness. We will produce a 90-day report after conclusion of project. The safety radii have been modelled by JASCO. Models for shallow waters suggest much larger safety zone than deeper waters. About 1/3 of line kilometres will take place in shallow waters. The exposure estimates for application were broken down by depth categories as well as east to west survey area. Average max were determined for a variety of species and displayed on slide that cannot be read from table! Estimated exposures at >160 dB threshold requirements for each period were provided as well.

Questions/Comments:

Diane Sanzone, BP: Another mitigation measure might be to work with USGS and look at bear data; you are moving into polar bear season. The other piece is within USFWS how are you going to handle maternal polar bear dens right around the time you will be working in the area? You mentioned infrared – how are you going to deal with that?

Darren Ireland, LGL: Off waters is mid-November which is the tail end of the surveys, and we don't have the aerial survey to deal with maternal polar bears.

Dane (unidentified last name/organization): For the record, November 15th is average, but bears den up earlier than.

Craig Perham, USFWS and Polar Bear Biologist: While it's true there are bears that go in sooner than that, as far as I know in open water you don't know. Again when we analyze, we'll incorporate a lot of what we know about polar bears in that environment and area to get a probability of interaction between this project and bears. There is a sister application with NMFS to USFWS projects.

Mike Payne, NMFS: What data did you use to get the seal density on ice?

Darren Ireland, LGL: On ice we looked at Frost data under the numbers including seals on haul out so actual exposure for seals in the water and used data from spring time.

John Hopson, Olgoonik Corporation: I'm going to make the CAA process complicated. The process used for boilerplating for draft has gone through every whaling community and had comments put in. At the AEWC meeting we agreed to the new CAA. If you've given a draft copy with your own changes, they have to go back to each community to see if that's okay. That's the process that is used. I am a captain; I hunt and eat whales, polar bears and seals. I don't agree with idea of ice

breaking – it affects my way of life. If you are in the ocean, it should be in open water. If you have two pieces of ice, the smaller will melt faster than the other and I can't feed my family. I urge the Feds not to let this happen in the ice.

Megan Ferguson, NMFS: I remember when JASCO were detecting in 2008 and this is a survey in early October to mid-November. It seems like there were bowheads in the area and there is some probability of seeing something there. Safety radii in 160 dB range from 31.6 km and the hours of daylight during the survey which is 11 hours in the beginning to three hours at the end. How confident are you that any estimated takes with MMOs are going to be given those factors?
Darren Ireland, LGL: I think there will be a challenge to estimating marine mammal occurrence ad distance further from essentially the single vessel. The estimates of take based on density seen from vessel are limited. We're going to have to work with it.

Candace Nachman, NMFS: Going off of Megan, your 160 radii...is that a combination of the two?
Darren Ireland, LGL: Only the airgun.
Candace Nachman, NMFS: You talked about working with the AEWC on bowheads, but the timing will be when seal hunting is starting up. What have you done to talk to communities to minimize impact on seal hunts?
Joe Gagilardi, ION: We are in the middles of stakeholder outreach now; we intend to do this next.

Robert Suydam, NSB: To follow-up with Megan and Candace, you are saying it will be difficult to get information where animals are near various zones. In additional to MMOs on ice breaker and source vessel and using spot lights and infrared, are there methods to monitor out to larger zones?
Joe Gagilardi, ION: Not at this time.

Jeff Denton, MMS: Mentioned SSV verification in open water conditions. With ice coverage the propagation with sound will be altered. How are you predicting this change?
Joe Gagilardi, ION: Model studies between water and air is an acoustic mirror. You have reflection of energy in the ice and you should have less transmission of energy in ice

Jeff Childs: I know this is a marine mammal centric meeting but I would suggest looking at how your survey will impact fish that associate under ice habitats that would have a potential impact on seal populations in that area.

Michaele Cerf, TGS: I was asked yesterday on how to keep marine mammal program under inclement weather is Infrared. I would be interested in seeing how it works for you guys and if it was effective.
Joe Gagilardi, ION: It will be included in the 90-day report.

George Edwardson, ICAS: You said you were going to have one MMO on one boat – he's working 24 hours per day, right? And you have three on the other boat, so you have no one to spare when they get sick.
Joe Gagilardi, ION: The current NMFS regulations are for all daylight observations so not on duty for 24 hours per day, only during daylight.

Lee Kayotuk, Kaktovik: Kaktovik is highly impacted by oil and gas activity, and there are polar bears in the Kaktovik area during that season. During movement of vessels to area, will the ships be double hulled or would they be travelling through ice conditions at that time?
Joe Gagilardi, ION: Both are ice classed, so they are rated for the conditions they will be in.

Alaska Department of Fish and Game and North Slope Borough Science Update

Lori Quakenbush, ADF&G, and Robert Suydam, NSB
Alaska Department of Fish & Game projects include: a) bowheads, satellite tracking & traditional knowledge; b) belugas – diet; c) ice seals – bio-monitoring and satellite tracking; and, d) walruses – satellite tracking and haul out monitoring. Projects are in conjunction with the native communities and hunters.

Bowheads Satellite Tracking: This project has been funded by MMS and is interested in where bowheads go and what they do. We have general information but wanted more specific information in the Chukchi. Objectives were to identify important habitats, document behaviours related to industrial activities and migration routes, and timing of movement and rates of travel.

Factors included working with whalers to deploy satellite transmitters and set objectives and have the project decided upon by whalers if it were to be continued or not and to ensure the proper objectives were addressed. Several whalers completed most of the tagging. Updates on the project were provided at AEWC and feedback received from various whaling commissions. Information is being received from transmitters that have been deployed. 2006-2009 shows all the tracks across the Chukchi for the September through November time period. This is the usage of Chukchi by tagged bowhead whales. To date there have been approximately 44, but it gives an idea of the movements. One way to look at data is by kernel density—the highest density by bowhead is around Barrow and within the lease sale area in September. In October it shifts with the high around Barrow but now more on the Takahtna peninsula as well. November it shifts to the Bering Strait – not much along the Alaska coast, but a few. In 2008 tagged whales went into the Bering Strait with the earliest on November 6th and the latest January 9th. This confirmed whales in the Chukchi in December as stated earlier.

Winter data through November 2009: Six whales are tagged right now, and we are still collecting data on that time. 2008-2009 we anticipate more use of west Bering Sea and in 2009-2010 the eastern Bering Sea. Kernel density shows hot spots in January 2009. We can also overlay ice data and show location of whales at that time to determine what type of ice bowheads are using. We completed a bowhead analysis of what type of ice they are using and they use quite heavy ice.

The bowheads leave the Bering Sea early March to end of April. The tagged whales left the area within a month. In spring migration we can show the track to Barrow and can look at detail as they

pass Barrow; we can see how far off ice they are. During springtime across the Beaufort there was only one whale in 2006 and six in 2009. The whales were travelling together in 2009; they were travelling differently but using similar tracks. The dark areas on the slide depict open water. We can only track when they come up to the surface, not when they are diving.

Tagged whales seem to spend time there as shown on the slide depicting summer months by year. We saw two animals come to Barrow and then move back to Canada, and we can see them traverse the Beaufort twice in a season before they migrate. In 2006, one bowhead was tagged at Barrow. It went over to the MacKenzie Delta area and interacted with seismic activities. This area is a known feeding area and was seen by aerial surveying during seismic. Several slides show where tagged whales deflected or turned at 5.7 miles of intersecting. The ship stopped due to other marine mammals being spotted by MMOs. This is real data on bowheads interacting with seismic vessels. The bowhead left after seismic interaction, but it stayed in the area and continued to feed. One thing to think about is that this bowhead was tagged in 2006 and it interacted with the seismic operations in Canada. The ship then went over to the Chukchi Sea, and this whale went north of this operation as well. It was the only tagged whale actually encountered by both operations, and we need to apply this to cumulative effects and what is going on during summer and migration.

Traditional Knowledge: We are collecting data about bowheads when we start the tagging project. George Ahmaogak pushed this element and whalers know a lot about the whales and get information as well. ConocoPhillips funded the first traditional knowledge study with Barrow and Kaktovik and did another one for Wainwright. Information is completed to add to tagged information.

Beluga Diet: Most of what we look at is diet from harvested whales. There are five stocks of belugas in Alaska, and we have samples from each area. The diet is different in the different areas. Some are more dependent upon salmon, smelt and unlacon. Northern areas show more diversity in feeding. There is an importance of Arctic cod, which is eaten by belugas as well as seals. They eat quite a bit of invertebrate, shrimp, octopus, etc.

Ice Seal Biomonitoring: This monitors health and status of seals including several types of harvest seals. Several factors are examined: diet, contaminants, parasites, genetics, productivity, body condition, teeth for aging and traditional knowledge by questionnaire. Fish and Game has been collecting this information for several decades and can make comparisons to see what changes have occurred over time. We can tell by region that in the 1960's and 1980's seals were eating fewer fish than they are now in the 1990-2000 timeframe, and we can tell what type of fish they are eating now. We can do the same with invertebrates. We can look at length of age from 1960s through the present to see how growth rate has changed, and we can also look at age and maturity. When females are stressed, they reproduce at an older age. Relating to disease and parasites, we can look to see what is more or less prevalent than in the past. There is no long term data for contaminants or metals, but we are beginning to collect this information. Metal levels are less in Alaska than other parts of the Arctic in Canada and Europe. Seals are important to native communities for subsistence activities, i.e., making boats from skins and food.

Seal Tagging – Kotzebue: We are working with local seal hunters to learn more about seal movements and important habitat areas. We have been working with the native village of Kotzebue since 2007 tagging ringed and bearded seal pups. Tagged numbers for fall 2007 included: 12 ringed seals. In the fall of 2008, 13 ringed seals and in the fall of 2009, 12 ringed seals and 11 bearded seals. We've learned through this project that juvenile ringed seals spend more time near ice edge than adults do. Of the 11 bearded seals tagged in 2009, we can show the tracks of the young bearded seals that are still being tracked now.

Village-based Walrus Studies in the Alaska Chukchi: This is based on a bowhead study with hunter involvement and coordinating study. There are no tags as yet, but the idea is with the ice leaving the Chukchi, walrus are dependent on the ice and can feed in deep water and will go to shore. We're interested in having villages look for walrus on shore and get opportunities to put tags out. Using similar types of situation such as the one near Cape Lisburne where 3,200 walruses hauled out in 2007; we hope to get tags out in these situations. The objectives are to count them, make behavioural observations and provide protection from disturbance while walruses are on land. Information will be shared with UGSG to maximize the information available regarding movements, habitat, and haul out behaviour. The last traditional knowledge interviews are being conducted to gather information on walrus hunter knowledge.

Questions/Comments:

(Unable to hear first name) Berkman: I was wondering if you have any tagged whales inside the Barrier Islands.

Lori Quakenbush, ADF&G: I don't think so. The area where the least data is in the fall migration. We are looking to tag more in Canada, but we haven't looked real closely at animals relative to the Barrier Islands.

John Hopson, Olgoonik Corporation: I haven't seen this presentation before. Can you come into the communities and do the same presentation?

Lori Quakenbush, ADF&G: I was in Wainwright last February; you must not have been there. I have given pretty extensive presentations at Wainwright, Barrow, and Kaktovik.

John Hopson, Olgoonik Corporation: Can you email it to me?

Lori Quakenbush, ADF&G: I can mail you a disk.

Dale Funk, LGL: On your deflection in Canadian waters, if you look at GXT SSV for 2006 in the Chukchi, that deflection would be about 160 dB which is similar to what Bill was showing earlier.

Lori Quakenbush, ADF&G: I hope we can look at it further, and the water would be a little more shallow.

Mike Payne, NMFS: Do bearded tagged seals off Kotzebue go east to Kaktovik?

Lori Quakenbush, ADF&G: We didn't see them go that far. They stayed south and stayed in the Chukchi.

Mike Payne, NMFS: Will they tag any in Kaktovik?

Lori Quakenbush, ADF&G: NMFS has this project trying to tag older seals, and there are other projects.

Peter Boveng, NMFS: We don't have plans yet developed or proposed to go to Kaktovik to work there. One objective is to spread the tagging effort around geographically but initially for the scope to be bearded seal movements in the Chukchi. It doesn't mean we only have to tag in the Chukchi, but we know that the species will eventually get there. Right now plans are to go back to Kotzebue and tag more. Plans to go to Barrow and work out of Wainwright and move toward (unable to hear) Bay if conditions allow. We're feeling our way—it's a new area, and we're confident after the Kotzebue pilot we can continue to get some more. We will discuss more tomorrow.

Chris (unidentified last name/organization): I'm interested in Arctic cod as generic; there are multiple species. Do you know more about it?
Lori Quakenbush, ADF&G: I mean Arctic cod. There are other species of cod, but I am talking saffron Cod.
Chris (unidentified last name/organization): There are multiple species of cod? We pick cod sounds up on the recorders, and I wonder if anyone else that has been recording has been paying attention to that.
Lori Quakenbush, ADF&G: There are records in 2007 on nets off Pt. Lay and Wainwright, Barrow and Cape Lisburne. The ones five to ten miles offshore were most accurate.

Craig George, NSB: I think there are two dominate species – Arctic cod and saffron cod.

Dave Hannay, JASCO: Just to respond to Chris' comments on Arctic cod sounds in the Chukchi... We've looked but haven't been able to detect them yet. We are looking for them, but we're not sure why we can't detect them as yet.

Chuck Monet, MMS: This study has been going on a few years and is planned for additional years. We are renegotiating similar contractors with long term goal to move to more complex tags to emit more information. Passive acoustic work for Shell displaying activities and movements of seismic vessels and want to include collaboration with Lori's study with the seismic data coupled with movement of tagged whales.

Jeff Childs: What I was working from is Arctic cod is most prevalent in the environment. There are differentiations in their use and in the water column and ice. Older life stages can occur in the water column. Other species not as common include the polar cod which goes to the north Atlantic and are switched with the scientific names. You have to know which realm you are talking about.

John Goll, MMS: Kerneling graphic – is that for only Barrow whales for all four years, or just one and do you have something similar for the whale staged in Canada?
Lori Quakenbush, ADF&G: All years are combined for kernelling and we haven't done kernel density in Canadian waters. They were mostly tagged there, and the sample size isn't high. We've been working with Lois who is doing surveys and other things, so it may be there. We can do it but need a bigger sample size.

Dee Williams, MMS: I wanted to let everyone know that Lori's project with satellite tracking has received a Department of the Interior award. It is a time to celebrate and congratulate her and her team for her work. The award is scheduled to be received in April in Washington DC.

Craig George, NSB

NSB Bowhead Whale Research Overview: I will be providing a qualitative description of the research being done by the department. The NSB Department of Wildlife Management has been around for 30 years and works collaboratively with science and the community. We've worked with the International Whaling Commission with focus on abundance estimation, stock structure question and in 2007 the scientific committee agreed that "the available evidence best supports a single stock hypothesis for bowhead whales." Bowhead research has included population size and trend; post-mortem exams, productive studies, reviewing technical documents; diet and feeding studies; traditional knowledge and age estimation, weapons improvement program, sensory organs, satellite tagging, and photo ID.

Bowhead abundance stimulation work is a critical part of the bowhead AWMP management plan and is useful as a population for a health assessment tool. The work was conducted by NSB and The Department of Wildlife Management (DWM) since 1981 and is required every ten years by the International Whaling Commission. Two methods have been used: ice based migration count "census" counting from the ice edge with the hunters, and 2) photo mark-recapture.

We took over the work from NOAA in the early 1980s, and hunters said we needed to make improvements as we were missing whales under the ice. Chris Clark showed up, and we used hydrophones to help capture that information which are deployed through the ice. This is an effective technique. The population size and trend is a 3.5% rate of increase from 1977 through 2005.

The health assessment/status is a long term program. Concerns driving it include climate change, industrial noise and development, oil spills, disease and density-dependent effects as identified by the native communities. The body condition index looks at the location of auxiliary girth measurements. Blubber is a key focus of health assessment. By measuring and looking at content, we can get a good indication of health status. We are doing research on the ear anatomy and possible auditory trauma and looking at normal anatomy of bowhead ears and determining potential injuries to them from a host of different sources.

The feeding and diet studies are a 30 year time series on communities in Barrow, Kaktovik, Niuqsut and St. Lawrence Island. We are adding the Bowhead Feeding and Ecology Study **(**BOWFEST) area in the western Beaufort Sea. There will be a 30+ year time series of stomach examinations. Local boat surveys are part of the projects. Local folks go out and find whales and note positions. Boat surveys in 2009 were July 1-September 13 and gives additional information on locations when aircraft can't fly.

Olfaction (sense of smell) studies: Bowheads are sensitive to smell. Inupiat traditional knowledge says bowheads are sensitive to odors ("puvlak"). There is no burning allowed during whaling.

Western science however assumes olfaction is absent in odontocetes and likely absent in mysticetes. We worked with hunters and wanted to look at the question. This required sectioning the skull. They allowed us to do this, and I was able to saw the cranial vault and then remove the olfactory vaults. It showed they are large and complex and about 50% of olfactory receptor genes are functional, and it is convincing that they smell as well as a human per a leading biologist.

The age estimation study is underway using eyeball aging, baleen ageing through analysis, ovary analysis and heating experiments with gas. It suggests bowheads live a long time. There was an 1879 weapon recovered in a whale in 2007.

In the contaminants study, we monitor blubber, blood, liver and kidney for contaminates including man-made pollutants.

Traditional knowledge includes reactions to man-made noises. Whaling captains in the 1980's stated noise from seismic testing and ships deflect migrating whales up to 20 miles and makes them harder to hunt. Whales aren't in the places we typically find them, and we have to go much further offshore to harvest them which can be dangerous. All these issues we have validated through western science.

They saw a marked reduction in whale density in the Richardson area in the 1980's due to intensive drilling and seismic as well as changes as food distribution. Research bringing seismic to whales and saw avoidance at highly close range which seemed to conflict with what hunters said earlier. In 1999, additional work was done to address the noise issue relative to seismic with a 10 nm radius. When there were seismic operations, there were significant exclusions. When not operating, you didn't see it. This is more consistent with migrating bowheads.

I want to put in a plug to use displays with seismic and marine mammal locations – it is easy to understand.

Other research includes ice-seal research, beluga whale research, post-mortem exams of strandings and biomarker assays.

Questions/Comments:

John Hopson, Olgoonik Corp: The slide on the smelling part... I think you should swap it around with a breathing error. When you go inside a home or bar, you breathe it. The whales can breathe and taste it when they go by a dump site. We don't allow burning during whaling because it will push the whales in Wainwright. If they burn trash, they move further out. No burning and they move closer. I need the multi-year ice to feed my family; the ice breakers don't allow multi-year to form.
Craig George, NSB: Excellent points. They evolved this ability to detect prey and for feeding but it could have implications to human and oil and gas activities. This is a very large year on multi-year ice—you couldn't pull this whale up on first year ice.

John Goll, MMS: There has been data collected for years of samples for whales and other things. What is the health of the animal? Has that data put in long term depository to be mined for that information?
Craig George, NSB: The answer is that a lot has been published and in fact there is contaminate work from the 1980's and other works have published updates. It's expensive and takes five to ten years to do analysis. It should be posted on a website.

Bob Day, AVR: Can you talk about what the bowheads are feeding on – copepods?
Craig George, NSB: Unfortunately I am not an expert in these invertebrate prey species. Do you know what they target in Kaktovik? It's published here in the book – they do field lipid through the summer and content is at the maximum in the fall. It is an excellent food source for them.

John Richardson, LGL: If I remember at Kaktovik, occasionally they are more prevalent in the diet?
Lori Quakenbush, ADF&G: Data has been collected for over 40 years. It wasn't me collecting data, but Fish and Game has been collecting data and putting database together in modern formats and we've been mining it ourselves to address recent listings of seal species to provide to NMFS a status review. We're actively doing that for use by others.

Day Two Wrap Up

Candace Nachman, NMFS:

- People have been asking what I'm doing. I am taking accurate records and a meeting report will be made available in the spring.
- Those people presenting over the past two days and tomorrow - if you can share presentations with everyone that would be great
- MMS and NMFS are hosting a public scoping meeting on EIS at 7:00 p.m. in this room.

Day Three – March 24, 2010

Day Two Recap

Denise from the Anchorage Convention Center provided a safety minute identifying emergency exits and the evacuation meeting spot in Town Square Park.

Announcements provided included reminders to new participants to please sign in and reminder to identify name and organization when speaking.

The agenda was reviewed and a small shift in timing noted. Parking Lot requests were discussed briefly:

Duncan Eley, Polarous: This is my first time here. We will be transitioning ourselves up here in the next couple of years, and it is great to see what the forum offers. I've spoken to a couple of people about the growing number of vessels in any operational fleet. My question is around the pursuit of the towed passive acoustic monitoring as additional or supplementary monitoring technology or methodology. I have a number of experiences using multiple towed passive acoustic monitoring which enables you to address some of the shortcomings of the poor triangulation of the technology but there are also questions about the low frequency ability of that technology. A comment as to where that is in this process and if it has a place in this process and whether it is worth going into the parking lot or further discussion.
Robert Suydam, NSB: It is an important issue, and we haven't talked about it at the Open Water meetings to date, and it is a technique we haven't used much. I think it was attempted perhaps in 2006. Talking a little bit more about the advantages and disadvantages and how it might fit into monitoring is a good idea.
John Goll, MMS: [Gave a thumbs up.]

George Ahmaogak, Ahmaogak Associates: I've given it some thought over night and over the last couple of days and after talking with some of my colleagues, the whalers, the stakeholders ... the sign out there "Stakeholders Meeting", and let me remind you of that. The issue that kept coming up several times is the conflict avoidance agreement. As the regulatory body, I heard them clear saying it's not required. The Barrow whaling captains are adamant about the conflict avoidance agreement to help control and protect whaling from adverse impact and cumulative effects. There is no other statutory authority, but there is a local ordinance with the North Slope Borough, because I'm a former mayor and helped write that thing. Again, we're saying it's not mandatory. Refer to the plan of cooperation—that is not clear either. Whether the regulatory body before an IHA authorization, whether this is clear to some of the stakeholders and how it is supposed to apply to the oil and gas industry is going to follow your regulatory procedures. It is not clear to these stakeholders. The bottom line is that it is supposed to protect subsistence whaling and yet you're saying a conflict avoidance agreement is not in order. I think MMS has to make clarification on this as well. We need to make the plan of cooperation and the conflict avoidance agreement clear in regards to regulatory requirements.

Mike Payne, NMFS: Out of curiosity, what issues are in the parking lot?
Lisa O'Brien, Alaska Training & Consulting: These are the only two.

NMFS National Marine Mammal Laboratory Science Update

COMIDA and BWASP Aerial Surveys conducted by NMML 2009 – Megan Ferguson

BWASP Bowhead Whale Aerial Survey Project. BWASP is the Bowhead Whale Aerial Survey Project and COMIDA is the Chukchi Offshore Monitoring in Drilling Area project. Today we will be talking about the COMIDA and BWASP aerials surveys that were conducted by NMML in 2009, and Janet will give you some context. She'll be bringing in all the historic data that goes back to the early 1980's. Traditionally, these surveys were conducted first by U.S. Bureau of Land Management (BLM) and then MMS and in 2008 NMML took over the daily operations, but it is funded by MMS. The study area is pretty vast. It spans from the U.S./Canada border in the east to 169 degrees west; this is 72 north latitude and this is 68 north. The official dividing line between the two study areas is right around Barrow at 157 west. The furthest offshore point is 170 nautical miles offshore.

The primary objectives of the program include: a) monitor bowhead migration, b) investigate inter-annual variation in bowhead abundance, distribution, habitat and behaviours, and c) collect and communicate information on bowheads and other marine mammal species.

Communication of Information is an important part of our project. Daily flight summaries are posted on NMML and MMS websites which allows for rapid dissemination of information to interested parties. It includes a summary of sightings, group sightings and other information (check www.afc.noaa.gov/nmml/cetacean//bwasp/index.php). I would like to make a plea for help to those higher up in NOAA because our survey team will finalize these within typically eight hours of landing but there are currently about four other levels of review they must go through before they can be posted to the website and depending on whether a critical person is on a flex Friday, it could mean that Thursday's report doesn't get posted to the web until Monday, and I think this summer in particular is an important time for us to get our information out as soon as possible.

Janet Clarke – Historical Data

The COMIDA effort in 2009 was June through October. Surveys were conducted almost non-stop except for maintenance and weather issues. This year was best ever for Chukchi Sea, especially in the offshore area. The survey area is quite large at 172 degrees and 169 degrees and transects were revamped this year to be done perpendicular to the coast as we found this to be a better way to survey the Chukchi Sea area. We got good coverage especially in July and September; August wasn't as good for weather and aircraft. October we flew quite a bit but we had to reposition our plan to Kotzebue because that's where our hangar was. It was a very good effort overall in the area.

In the Beaufort, it was a little bit different situation this year. It started out wonderful. In the first week of September we flew, flew, and flew. We actually even took our crew back to lines at 8, 9, and 10 – those were areas that had not been surveyed as much recently, but we wanted to survey them this year because of information we had gotten from the tagging project we heard about yesterday. We had bowhead going from Canada back over to Barrow and back to Canada. We didn't see any bowheads, but we did get some good data otherwise. Then, as we like to say, the sky fell out from September 8-28. We had wind, fog, snow, and rain. We had very poor survey coverage for about three weeks in September. Then, in late September, we got our good weather back and coverage was good through October for BWASP.

A total of 71,000 km were flown with 333 hours of flight time. Actual survey time was 240 hours, and the bulk of that was COMIDA time and area; BWASP wasn't as good, particularly in that September timeframe.

The first bowhead sightings in 2009: In the COMIDA area, there were bowhead sightings in every month surveyed from June through October. Sometimes there were just two sightings, as in August, but sometimes there were significantly more, particularly in June and July. These were fairly significant because there hasn't been an awful lot of work done in June and July. There have been a few papers published that have referenced these including the paper published in DC Research by Sue Moore Letters, and, certainly traditional knowledge has always told us that bowheads are in this area. This year we were actually able to find some groups that were hanging around for a fairly good amount of time. Bowheads in the Beaufort area this year for September, there weren't many of them. Again, remember that our survey effort was not great in September and as goes the survey effort, so goes the sightings. In October, a lot more sightings spread across the Beaufort but again, you can see a lot of them in [this] area.

Beaufort 1982-2009 BWASP bowhead whale sightings: This slide shows transect only sightings. Transect only means that they have been collected in a fairly equal way over the course of this database. The BWASP database, as most of you are aware, started in 1979 and our methodology was really more cemented and made more consistent starting in 1982. Transect only sightings are sightings that have been collected in a consistent manner, and they don't reflect that the surveys have gone back to the same area, it doesn't reflect animals seen while circling or animals seen on search surveys, so they really are the sightings that should be used. We've plotted most of the proposed work that will take place in 2010 with Shell proposed drilling sites, the shallow hazard area, ice gouge survey, and ION seismic survey area to show where bowhead are sighted with respect to proposed seismic activity.

COMIDA area sightings: This encompasses sightings and efforts 1982-1991 and 2008-2009 are displayed. There is a gap of information in the surveys as there were no surveys in 1992 through 2007 in the Chukchi. 2008 the surveys were started again with three three-week time periods, but it really hasn't been until 2009 that a concerted effort to cover the area began again covering June through October periods. Again, we plotted proposed sites to gauge locations of bowhead to proposed activities.

We do look for cow-calf pairs. We do transect surveys but will divert off the transect to investigate sightings to verify species, to get a better idea of how many animals are in the area and if there are cow-calf pairs. We don't circle for very long but long enough to get the information, and we found 19 total; one in the Chukchi and rest scattered in the Beaufort and most were seen over two days in Block 12 between Smith Bay and Barrow.

Feeding bowheads: This is historical data with proposed exploratory and industrial areas. One thing to note is that it says "as reported." We under report feeding in the database because at times the whales cooperate and really show us they are feeding, but other times it isn't the easiest behaviour to pick up. When we circle, it might be for a minute or two. We have to make the determination very quickly and as a result it may be underreported. In 2009, these are the areas where we saw whales feeding. We sighted a group of seven to 14 whales off Pt. Franklin from June 30th through July 11th several times. These were definitely feeding. Whales were sighted on September 19th (18 whales) and several groups were seen October 13th and October 29th. On October 13th we sighted an estimated 300 whales off Barrow. [Showed and provided explanations of several photos.]

Beluga distribution from 1982-2009: 2009 sightings including seeing beluga whales in the Chukchi in July and October with not a single sighting in September or August. In the Beaufort, pretty much they were along the areas you would expect to see belugas with one close to shore. There were a lot of sightings in the Barrow Canyon area in October. Historic sightings really do show that we find them out along the slope. The Beaufort is just full of belugas and the Chukchi isn't but a reminder

that this area has not been surveyed near as much. It was striking that beluga distribution in the Chukchi is rather dispersed; it's not this very tight area like we tend to see in the Beaufort Sea.

Gray whales and other large, unidentified whale sightings are shown on this slide. They were animals that we could not identify the species because we couldn't see them clearly. Species could include humpbacks, gray whales, etc. Most unidentified whale sightings are in near shore area between Icy Cape and up to Pt. Barrow. The 2009 gray whales are seen mostly in the near shore area. The historic data, in late 1980s/early 1990s, shows we could find bowheads out here in this _____ (unable to hear) area pretty regularly, and we almost expect to see them. This year we expected to see them, and, while we did have a few sightings, there weren't too many and that was kind of interesting. There were a lot of gray whales in July and August, but sightings decreased in September and October, which was unexpected because conditions hadn't changed much and there were good survey efforts being made.

2009 Other Marine Mammal Sightings: Four polar bears were seen in the Chukchi and bears in the Beaufort were seen close to shore. Pinnipeds and seals were scattered throughout the survey areas. Walrus in June through the first part of August were seen in groups on the ice. If ice came into Barrow, which it did in early to mid July, we saw them on the ice. When the wind pushed the ice back out, we again saw them on the ice just further out from shore. In late August, the ice was out of our survey areas, and we weren't seeing the walrus on the ice anymore; we were seeing them swimming and mostly right along the shore.

On September 2nd we saw a haul out on Icy Cape and documented two more times after that with 2,500 to 4,000 walrus being spotted. By the 14th of September it had dispersed. There were other haul outs found further down the coast; we did not see them, Fish and Wildlife Service did. In October the sightings went way down and tagged data from that time showed they were spilling out of the Chukchi at that time.

The 2010 plan is similar to 2009. We will work out of Barrow exclusively for better access to the work area. Work will be conducted from July 1 through October 22. BWASP work will begin August 31st through October 20th and will be based out of Deadhorse. Appreciation to those that help, including MMS and Chuck Monet, NMFS NMML, software support, aircraft support, and aviation management.

Questions/Comments:

George Edwardson, ICAS: Are you flying with one airplane?

Janet Clarke, NMFS: We have one aircraft devoted to the Chukchi and one devoted to the Beaufort.

George Edwardson, ICAS: If you are looking for the animals, instead of just getting about 10% of what is there, if you would chase one plane with another 15-20 minutes behind it you would see those at the bottom of the ocean. It would be more to your interests and benefits to do that. If you do that, you'd have a better picture instead of sparse sightings where you can say, oh, there's no whales right there, it's not important. Take the proper look and make sure they are there and stagger the planes by 15 minutes and put the two reports as one.

Megan Ferguson, NMFS: Thanks George. It really is a logistically difficult study to coordinate both because of the size of the study area and the expense. I think you will see we are trying to cover a broad area so we really do have (unable to understand) resolution. The BOWFEST Study that will be talked about later has a much tighter resolution and they have more opportunity to take a look at what is out there just because they are covering a smaller area.

Brent _____, JASCO Applied Sciences: I wonder what the public access is to those sightings. Is there a database somewhere we can get access to?

Megan Ferguson, NMFS: It is available publicly on the web through 2008. For the 2009 data, the flight summaries have been on the web since a day or two after flight, and we are cleaning it up so 2009 data should be available in the next couple months.
Brent _____, JASCO Applied Sciences: Can you say how it is accessed? Reports? PDF?
Megan Ferguson, NMFS: Historical data is in a Microsoft Access database format, and we have some well documented metadata that explains all the fields. Janet and I are available to explain information. We are putting time in thoroughly reviewing the historical database to make sure the information makes sense. The existing available 2009 data are just the daily report formats in PDF, but when we do post it to the web it will be part of the Access database.

Susanna Blackwell, Greeneridge Sciences: I was just curious on the map Janet showed with the sightings there was a big mass of beluga sightings in the Beaufort. The lower edge of those sightings seems to correspond roughly to an isobath. Do you know what that is? Was it 100 meters?
Janet Clarke, NMFS: I will get back to you on that; I can't read it on the slide. I'll let you know.
Susanna Blackwell, Greeneridge Sciences: Okay. Robert suggested it was 200 meters.

Chuck Monet, MMS: Additional access to the data will be available through the MMS website. One of the things that's on the MMS website is all the annual reports back to 1986 and in those reports are summaries of each daily flight with isobaths and all sorts of summaries. www.mms.gov/alaska. If you can't find it, get in touch with me, and I will help you.

Craig George, NSB: I'm curious why you are not picking up killer whales, which are seen each summer by the hunters. I don't know that they've ever been seen on the BWASP or COMIDA surveys.
Janet Clarke, NMFS: We're curious about that too. The killer whales are in the database, I believe we've had one sighting and they were chasing grey whales but that was back in 1982 in the southern Chukchi and not in our current survey area. We haven't been lucky enough to see them. In the late 1980's, in Block 16, we saw a single pinniped sighting and flight service said did you see the killer whales?

George Edwardson, ICAS: You are talking about my dinner table and you're talking about government all across it. The reason why you need a second plane is I want you to see the animals I live on. Saying you don't have the money isn't a good answer. This is what feeds my people, and I need you to take a close look.

Harry Brower, AEWC: An observation on your survey. I see animals closer to shore in different areas and grey whales around Barrow and beluga seen way offshore along the shelf. They come in on the west side of Pt. Barrow right to shore, and you can take animals almost right off the beach. I wanted to share my observations with you. The killer whales are west of Barrow, right up to Pt. Barrow and on the ice edge. I have seen a group of seven with large dorsal fins and they are very noticeable.

Craig George, NSB: I was fascinated on the under ice feeding. How often have you seen and recorded that type of behaviour? It's fairly uncommon, at least at Barrow.
Janet Clarke, NMFS: Off the cuff, I would say we probably have not recorded that much because of the time we survey. We are there during open water. Most of our surveys, the vast majority of our Beaufort BWASP and COMIDA surveys are during times when there is not much ice. Only in 2008-2009 have we had surveys started when there was ice present. We probably don't have a lot of instances in our database.
Craig George, NSB: (unable to hear – no microphone)

Janet Clarke, NMFS: This was, but as far as how much that is in our database otherwise, I'm not really sure.
Craig George, NSB: Were they synchronistically diving?
Janet Clarke, NMFS: Yes. Not on every day we saw them there but on same days and in the sightings off Pt. Franklin in latter part of June and first part of July. The ice was there but then the ice moved out and when we saw them in mid-July with no ice there and at least one of those whales was the same and they were still there feeding. The conditions had definitely changed, they were still there feeding, there where gray whales in that same area as bowheads and they were still pretty much in that Pt. Franklin area.

Robert Suydam, NSB: Thanks for the report. The information has a lot of data and is valued, and we appreciate your efforts and for funding and conducting the survey. One valuable thing about the survey is in the Chukchi where things have changed a lot in the last ten to 15 years with ice coverage, and I think the sightings will become important and valuable. What do you think about the potential for using COMIDA surveys to help us understand the impacts for when drilling and seismic occurs? Any thoughts on that?
Megan Ferguson, NMFS: We want to make sighting data available as quickly as possible, and the database is public. Once we make sure report is final, we'll get the data out as well. We are trying to cover a really large survey area and so the spatial resolution that we can really address is relatively broad scale, but I think we are getting out there at a good time before a lot of the industry has really ramped up, and, so if we can keep a constant time series out there, I think we are doing ourselves a favour especially in those far offshore areas. One of the things that has been really exciting for COMIDA is I recently attended the workshop at NMML with the Alaska Beluga Whale Committee and trying to help them find a design for a more near-shore aerial survey to estimate the abundance of eastern Chukchi beluga. It's nice when our survey data can help a sister project like that.

Lisa Rotterman, NMFS: To follow up on Craig's question and, Janet alluded to the fact that feeding is underestimated, certainly for the years when MMS did the surveys and the period I was involved in and with conversations with other people at MMS who did the project at different times, that is certainly something that is definitely underestimated because we rarely took the time to look to see what they were doing. We were trying to cover a lot of ground, and so, I think feeding is definitely underestimated, particularly around ice. Both females and calves are underestimated and feeding is underestimated.
Megan Ferguson, NMFS: I agree with that and I also think Julie _____'s work looking at the photos from _____ whales would reiterate that because a lot of the sightings might not have said the animals were feeding but if you go look at the photos there it is.

Lars Nelson, Barrow Technical Services: I wanted to ask if you considered a current remote sensing and satellite imagery technology which yields two foot resolution. We used to see it over land but _____ (unable to hear) over the ocean.
Megan Ferguson, NMFS: I haven't investigated, but that is an option.

BOWHEAD FEEDING AND ECOLOGY STUDY (BOWFEST) Dave Rugh, NMFS
Craig George mentioned BOWFEST yesterday, and we are working intimately with the North Slope Borough native communities. NMML aerial surveys are conducted in a focused area which Janet described. It's a sweep over much of the Alaska Arctic. This area is very focused between 157 degrees and 152 degrees up to 72 degrees north, but mostly in the Barrow area. As you've seen satellite images were showing high concentrations of bowheads spending time in this feeding, and we want to know more about it.

In this picture is a forward motion compensating camera that has this little rotation that every time you pass over a whale it fires the camera so we have very precise images that can be converted to size. It will give us an idea if, in this Barrow, area, are they all big or are they all small or are they a mix? So far we've found mostly large, but then a mix down to very small whales. The hand held camera can move around to capture any whales that are below the plane and look at the marks on the backs of the whales and ask questions like are they the same whales every year or is there quite a turnover? Evidence so far is that these are feeding migrations; they come in, feed, and move. Julie, as Megan mentioned, is taking the lead to look at images and study them. As they are studied, about 60% of whales in this area have mud on the topside which indicates they are feeding low. There is a lot of feeding in this area in the August and September time period.

Passive acoustics are limited by winds and low ceiling. We are getting an average of seven days for the four weeks were there. There are other ways to capture noise through the water column to answer when they occur and where. The NSB has been contacting local whalers to go out and find the whales; they can work in fog and other rough conditions to help locate whales. The NSB has been examining the stomachs of whales in the harvest to help identify what they are feeding on. Tagging and fine-scale oceanography is being conducted by the Woods Hole Oceanographic Institute. They launch tags immediately prior to attaching a bowhead, which allows them to see the whale go to the surface and then down to the seafloor to help identify where the prey are.

Oceanographic sampling on a broader scale is being conducted with the University of Alaska and University of Rhode Island. Sampling is occurring throughout the year to see what is happening with current, temperature and salinity to answer as currents move and winds blow, what level of predictability do we have? This is a five year project and we should be hearing more in the next couple of years.

Questions/Comments:

Bill Streever, BP: Have you tried to correlate recordings and call types with feeding events to see if there is a pattern (unable to hear)?
Catherine Berchok, NMFS: We haven't analyzed fully but the tagging project has these (unable to hear) buoys that they deploy around the feeding whale and they can get the tracking view but they can also get the acoustic recordings to that they (unable to hear).
Bill Streever, BP: Including call types?
Catherine Berchok, NMFS: Yes.

Robert Suydam, NSB: The last photo showed looked like there was a cloudy spot in front and to the left of the whales. What was it?
Dave Rugh, NMFS: I believe what's ahead of the whales or below is a dispersing blow but behind the whales, they are in a echelon formation, they are shoulder to shoulder feeding, so I think there is quite a bit of krill or (unable to hear) in the water. From the air sometimes you will see it in the front of them, just a mass and the water will look brown or red.

Earl Kingik, Pt. Hope: About the krill, are you doing data studies after seismic operations? Will the krill be available for the bowhead?
Craig George, NSB: Yes, we are characterizing the prey species. There is a laundry list of species. Some of it is published in the bowhead book but we have updates on it as well. Basically the dominant prey at Barrow are the true krill, and to the east it is usually copepod dominated. But there are literally hundreds of species that are taken that wind up in the bowhead stomach but there is usually one prey that is 80-90% of the stomach volume. Impact of seismic on invertebrate prey, and to my knowledge, there has been very little done on that that I'm aware of except that we

did ask Bill Streever, when they are doing a seismic shoot, shallow water shoot, near Prudhoe to follow the boat and look for any direct evidence, mortality of fish and invertebrates, and they saw very little. The question keeps coming up in the Native community, and it needs to be addressed.

Sarah Tsoflias, International Association of Geophysical Contractors (IAGC): Craig is right. We get the question a lot about seismic impacting prey species. I realize it is a different species and a different environment but one of our companies is doing a study offshore in Brazil to look at what the humpbacks are feeding on and we've got before, during and after seismic surveys there specifically looking at the prey of the humpback. We are looking at doing studies, and we'll be happy to share the information. We realize it isn't the same prey you are interested in.

Catherine Berchok – NMML Science Acoustic Surveys
I am here to give an overview of the acoustic programs. Projects include the Beaufort, Chukchi and Bering Seas. In the Beaufort: BOWFEST off of Barrow; in the Chukchi it includes the CHAOZ Chukchi Acoustics, Oceanography and Zooplankton study; and an International Polar Year project with a recorder on the Chukchi plateau; and a project in the Bering Sea where a few of our recorders are picking up beluga and bowheads.

When I refer to acoustics, I am referring to passive acoustics, which means we are listening. The listening devices we use are autonomous Underwater Recorder for Acoustic Listening (AURALS), ecological acoustic recorders (EAR) and sonobuoys. All have similarities in that they all have underwater microphones that pick up sounds from the water. How they differ is in what they do with those sounds after they are picked up. AURALS and EARs store that data on hard drives internally and can be kept down for a year at a time. The con to that is that you can't retrieve the data until you get the unit back and open it up and access the hard drive. We also use sonobuoys. These pick up the signal and send it via radio waves to either the boat or the airplane that is monitoring so they are not entirely autonomous but you did get real time data.

AURALS are big and they go on big, heavy, seafloor moorings. We put all of our own AURALS down for a year at a time. They typically record for ten minutes of every one-half hour, and the frequencies that we use pick up most of the calls of baleen whales, some seal, walrus and beluga whistles. EARs are much smaller. We have two uses for the EARs; we deploy them both on year long moorings, heavy seafloor moorings in the Bering Sea, and we also deploy them short term in the Beaufort Sea on moorings that are hand deployable. Yearlong moorings are limited to recording five minutes on the hour, and we go on the lower end of the frequency band and are mostly just picking up baleen whales and lower end seal, walrus and beluga sounds. The shorter term moorings we deploy for a couple of weeks to a month at a time. These can run continuously, and we record pretty much the full bandwidth of any marine mammal in the area short of the higher end amplifications. Sonobuoys have been mentioned a few times. We've used them primarily in the Bering Sea. They have been deployed from our aerial survey planes and also from the ship itself. They are deployed and an antennae is held up to the surface with a little float, and this antennae sends a signal back to the ship or airplane where the sounds can be monitored and recorded on to a hard drive. They record continuously for one to eight hours. Sonobuoys are a product of the military and were designed to be able to spy on the enemy and we are graciously lucky to receive these from the Navy which really help our efforts. The frequency band range is picking up baleen whales mostly to (unable to hear) marine mammal sounds. There are two very good things about the sonobuoys: 1) they can be deployed in conjunction with visual surveys which require the boat to be continuously moving and 2) some of the sonobuoys, most of the ones that are manufactured today, have the capability of having directional information and actually Greeneridge Sciences developed software to take that directional information off the transmission.

Beaufort Sea: Two modes of acoustic monitoring for the BOWFEST Project, both long term and short term. Long term monitoring is with AURALS at the 100 meter line between Barrow and Cape Halkett, and these stay down for a year at a time. They have been deployed since 2007. We will be turning them around again this year and we will be retrieving them in 2011. There are two types of short term monitoring: AURALS and EARs being deployed. These are deployed in 10-20 meters of water off Barrow and Cape Halkett and they stay in for about a month at a time.

We wanted to include traditional knowledge in the effort, and we collect visual data along with acoustic recordings and localization. In 2008, I went to Barrow to work with Craig George to identify a local that might be interested in being trained on the system. There was some interest but nobody was completely gung ho about it. In winter 2008-2009, we were able to locate a local representative, Frederick Brower who is a whaling captain in Barrow, and once he saw this system and what it could do he got very excited about the project, and he will be continuing this project for us this upcoming year and the following years. He lives in Barrow and he'll be able to go out when the weather is good and he sees a lot of whales. Fred has been trained on the putting the system down, recovering it, taking notes from the field on what's going on and also being able to open up the system and actually being able to refurbish it and put it back down in the water. Two good things about the traditional knowledge: 1) they are making their observations of the whales while this array is down and 2) they have the knowledge of where to put the arrays down as the season progresses.

On September 4, 2009, on the western EAR, we picked up airgun sounds that were above ambient; they were pretty distinct in about 30 feet of water. Our plans for 2010 are to continue the long term recorders (AURALS) on the 100 meter line. Three AURALS were deployed in 2008-2009, and they were lost when we tried to retrieve them in 2009. We will be coming over to Barrow to try to drag for those in 2010 to recapture the equipment.

2007 Results: 2007-2008 deployment used AURALs. It showed the AURALs have oceanographic capabilities to show temperature changes that come in. This slide shows airgun detections on the arrays from August 20 to the first week of October. Starting from western units, at the end of August, there were no airguns detected and then shows later when airguns were detected every day. On the eastern side, airguns were detected right away and continued throughout. We haven't localized where the sounds were coming from.

There was ambient noise on instruments from August through March. We didn't record a full year due to programming. There were much higher levels on the western units versus the eastern unit. We looked at spectral anomalies as well. You can see the noise level at 100,000 hertz is louder in the fall than in the spring due to ice coming in. Looking at presence of bowhead calls on instrument closer to (unable to hear) Canyon to see if calls were present or not from August through March at three-day intervals. The data is not surprising for August to early November, but still calls were present from January through March.

CHAOZ Project: Objectives include: a) monitor baleen whales in lease areas through long term passive acoustic recorder arrays and sonobuoys and shipboard visual observations. b) Ecosystem changes – biophysical moorings, shipboard observations and climate numerical models. In 2010, crews departed Nome August 24 and went into the Wainwright area for 18 days from August 27 through September 13 and then returned to Nome September 16 and Dutch Harbor on September 20. Three five-element passive acoustic arrays will tentatively be deployed. One will be deployed between the Klondike and Burger sites and will also have a TAPS instrument on it. Also, visual observations will be part of this and will be dragging for the three moorings that were lost in the Barrow area.

International Polar Year: We have three AURAL recorders in the high Arctic piggybacked on other people's moorings; two are in the Fram Strait and one on the Chukchi plateau. It has been deployed since 2008 and Kate Stafford has been working on those analyses. So far she has found as natural sources beluga whales, bowheads, ribbon and bearded seals, and anthropogenically, airguns. She reports overall low ambient noise level on this mooring.

Bering Sea work is being conducted in the Bristol Bay oil and gas lease area. We have EARs in that area and sonobuoy deployments. I would like to point out the red dots are four moorings along the 70 meter line in the Bering Sea. This is a data set that has been going on for 16 or 17 years. It may not be deployed this year due to funding. We have been occurring in some way or shape these moorings since 2006. The two I would like to point out are the M8 and M5 moorings, which we do hear bowhead whales and beluga whales on.

Traditional Ecological Knowledge (TEK) Pilot Project: This project is being started to use traditional knowledge to answer a couple of questions. First is to help identify sounds and also to get more use out of long-term recorders. We are providing small, compact, easy to use, hydrophone project kits to local hunters to take out with them and can deploy and record along the time they are noting visually what is happening. Important to us is what's going on in terms of a week before and a week after. Is this the beginning of the ribbon seals moving through? Is it the end? And what else is around? It will be starting in Gambell and Savoonga, and we hope to get more funding to expand the project and distribute these to villages all the way up the north shore.

Questions/Comments:

George Ahmaogak, Ahmaogak Associates: I commend and appreciate your use of traditional knowledge. Oil and gas are using scientific reports that lack traditional knowledge, and they should use traditional knowledge and support it. I see that missing link, and I am critical. You have clear, concise evidence that matches with traditional knowledge. I got two bowhead last fall. Over the years the whales are skittish and erratic. We have to go 30 miles more offshore when there's impact when normally it is four to five miles northeast of Barrow. Because of the impact, we had to go 30 miles offshore, and it's hard to catch and drag it facing the evidence. Did you correlate your data to any of the letters of authorization or IHA permits to that timeframe?

Catherine Berchok, NMFS: We haven't looked at that.

George Ahmaogak, Ahmaogak Associates: I commend you for using traditional knowledge. We want quality scientific reports from these monitoring programs. I see that missing link; clear and concise evidence matching up with traditional knowledge. I am a Barrow whaling captain and last year I got two bowhead whales. Over the years we've seen some of the whales that are skittish and erratic in behaviour that are coming from the east and going to the west during the time we started. Normally we used to go four, maybe five miles off the coastline. Now we have to go 30 miles when there are impacts. You have clear, concise evidence of those airguns going off. Did you correlate your data to any of the letters of authorizations or incidental harassments to that time frame when you picked up those airguns?

Catherine Berchok, NMFS: We have not actually looked at that to see where those sounds are coming from yet?

George Ahmaogak, Ahmaogak Associates: Traditional knowledge is picking this up from our end. It is a hard whale to hunt. It seems like there is a disconnect, although this is a MMS project. From the time you picked up those airguns and the sonobuoys, how long of a time did you take to interpret data? 3 months? 4 months?

Catherine Berchok, NMFS: We haven't fully interpreted the data yet.

George Ahmaogak, Ahmaogak Associates: I know but you said you picked up airgun blast, but how long did you know from when the sonobuoys were put in?

Catherine Berchok, NMFS: Recorded on the moveable ears, and they were down for a couple of weeks, so it was about three weeks later.

George Edwardson, ICAS: I am glad to hear there are ears finally in the ocean. Have you taken or contacted the aerial flights coming through chasing or looking for whales from the air? Do you correlate your information with their data?
Catherine Berchok, NMFS: The BOWFEST will be doing that.
George Edwardson, ICAS: You can mandate who correlates with you right?
Catherine Berchok, NMFS: He works down the hall from me, so that works.

Earl Kingik, Pt. Hope: You got ears out there and buoys. We know there is a difference between the animals and the reaction to us and hearing the sounds we make. I want to ask for opinions from people that know about the sound is important. That frequency receiver on buoy that listens, are there any studies with disturbing the sea mammals out there? As operations have been going on in Prudhoe Bay over the last 20 years, hunters notice how the animals behave. Is there any disturbance being done with the high frequency receivers you are using?
Catherine Berchok, NMFS: Are our instruments having an effect? They don't broadcast any sound...
Earl Kingik, Pt. Hope: The high frequency receiver – does it disturb the other animals because of the sound? They got ears - are you disturbing them?

Robert Suydam, NSB: Earl, are you asking if the receivers, the instruments that are down on the ocean bottom are making sounds?
Earl Kingik, Pt. Hope: Yes, are the receivers making sounds?
Catherine Berchok, NMFS: They aren't making sounds.

Robert Suydam, NSB: I'm interested in the deployment of instruments in Chukchi especially between Klondike and Burger. What are your views on the ability to use the information collected to better understand impacts to calling and call detections relative to industry activity in the Chukchi?
Catherine Berchok, NMFS: The one thing that struck me at the Alaska Marine Science Symposium in January was the reports from the Burger and Klondike sites and how different those two sites were. It seems like there might be a transition between those two and industry is monitoring those areas with their arrays, and we felt that it would be a nice place to actually monitor what's going on between them in this transition zone. It will give us a good idea of what's going on oceanographically.
Robert Suydam, NSB: Are you collaborating with industry at this point to merge data sites?
Catherine Berchok, NMFS: We hope to. We'd like to.

Chuck Monet, MMS: There are a variety of studies from MMS, and I want to point out the studies are inter-related by design. George had commented that we need more aircraft flying. It's not always possible to maximize all elements, but we try to get a balance through a variety of methods. Other studies that bring acoustic, oceanographically data and mammal studies are underway to bring information and to understand the ecosystem. There are two ways to add value to the suite of studies going forth. 1) While investigators are creative and have ideas on how to reach out to other data sets, i.e., tagging movement, they are busy, so I encourage people that have concrete ideas on studies that can interact to formally do so through the annual studies process. Submit a profile and send it through. 2) The Arctic synthesis study to create a funding environment for bringing studies together. The task is to take inventory of available information and using the knowledge, identify the thread in an interdisciplinary way that isn't addressed in a single study. The study goes forward and ends and there currently isn't an opportunity for multi-disciplinary to create high quality peer-review products. The two ideas interact, as there now are ideas to merge studies and data sets and answer questions. Help us think of the questions that we have the capacity to address.

Bill Streever, BP: I think I heard you had recording of bowhead calls in the Beaufort Sea? Where specifically in relation to openings in the ice?
Catherine Berchok, NMFS: I don't know. It was the Unit 2 off Barrow Canyon.
Craig George, NSB: Off and on through the winter, yes.

John (did not identify last name): I am interested in records of bowheads in southeast. There are only ears there; not many eyes in the winter. What was the seasonality of those, and are they common?
Catherine Berchok, NMFS: Yes, they were common, and we're just starting to look at that data.

Ronald Westly: I'm a whaler. I've whaled since I was 9 years old. I was a paddler when I was 12. Up to this day I know the animals that pass by Pt. Hope by season. In the last couple of years we haven't seen a killer whale usually comes through Pt. Hope each season. Last year, there wasn't tomcod. Normally there are tomcod near Pt. Hope, but this year they caught only five a day when it was usually a sack a day before. This is happening in Pt. Hope.

Craig George, NSB: Streever asked my questions. It looks like there is clear evidence of bowheads overwintering near Barrow?
Catherine Berchok, NMFS: It appears so.

Bill Kelly, Center for Regulatory Effectiveness: I heard a lot of references to skittish behavior. Is there agreement on what constitutes skittish behaviour? And, is it possible to identify from aerial surveys and what occurs? What does it look like? Where has it been seen? Near seismic surveys or just by hunters?
Harry Brower, AEWC: Through hunter observations, not part of the aerial surveys or any agreement of the definition of the terms, it's the behaviour of swimming, surfacing movements. Surfacing, just taking a breath at the very surface, with only the snout or blowhole and without the body coming out. It is dangerous for the hunters to approach, and the situation of the animal is uncertain and must be continued to be monitored as it travels and moves. We need to get to the animal to strike and make a sufficient kill. If we approach it in that state, the boat can be capsized very easily. Another is the movement patterns, i.e. moving fairly fast. As hunters, we wait for animals to come by, and if it is moving fast, it is some type of disturbance that has occurred. I hope this is helpful. I can't answer all your questions.

John Richardson, LGL: What it looks like from the air, it's difficult to discern from straight surveys, but when you conduct longer duration observations subject to disturbance, you see the things Harry referred to. They blow once when come to the surface, with the lower part of body at the surface, less conspicuous blow and more difficult to find when they come to the surface at the next time than when in the absence of disturbance.

George ICAS, Barrow: We have heard today about a federal agency trying to balance these studies. I've been talking about this over the past three days because as a people I feed myself from the ocean. We meet the first week of the month year round and as a people, over 70% of our protein comes from the ocean right in the middle of where industry wants to drill. That is my dinner table, and I need the government to take a look at it like I do. Otherwise you are like a cowboy going in there shooting and making noise. You can't do that. Over 70% of my people need that – we are unemployed, uneducated and feed ourselves from the ocean. You are talking about taking food from us. If you make a mistake or make a wrong choice, I want you to be aware of this.

ICE SEAL SURVEYS – Peter Boveng, NMFS

Ice-Associated Seals: NMFS Research and Monitoring. Most of the work I'll talk about is funded through the NMFS budget and is not specifically designed to address open water industrial activities with the exception of the bearded seal works funded by MMS in recognition of the need for information to evaluate and avoid potential impacts on bearded seals.

Why study seals? Seals are a very important nutritional and cultural resource. They are a key component of the Arctic marine ecosystems, and there are looming changes in climate change, sea ice and ocean changes as well as potential impacts from increasing industrial activities. From an agency standpoint, we have to address obligations under the MMPA and the ESA. There is a need for better points of reference to respond to needs and detect changes.

Monitoring and research are areas of expertise during surveys to estimate population abundance, identify trends and distribution. Satellite telemetry is used for study of movements, usage of habitat and foraging behaviour as well as haul out timelines. There are collaborative studies on population genetic structure, health and condition and diet. Recently, work has been driven by the need to respond to petitions under the ESA and listing all four species as threatened or endangered: bearded, ringed, spotted and ribbon seals.

One of the first substantial bits of funding research were surveys in the Chukchi for ringed seals in 1999 and 2000, mostly in coastal fast ice zone but also some transects out as well. The results found an average of about 230,000 ringed seals in the area. The surveys are now ten years old and need to be done again. They were conducted in late May or early June when they are on the ice, and that is the only feasible time to conduct seal surveys when they are conspicuous and on the ice. Bearded seals results from the same time showed much lower densities (less than one individual per square kilometre) as compared to almost twenty per square kilometre for ringed seals. We weren't able to estimate the total number of bearded seals in the survey, and one of the questions is whether that is even an appropriate time of year to get estimates. This slide shows surveys from the U.S.Coast Guard (USCG) in 2007. There is an area southwest of St. Lawrence Island with large concentration of bearded seals in April and May, and large concentrations of spotted and ribbon seals as well. In terms of population estimates based on 2007 surveys, there were 66,800 bearded, 71,200 ribbon, and 127,000 spotted seals in May 2007. What does that mean for activities in the Chukchi? We've put satellite transmitters on ribbon seals tagged in the Bering Sea in May and tracked movements through October with substantial factors showing them moving through Bering Strait, about one quarter , once ice retracts, making their way into the Chukchi and beyond into the Arctic basin. Similar movements of other seal species show that they do eventually travel through this area throughout the season. The point is to draw attention to the very dramatic seasonal movements of the species and make the link between the surveys for population size in the Bering Sea and how it relates to the Chukchi and Beaufort areas. We can't put numbers on this yet but hope to convey the sense that they may be able to contribute more quantitative information on it.

Habitat preferences and seasonal movements of the young-of-the year bearded seals: we tended to not have access to information for this species; they are wary and difficult to tag. There has been progress recently by Kathy Frost and Kotzebue Native Village from a grant received from Fish and Wildlife Service starting studies in 2004 of six to twelve month old seals in this area. Seals were caught and tracked in the fall, which shows they travel extensively.

What about older seals? Summer? Adults are the largest age class and the breeders. Summer is critical for feeding. The ice recedes to deep water. We need to build upon the previous studies by developing the capability to track adult and sub-adult bearded seals. Funding was acquired from MMS. There is a pilot project in Kotzebue to develop a program to capture larger bearded seals.

Elements looked at seasonal movements, habitat selection, foraging and haul-out behaviour in the Chukchi. This will continue in 2010 to tag and track adults. Working with the North Slope Borough, Kotzebue, MMS and NOAA, and will use local hunters to set timing, place and locale to do work and avoid subsistence harvest and activities.

Results: Three larger bearded seals were caught in late June and a transmitter attached to track movements from June 15 through December 2009. By July, they were up into the Chukchi, and some were as far as Prudhoe Bay. They remained in the Chukchi coast area in August with adults further over near Prudhoe. In October ice returns, adults leave, and they move down the coast rapidly by end of November. In December, with ice advancing into the Bering Sea, they were near the ice edge in the vicinity of St. Matthew Island and Norton Sound where they remained since that time. In the last week or so two of the transmitters have now stopped. I want to urge you not to draw conclusions about distribution relative to industry activities—it's a very small sample and needs to be expanded before we start making conclusions about the population as a whole.

In closing: Regarding seasonal distribution movements, the numbers and densities from one area may not apply to another. They are relatively inconspicuous in the water, and this makes it challenging to monitoring and estimating takes. There is an importance of the Bering Strait. From tracking studies you can see a lot of seals and other species going through the area as ice expands and retracts. There are a lot of marine mammal resources going through there in concentrated form in short periods of time and we need to keep this in mind as activities ramp up. There is potential for various impacts if the level of shipping traffic elevates and the risk of accident becomes significant. A state-wide research plan and the need to incorporate information from other studies including acoustics, whale surveys and industry monitoring are important.

Questions/Comments:

Harry Brower, AEWC: Thank you for the presentation. As a hunter, I look at seasonal movements that there are in various animals. We continue to hunt the ringed seals. They don't move around as much; some stay in the area. There is a presence of animals in the Arctic through the season. They don't all move out of the area.

George Edwardson, ICAS: On the tracks you showed for the tagged seal, have you looked at previous studies done before in the tagging of seals without the radio but just tags only? Did you look at those studies when you did your study?

Peter Boveng, NMFS: I don't know if we are aware of every effort that has been done. The earlier studies out of Pt. Lay have been looked at. When we are ready to take our data to do density estimates to indicate importance of locales and times we need to incorporate earlier work. We're aware of radio tagging on ringed seals that has been done and need to include that work in our survey designs, but I'm not certain if we are aware of all tagging results that are out there.

George Edwardson, ICAS: Toward the end of the 1970's, the U.S. Fish and Wildlife were tagging newborn seals ten miles north of the point of Barrow, and it was caught in Northern Labrador. The animal doesn't know international boundaries. We have Pt. Hope, Pt. Lay, Nuiqsut, Barrow and with assistance from the government can show what we take and with your assistance we can help you look at the animals we eat. We know the animals and need help from the government to set up the programs. We are able and capable of doing that, and we are the ideal partners if you want.

Peter Boveng, NMFS: The research project with the ice seal committee has needs for both ongoing and high priority but is currently unfunded. I hope the research plan will help shake lose funds for this.

Chuck Monet, MMS: I wanted to mention access to study results. Because of the Internet, there are new strategies, and you can look at the NMML website and Department of Fish and Game website

where projects are sharing weekly and bi-weekly data dumps and are being sent to people on a regular basis. Look specifically for the poster section over the last few years that address studies talked about today. There were some gaps because some don't have access to website, but MMS Alaska region has posters for everything from Fish and Game movement to oceanography posters. The information is there, so avail yourselves of it.

North Slope Science Initiative Overview

John Goll, MMS: Public Service Announcement
The North Slope Science Initiative (NSSI) and the Alaska Ocean Observing System are two different groups that help in the coordination and collaboration amongst agencies. The NSSI started about seven to eight years ago and was incorporated in the Energy Policy Act of 2005 aimed at trying to ensure coordination among agencies involved in activities on the North Slope. The membership consists of land and ocean management agencies, advisory groups and science technical advisory board. They are regional directors of federal and commissioners from state agencies to ensure government knows what's going on to ensure collaboration and knowledge sharing. The Advisory Board includes: National Weather Service, U.S. Army Reserve Command (USARC), U.S. Department Of Energy, USGS: BLM, MMS, U.S. National Park Service, USFWS, NMFS, Alaska Department of Fish and Game (ADFG), ADNR, ASRC, and NSB. Website: www.northslope.org. We are trying to get information up on projects that are going on and the annual report to congress that shows all the research the various agencies have been doing in collaboration is made available.

The Alaska Ocean Observing System is part of the nationwide Ocean Observing Systems being established around the country. The National Weather Service, onshore, has a lot of observation sites at airports, at other forecast offices, where observations on weather and such are being taken. One of the goals of the Ocean Observing Systems is to do the same thing in the ocean and even more beyond that in regards to observations. In Alaska, we have a larger task because of 30,000+ miles of coast line. Members include: the Alaska Sea Life Center, North Pacific Research Board, NOAA AK Fisheries, Prince William Sound Science Center, ADFG, USARC, USGS, NEWS, University of Alaska Fairbanks, Sea Grant, AK Native Science Consortium, MMS, BASC, UAF School of Fisheries, USCG, Alaska Department of Environmental Conservation, ADNR, Marine Exchange of Alaska, NOAA-OAR,. etc. Projects include data clearinghouse and web access (www.aoos.org), Prince William Sound pilot, harbours around the state, a little bit in Cook Inlet and more so in the Arctic. Challenges to both include areas to cover, limited funding for the entities, relying on partner agencies and collaboration.

Questions/Comments:
Robert Suydam, NSB: I'm curious on the perspective of how these can help with offshore oil and gas and related issues.
John Goll, MMS: The Alaska Ocean Observing System hears about the information that is needed. The goal is to get observing networks around the country and state. Unless we get infusion of money, we will rely on agencies to do the work. Both groups recognize oil and gas activities in the Arctic, cruise ships, marine traffic and industry and want to look at all of this more holistically.

Darcy Dugan, Alaska Ocean Observing System: A project we're starting in the next month to pull together a map that has all the assets including oil companies, NOAA, the Universities, National Science Foundation, other researchers, etc. That will show where moorings and buoys are, especially looking at this summer to make sure we have a more integrated approach to data gathering.

John Goll, MMS: This has been a great need, knowing who all is doing what.

George Edwardson, ICAS: We hold the sovereignty in the Arctic as a people and I can't understand why these organizations do not have us as members? We hold the sovereignty and our jurisdiction goes to the North Pole as per our constitution. I don't have a 200 mile limit like the U.S. has; I have historical ownership. The federal government comes and check with us annually, so does North American Aerospace Defense Command to see if we see if we need something and all the other federal agencies ignore us. We need to be members of the organizations whether federal or state, and you have to have us there.
John Goll, MMS: You would be welcome to attend. NSB is represented but it's a government agency.

Bill Streever, BP: You emphasized the agency role and value of coordination and funders, but the products from the papers are valuable to me that manage smaller research monies and helps guide my thinking on how we spend money and research requirements and would be useful for academics and independent funders and contributors to Arctic research.
John Goll, MMS: I believe those are on the NSSI website.

Shawnna Larson, Village of Port Graham and Chickaloon and I work for Pacific Environment: I have a question about federally recognized tribes having a seat at the table. If that's not taking place, how are protocols and protections being put in place as traditional knowledge is shared to ensure that the traditional knowledge isn't used against the communities in terms of studies happening? A lot of tribal people are offering forward traditional knowledge, giving information on where the fish are, what's coming and what's not coming and the scientist can document it. What safe guards are being put in place so if the studies come out in contradiction of traditional knowledge, how is their knowledge being protected and that it won't be used against them?
John Goll, MMS: The studies are subject to peer review, and the science should speak for itself. If a tribe has a concern about how data is used, the discussion should happen with the researchers but if it gets in to a report it has to be public and the science. If it is reported, the science goes where the science will go.
Dee Williams, MMS: I will have something to say about this at the end of my presentation as well.

Minerals Management Service Science Update

Dee Williams, MMS
62 projects are underway right now, and I've heard about the keystone projects regarding marine mammals. I'm going to emphasize updates and focus on announcements. I invite you to go to www.mms.gov/Alaska/css/index.htm to see what projects are currently underway. There are a variety of environment studies in Alaska with links to databases or documents of interests to monitor programs reports and ongoing studies.

New Technical Reports from continuation of Artic Nearshore Impact Monitoring In Development Area (cANIMIDA): Summary reports of a seven-year program. Principle investigators prepared summary reports analyzing multiple years of data including two social science reports, subsistence mapping of Nuiqsut, Kaktovik and Barrow and traditional knowledge regarding bowhead in the Chukchi Sea and will be available via web shortly.

Project Data Dissemination:

- cANIMIDA – document/data website: www.duxbury.battelle.org/cANIMIDA

- MMS data web portal is forthcoming over the next year
- Geographic information network of Alaska: www.gina.alaska.edu/projects/nssi-catalog
- Project browsers (Arctic Observing Network [AON]/Sustaining Arctic Observing Networks [SAON]) AON project browser by national science foundation and SAON project browser by Arctic Counsel to bring together information in one convenient location.

Keystone marine mammal projects presented at the Alaska Marine Science Symposium:

- NMFS – aerial surveys, whale feeding variability, passive acoustic detection and monitoring, bearded seals with Native Village of Kotzebue
- ADFG – bowhead tagging with AEWC; walrus tagging with the Eskimo Whaling Commission
- USGS – polar bear demography to research the stressors related with the diminishing ice to collect data on health and nutrition

This slide shows examples of data on previously tagged polar bear movements done by the University of Alberta, Canada, dated January 2009 for 2007 and 2008 collars.

Keystone oceanographic projects:

- Mesoscale meteorology for Beaufort and Chukchi Sea by the University of Alaska Fairbanks to collect weather and satellite data over 30 years and combine into one comprehensive model: www.mms-meso.gi.alaska.edu
- Surface Current Circulation High Frequency Radar Mapping in the Chukchi, Phase II (Phase I was in the Beaufort).
- Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Chukchi and Beaufort Seas (ice extended thickness and focus on Icy Cape and Point South
- Ecosystem Observations in the Chukchi Sea – field work should be getting away shortly.

Oil spill studies:

- Ice-ocean modelling – comprehensive modelling in ice diminished Arctic
- Empirical weathering properties of oil in snow and ice—lab experiments on four crude types
- Updates to Fault Tree Approach of Oil Spill Occurrence estimators—oil spill occurrence data and geo-hazard data
- Oil spill response

Keystone Fish Projects

- Beaufort Sea Marine Fish Pilot Survey
- Demersal Fishes in the Chukchi Sea
- Snow Crab Population Disturbance Impacts

Social Systems

- Impact assessment for Cross Island whaling activities
- COMIDA – impact monitoring for offshore subsistence hunting – the idea is to essentially extend model for Cross Island hunters into the Chukchi Sea using multiple season and data. The Chukchi starts in Pt. Lay and Wainwright to look at bowhead, beluga, walrus, and seal. GPS tracking units to hunters for several species over time.
- Subsistence Sharing Networks: A project to collect information with the focus on sharing network system and how sensitive the network is by activities. Data shared to diet and nutrition and well-being.
- Aggregate Effects Research in the Vicinity of Nuiqsut – how successful are mitigation strategies in both federal and state projects from experience of the village?

2011 projects:

- Updates to fault tree for oil spill occurrence estimators
- Synthesis reports – marine mammal/Phys O
- Arctic Whale Distribution Monitoring (extension)
- Hanna Shoal Ecosystem
- Dist. of Fish, Crab, and Lower Trophic Communities in the Chukchi
- cANIMIDA III to expand further east and include Camden Bay

Questions/Comments:

George Edwardson, ICAS: You had map of where to monitor from Pt. Lay and Wainwright – if you can bring that up I will show you other communities to do. When looking at lease sale area, storms go west to northwest. Storm surge that 48 hours and will reach Barrow – that should be a critical monitoring site because of storm surges. Another village from prevailing currents is Pt. Hope. Those communities need to be included on subsistence impact monitoring.
Dee Williams, MMS: This is the initial part of the project closest to lease sale areas and how it was prioritized. The intention is to expand the project to both Barrow and Pt Hope.

George Ahmaogak, Ahmaogak Associates: For those who haven't gone to the website, I have numerous times. I check them against traditional knowledge, confidence report and peer review. Years ago MMS did risk of oil spills – I didn't see anything on the oil spill risk models. Are you still continuing and updating that on Arctic conditions or is it out of the environmental studies? The fate and movement is important, but statistics and probabilities are important – is that being continued?
Dee Williams, MMS: Yes, we continue with that. In 2002, I believe, we moved to the fault tree approach to understand risk and that is still the primary method of getting at statistical estimation of risk of oil spill. I tried to show that it is time to update the update, and it is in our plans for 2011.
John Goll, MMS: It is the Berker model that incorporates Arctic conditions in the fault tree that Dee is referring to.

(Speaker did not identify themself): This question is relative to fish sampling. A lot of the studies that have been done provide a great amount of information on the life history of invertebrates and vertebrate fishes. I'm curious if the future program will get to estimates on abundance and density of fishes on the scale that NMFS does in its fisheries assessment in the Chukchi Sea and elsewhere. It doesn't seem like we get a real handle on abundance, distribution and density of Arctic cod, saffron cod, and the major prey species for marine mammals. I am narrowing it down to fishes. Is that on the drawing board for the near future? We need to understand what the prey species resources are.
Dee Williams, MMS: The sacrifice has been fish data. It has been collected but is not as driven by stakeholder interest as marine mammals. The recent prioritization of fisheries in the Arctic is meant to demonstrate that we intend to rectify the situation. This project was first out of the door, a pilot survey, for the western Beaufort and it is a more systematic approach to get important density and abundance information you describe. We have a central Beaufort project getting underway this month and an award is going to be made to University of Alaska to conduct a central Beaufort survey and then follow with an eastern Beaufort.

John Bengtson, NMFS: I can add to what Dee is saying. In addition to the fish studies that MMS is funding, NMFS has an interest in extending the surveys they do in to the Bering Sea and maybe up in to the Chukchi Sea. There is a clear interest in doing that, and it is in the early planning stages.

Jerry _____(unable to hear), (unable to hear) Consulting: Could you shed a little bit of light on the Hanna Shoals ecosystem study, when it might occur and what it might involve?

Dee Williams, MMS: That is in our prospective list for new starts in 2011, and we have to meet with scientific committee that advises us. The thought is we need to better understand how to explain the biological richness of that area and to evaluate community (unable to hear) against water column conditions.

Chris Krenz, Oceana: I have a follow-up on John's questions. I am curious in your decisions about what to fund and is it driven by information gaps to fill or is it guided more by a comprehensive research plan? In particular, I'm interested in integrated research on multiple variables at the same time such as planktonic communities, the benthos, food web sort of type studies and how that integrated research fits into your priorities as those are particularly helpful in elucidating some of the processes that help drive the structure and functioning of the ecosystem and are important for us to know.
Dee Williams, MMS: It is a balance between long term comprehensive ecosystem based needs and the fact we're a mission oriented operation that has to deal with immediate, short term information needs and demands. The general disposition is to develop a long term vision while covering necessary bases that are lacking in information.

Dee Williams, MMS: In regards to George's question about BWASP, he posed the question about adding a chase plan that might enhance detection rate or improve observations. Those questions are entirely welcome. We think about ways to adapt techniques and methodology to new technology available and conditions and so George, you should know that's not errant to our thinking about how to improve the methods and get outcomes. We are reviewing techniques, and it is always subject to revision.

Dee Williams, MMS: The other question about how to establish a safe haven for communities to share traditional knowledge? It is a tough question. Once information merges, you can't control where it goes. It is a fact of reality. It is in their interest to participate in MMS projects brought into their communities. We sent teams into the community to explain the project and discuss in detail whether the community wanted to participate in them and the outcome was success. It was in their interest to document the richness of subsistence sharing, hunting tracks and other things. Short of the given risk, we make every effort to protect data in ways we can with confidentiality of the source or promising and ensuring communities can review deliverables before finalized. It isn't always experienced, but it is there.

Earl Kingik, Pt. Hope: 2011 projects—very good. Are you going to be working with regional tribes? Yes or no?
Dee Williams, MMS: Generally what triggers engagement with local communities is if it requires participation to collect data; any social project triggers that need. The synthesis report has nothing to compel the project principal investigator to solicit community input on these, but it is welcome. It would be proactive to reach out on these types of projects because this data exists. It is not a fresh data effort. The BOWFEST data making contributions to the project are already inside the data collection effort and project. To the degree that the institutional arrangements exists will be perpetuated in this synthesis report.

ConocoPhillips/Shell Chukchi Sea Environmental Studies Program Overview

Robert Day, Environmental Research & Services & Caryn L. Rea, ConocoPhillips Alaska Inc
Caryn Rea, ConocoPhillips: We've been asked to present data collected on a baseline studies program being conducted for the past two years. This program is not an IHA requirement. You have heard about the acoustic portion, but we have augmented information to include not only marine mammals but prey species as well. As relates to traditional ecological knowledge...we have travelled to villages a couple of times a year and met with community members, and our plan is to incorporate their information into reports as well. We thank Shell who has helped fund the project for the last few years and welcome StatOil's participation in the upcoming season.

Bob Day: The scientific team would like to thank ConocoPhillips and Shell for funding the joint study as well as several other people and organizations. The objective was to collect information in order to understand the Chukchi environment in support of exploration permitting by building on historical science data collected in the area, using an ecosystem approach to baseline data acquisition and using the data to assess potential adverse impacts from oil and gas activities.

Ecosystem Approach – components of study include: 1) marine mammals, 2) seabirds, 3) fisheries, 4) biological oceanography (benthic invertebrates and plankton ecology), 5) physical oceanography (currents, temperature and conductivity), 6) hydro acoustics (acoustic readings of vocalizing marine mammals and prospect specific and regional scale), 7) two sets of upward looking sonar buoys/Acoustic Doppler Current Profiler, 8) Metocean buoys, 9) metals and hydrocarbons in sediment and biota, and 9) ambient air monitoring (two stations in Wainwright).

Ecosystems and Potential Prey: There are two study areas, Klondike and Burger, northwest of Barrow. There will be three research crews in the year with a variety of disciplines at 20-30 days on each cruise collecting a variety of information including physical oceanography, nutrients and zooplankton, benthic, chemistry, fisheries, seabirds and marine mammals. We deploy acoustic moorings in late July and retrieve in October before the cruises. Study areas 30 x 30 nautical miles at Klondike we focus on the interest for oil and gas development within Klondike and Burger. Five rows by five stations each with samples taken from each – a subset of all the odd stations are sampled for the fish, benthic and baseline chemistry. Additional benthic and chemistry have a series of random stations for a total of 25 each to get better statistical information. Bird and mammal survey lines will start at Klondike and go 30 miles out, and move over two mile intervals. Secondary surveys are one mile in between. We try to do all 16 primary lines and then, as time permits, secondary lines in the areas of greatest interest. Our staging is out of Wainwright, and we put in a series of transect survey lines, and, when the ship goes in or out, we try to run the lines to collect additional information. The third type of sampling is the hydro-acoustic sampling. This is a set of moorings, 12 at Klondike centred in the area of greatest interest. So, again, there is a very intensive sampling in a small area.

Results: Physics rule! Starting in the Bering Sea there is a northward flow of oceanic water on the western side and coastal water on the eastern side. This flows through the Bering Strait. It flows northward because the sea level is higher in Bering Strait than in the Chukchi. The currents transport heat, carbon and nutrients from the Bering Sea and the strongly affect production in the Chukchi and the Arctic Ocean. The Chukchi has alternating highs and lows in the region which makes some waters divert into the Alaska coastal current. There are some low lying areas where the water is stagnant in the area of two shoals. Looking at surface versus subsurface is that the surface water flows in opposition to the current. Subsurface currents oppose mean winds. It is swiftest in canyons/channels and weakest in shallow areas. Currents also affect ice retreat and transport heat and affects water. Generally speaking, ice retreats earliest in channels and later over shoals. This

has implications for marine mammals who are trying to find remnant ice. There is much variability among years. Wind direction and magnitude also affect ice. Wind direction in July 2008 was different from 2007 and 2009. In July 2007 and 2009 winds were blowing more westward and were able to move the ice out and were melted by warmer water.

What does the area look like oceanographically? Results from 2008 showed that water is getting warmer through time; winter water is gradually displaced north eastward through time. Melt water at Hanna Shoals is light water sitting over denser water is always at the surface, while Bering Sea water, which is warmer, penetrates north eastward with time and the flow increases. There can be a great difference of inter annual variability. In 2008, the water is between one and four degrees centigrade at the surface, but in 2007 it was between eight and twelve degrees centigrade.

Preliminary 2009 data show there are dramatic difference between years, but melted water and winter water barely occurred in the northeast corner at Burger, and the bulk of the area was warmer Bering Sea water. It looks like the current was flowing so fast it overlaid most study areas.

Planktonic Communities: There are three main groups: copepods, meroplankton and larvaceans. The remainder are copepod nauplii, chaetognaths, jellies and euphausiids.

Is there a difference in the area in terms of the environment? In terms of large copepods, they were found only in Klondike, while shell species predominated in the Burger area. Many species are found in both areas. They typically dominated in one study area or the other. There is an important part of the zooplankton: temporal variation. Medusae (jellies) reside in primarily oceanic water. These communities are changing constantly with seasonal succession, making characterizing plankton communities difficult. To do so, we looked for patterns among samples and seasons. At Burger they clustered differently than Klondike, indicating two distinct environments between the two prospects.Inter annual variability, in 2008 there was late ice retreat and low sea surface temperatures resulting in little food for higher pelagic trophic levels. In 2009, with early ice retreat and high sea surface temperatures there was abundant food for higher pelagic trophic levels.

Benthic System: The nutrient rich water from the Bearing Sea is critical to the econology of the Chukchi. There is much warmer water at Klondike than Burger, and with less saline. There are differences in the crustaceans in the area; they were more common in Burger. The same species were found in the same area and across all taxa. Infauna were more abundant at Burger. Diversity was similar between areas with difference related environmental gradients. The point of mean abundance was four times at Burger and two times biomass for bottom feeding mammals.

Epibenthos: We started in 2009. The Ophiura sarsi is the dominate epifaunal species in both areas. Another important thing in Burger is the anthropods represent 13% of the biomass in Burger; there are a lot of anthropods in Burger that are not there in Klondike. The composition of major taxon categories is similar between sites, but Burger has greater biomass. The biomass of upper fauna was three times than Klondike.

Benthic Hot Spot: Back in 1985, Howard Feder did a study of benthic sampling stations, and he had what he called a benthic hot spot in the north eastern Chukchi Sea near the head of Barrow Canyon. There was an analysis done including our data from 2008, and what you see is the addition of the Burger data extends this hot area clear up on to Hanna Shoals, whereas the Klondike area is much lower at the bottom end of the scale and more closely related to the central channel.

Data Collection: We had two marine mammologists alternating every four hours on all daylight hours. The species listed were the main cast of characters for the area. This is a plot of the total

number of marine mammals seen by year by study area and by another area running between sampling areas and Wainwright. The overall abundance of marine mammals is higher in 2008 than 2009 we think due to the ice persisting quite late in to the open water season. Total marine mammals sighted were approximately 2,100 in 2008 and just under 600 in 2009. Pinnipeds represented about 90% of total marine mammal community, differing dramatically between years probably again due to the difference in ice. Seals were the dominant group with about 55% and walruses were 45%. Many fewer seals were seen in 2009 with walruses becoming the more dominate marine mammal sighted. Gray whales were the most common cetacean in 2008 with 18 sightings; there were two bowheads in Burger in October 2008. Seven porpoises were sighted in Klondike. There were nine polar bears sighted at Burger in 2008.

This map shows the seal distribution in 2008. Some were near shore going in and out of Wainwright. Walrus were dominant in and around Burger, and a few were seen during transits in and out, although some were sighted in Klondike.

In 2008, Klondike was pelagic dominated, and Burger was benthic dominated system. Preliminary data in 2009 suggested in effect there is a pelagic environment overlying both study areas. So we would predict that pelagically feeding seals would differ in relative abundance between study areas in 2008 but not in 2009.

Think about the benthic feeding pinnipeds. I would predict that they would differ in abundance between study areas in both years, and they would prefer Burger because there is considerably more infauna biomass, and there is more epifauna biomass than in Klondike.

Ice did affect overall numbers. The point is that Hanna Shoal is an important feeding area for benthic feeding organisms.

In conclusion, I want to point out again that the study area is not spatially uniform; especially in 2008, there was this front between the two areas; there are differences in water masses, in zooplankton and in benthic communities, but some inter annual differences.

Most marine mammals species found in Chukchi also occurred in one or both of study areas. Remnant sea ice affected the number of seals, bears and walruses. Seals were more abundant in the 2008 cruise one with lower, similar numbers in cruises two and three. Most gray whales were east of Klondike and Burger survey areas. There was a small number of other cetacean species occurring sporadically in survey areas, with some bowheads migrate through or near both study areas.

My hypotheses of greater numbers of benthically-feeding walrus and bearded seals at Burger and greater number of pelagically feeding seals in Klondike during open-water period reflecting environ difference. Inter annual variability is high.

Questions/Comments:

George Edwardson, ICAS: I'm sure glad you took a good look. This is what you learned on two years of work; two cruises a year for two years. You've taken a good peek and now let's take a look to see what happens as the years, the season goes on. If you talk baseline, you need to look at a good 10 to 15 years of study, not four boat rides. Let's see what the ecosystem is doing. There's a lot of animals and fish you missed. Let's go find them and lay the baseline out during the ESA, MMPA and Migratory Bird Act. Let's finish it.

Robert Day, Environmental Research: We're excited. It is hard to get scientists involved in such a small area and by luck of the draw where the boxes were, we were able to find out a lot of information. We're excited about next year and the future to look more.

(Unidentified Speaker): On the marine mammals, do you have a feel for what portions of the sightings were unidentified? It looks to be roughly about 30%.
Robert Day, Environmental Research: Unidentified seals, you mean?
(Unidentified Speaker): And cetaceans.
Robert Day, Environmental Research: Yeah.

George Noongwook, St. Lawrence Island: Thanks for the presentation. Coming from Bering Strait on St. Lawrence Island, when talking about variances between each year it's different and every once in a while we experience winds coming from one direction every day the whole winter and that happened in 2008. Constant winds from the northeast daily so consequently, the wind pushed all that ice south of St. Lawrence Island, way south. North of St. Lawrence the ice was jumbled and thicker. Our elders were telling us we're going to have a poor spring hunt and when time for ice to retreat when currents started flowing north, nothing held the ice when it was time to retreat, and it went out so fast, and we did have a poor spring hunting season. The one hypothesis needs to work on as a community is to test against what is being learned through ice modelling, experts, etc
Robert Day, Environmental Research: Interesting point
George Noongwook, St. Lawrence Island: Marine mammals are ice driven. When it's spring or during fall when ice is moving fast, a lot of marine mammals are ahead of the ice moving in mass—walrus, seals, whales, sea birds—it is different when the ice is retreating the marine mammals are travelling in mass behind the ice trying to keep up with it.

Chris Krenz, Oceana: The information should be looked at as a model to see what information is needed and research in the region and thing about integrated research program by NMFS and MMS. Shell mentioned they were interested in study how important the areas in which they work. Increasing other areas to get a broader perspective---is this an important area in the Chukchi. Another point that Shell raised is they wanted to improve the information out there and uncertainty, and so I want to ask will the data be publicly available as it will help satisfy concerns?
Caryn Rea, Conoco Phillips: Thanks for the comment and question. I have spoken with Jeff Short – all the reports that are prepared are distributed across a wide network of agencies, communities and if you are interested in being on the distribution list, let us know, and we will ensure you get copies of reports. We will work with NMFS as work on EIS to help support data.
Chris Krenz, Oceana: Will the raw data be available?
Caryn Rea, Conoco Phillips: No, it will not be available.

Robert Suydam, NSB: Thanks for the presentation, for the work, and thanks to industry for doing a system study. What is happening at Klondike and Burger and BOWFEST are good models for system studies and help understand what is changing. Bob, when showing the marine mammals, you said the usual cast of characters – one that wasn't there was belugas – sightings are difficult in October. Were there no surveys at Klondike in October?
Caryn Rea, Conoco Phillips: That is correct.
Robert Suydam, NSB: Any idea what the dense acoustic recorders showed in terms of bowheads and belugas in particular? It seems like a lot more of those species should have been seen.
Caryn Rea, Conoco Phillips: Chris can talk about the 2008 information and Dave Hannay can brief on the 2009 observations.
Chris Krenz, Oceana: So belugas were sparsely detected on both, more at Klondike. Walrus were also detected throughout surveys on both places. Bowheads were seen every day at Burger and 60-70% of days at Klondike. Belugas were rare, but they did occur but there was no clustering; they were just scattered out there.
Caryn Rea, Conoco Phillips: Bowheads were detected daily at Burger?

Chris Krenz, Oceana: Yes, less so at Klondike. When we attempted to answer the question of presence/absence and what are they doing, are they moving through or are they resident... Well, there is clearly east to west movement through the area because you do get tracks of the animals moving through. And the other question was can you make some minimum estimate of the number of animals there were? It's tough, but if you look at the number of individual tracks, it looks like on an hourly basis you can get six to ten animals per hour. One interesting comparison is to look at the number of calls we got are much less than numbers over in the Beaufort. Trying to translate to a density estimate is going to be a challenge. I think we need to do this across the Beaufort and Chukchi areas to look at these as systems.
Robert Day, Environmental Research: I saw a map of location information on belugas, and they were common around the Barrow Canyon around the northern edge of Hanna Shoals, but the map I saw, there were few sight records in our study area and I thought, are they generalists? Are they specialists? Why would they not be out here? I don't have a real good answer.
Chris Krenz, Oceana: Speaking on behalf of biostatisticians, there are tremendous numbers of detections that we can't identify. We think they are marine mammals because they are loud and can be detected over many miles, but I have conversations with others trying to identify the animals. There are really strange sounds out there.

Michael Macrander, Shell: I think we are excited about the learnings from the programs. I think the program design is unique and provided an intensity of sampling that wouldn't occur in a more dispersed sampling program. We should recognize that MMS is funding programs out there on a lease area wide basis to truth some of the patterns we think we're seeing. Adding components to those programs to cover all the trophic levels is going to be an important step.

George Ahmaogak, Ahmaogak Associates: I keep saying traditional knowledge is important again and in more baseline studies that could offer a lot of assistance and that the Department of Wildlife is contacted to collaborate with traditional knowledge. It has been done with the hunters and advice given to conduct baseline research is important. Public meetings I've attended in 1977 and community keeps requesting bottom line, baseline information is needed before oil and gas production takes place especially in outer continental shelf areas. Scoping meeting—get the baseline environmental data. I commend Shell and ConocoPhillips for conducting this, but we went through a lot of meeting for plan of cooperation and CAA to make this happen. It took a lot of effort to understand this and allow them to do that research. Interaction with community is needed first and foremost. The community wasn't part of the design process – there's a brick wall, and we need to change this. If scope of design is needed, get a hold of the community to help out. They may have information you can't see or tap into to make your report more robust. A good example of baseline research is for industry to understand the current and commend you to understand the current thing. The elders have told us never cross any of those currents at that particular time, especially when there is diversity of marine mammals that are out there. There is definitely a need for baseline data for exploration and industry, and that is what the community needs. I think for you to measure the impact to reflect the necessary changes to take over time, we'll be watching what happens in the face of exploratory, seismic, production activities, etc. When there was that accident in Prince William Sound with the Exxon Valdez, they didn't have the baseline data of the impact of the oil spill.

Cross Island Study: Incorporation of Traditional Knowledge into Mitigating Effects of Offshore Oil and Gas Activities

Michael Galginaitis – I don't consider this a real traditional knowledge study in the same sense as it is commonly used. I do rely on local experts in Nuiqsut. The distinction between local and traditional knowledge is fine at best. Thanks to the Nuiqsut whalers and captains association and AEWC. It has been funded since 2005, with industry helping fund in recent years.

Nuiqsut whalers have to travel to the ocean. Depending upon the level of the river, they will take the short way. If it is shallow, they have to take the long route. They don't go out of the Barrier Island unless conditions are very good. The short way is 92 miles, and the long way is 101-102 miles from Nuiqsut to Cross Island. The island is just a low, sandy island. There are cabins on the low and high parts of Cross Island. They generally whale to the north or northeast of the island. There were 11 boats out there in 2009; the norm is usually two-boat crews in fibreglass and aluminium boats. It wasn't a success or failure; basically just frustrating. Long at 20 days with relatively few sightings – used three strikes and took two whales. Saw few whales when they went out – the sighting conditions poor due to swells. They thought there were few whales in the area when they were out there. I was aware of four sightings when they went out. In 2009, there was a recalibration after the first several days. They only reported things they were relatively sure of. They also encountered more barge vessel activities in 2009, or at least reported more. Nuiqsut was re-founded in 1973 so documentation began at that time when one whale was taken. Success was relatively poor in the 1980s with few whales taken. In late 1990s to present, success has been relatively regular. Of four strikes documented by this research, they used three of those strikes per records taken from AEWC records quite a few years ago. 2009, no ice, swells, difficult sighting conditions, whales relatively distant. Most of whales are taken northeast of Cross Island although there have been exceptions throughout the years of documentation dependent upon conditions.

This graph shows a summary of the season. The red bars are where both were looking for whales, triangles are strikes. Factors included barometric pressure and wind speed factors. Travel at 10 miles per hour when looking for whales. There was only one period of really high winds over an extended period of time; from September 7-11 when east wind was high. Whalers remarked that the wind was always shifting, which is unusual. Shifting winds tend to be the period when looking for whales is feasible but preferable. After the wind shifts, whalers took opportunity to go out. One main methodology is to give a GPS unit to each boat that goes out (a slide displaying tracks and whale sightings were displayed). They looked in the same areas most of the times to find whales – some crews prefer different areas, but all crews will go into an area to see whales. This was a much denser pattern than in previous years. Tracks were closer together. That's partly because in 2009 there was a total of 109 separate boat trips. The previous high number was 60 or so, so there was a much higher effort in 2009. In 2008, that was the most concentrated track pattern for the whole project period. In 2009, the tracks were almost four times that of the prior year. In 2009, the whalers had to travel almost as far as they ever had to harvest whales.

'Boat hours per strike' is a measure of effort by unit per catch (catch defined as a strike rather than a landed whale). What it shows is that in 2009 there were 251 hours per strike versus in 2007/2008 you had 31 and 40 hours, same as in 2003. Other years varied between the two, except for 2005 which was the bad ice year when they only took one. You can see that these pretty much correlate with further distance gone (that boats go from Cross Island). The further you go, the longer it takes unless you are at high speed. The length of trip (61.6 in 2009) is in the typical or high range. Again, for the most economical years, whales are found much closer. The 2009 season was 20 days. The most efficient seasons tend to be about 13 or 14 days. 2003 was about 20, but they had a lot more

weather days in that season. What this is saying is that whalers had to devote more effort to the 2009 season.

BP's acoustical information seemed to indicate there were relatively few calls from the start in late August to the 13th or 14th when there was a spike and then the rapid decline until late in the month. It shows the total calls at the one consistent (form year to year) station had a typical number of calls but seemed to be much lower in 2007 and 2008 than in 2009, which can be an indicator for lower numbers.

BP call localizations were plotted on this map overlaid with whale sightings. [Several slides were shown showing daily plotting.]

Whaler encounters with vessels in 2009: there were five reported incidents of vessel encounters; four were not covered by CAA, they were not industry vessels. Two commercial barges, one was a private sail boat, and one was an unidentified barge or cruise ship. Localizations were plotted against where whalers reported seeing a whale anytime throughout the season. Vessel traffic is occurring where whalers are seeing and looking for whales, and this is a concern.

Whalers characterized the 2009 season as the whales being skittish, same as in 2001 and to a lesser extent in 2002. Most whales were travelling fast, surfaced one time, breathed once, and didn't come up far, staying somewhat submerged. Really didn't blow; they didn't see many blows at all. Some described whales who would come up and turn sideways and sort of blow sideways so the whale wasn't real visible high up. At the same time, when they saw feeding whales and seeing red streaks in the water or "whale food." They felt they were that many whales and most were behaving strangely. They did not blame it on any one factor. Some thought barge traffic may have been a factor, and others thought there were relatively few whales out there. The main point is that vessel traffic is a key concern and is something that may need to be made part of the CAA or there may need to be some type of tracking of vessel traffic, and it should be a primary concern. The skittish behaviour is a factor whalers see, and there is variability from year to year. One of the most important factors for Cross Island whalers is how far the whales are to Cross Island even though weather wasn't necessarily good. In 2009, they didn't find them close and they weren't all that successful.

Questions/Comments:

John Goll, MMS: The barges, what direction were they going?

Mike Galganitis, Applied Socio-cultural Research (ASR): East to west, going towards Barrow.

Harry Brower, AEWC: Sharing the information is just a glimpse of information. Once an animal is taken (unable to hear) is bringing the harvest home and is a lot of work on the part of the community. It is a big deal to see the effort going into a hunt – it's not taken lightly. It brings out joy when a hunt is successful and depression when there is impact caused by other activities and not knowing where to turn to seek help. I share this with you because these are some of the things I have to deal with this as part of the AEWC and that interaction sometimes is a bit difficult. It has to be addressed in other communities where other activities occur as well, for instance in the Chukchi Sea. It is somehow going to grow into that setting. It may not be visible at the beginning because there isn't a lot of interaction depending on the success of the hunt in the spring. We have good years and bad years because of conditions we're confronted with. In a bad year you are expecting to conduct your business as usual. I think there's going to be a means of... times of slow period for an opportunity for the community to conduct this hunt to make up for the losses in the spring.

Mike Galganitis, ASR: Thanks Harry. The report has more detail on why it is focused on Cross Island and why activity throughout the year isn't discussed in depth. But you are right, it is a year-round activity and thought about all year and the real focus of the year.

Brad Smith, NMFS: I think we, as managers and administrators, have a keen interest in the interest of skittish whales. It is still elusive – I encourage you to get as much information as possible to describe it, and I wonder if the hunters can provide additional information. Is it year to year? Is it more pronounced in near shore water or shallower water? Or a normal flight reaction in the course of pursuit? Any additional information especially linking it to the crossing of vessels would be helpful. We need to issue IHA that doesn't interfere with subsistence and this seems to defy quantitative measures. If you can help us narrow in closer, we could address it. We get the reports and we're frustrated by it.
Mike Galganitis, ASR: The thought occurred to me that 2009 was a skittish year. 2008 was not. 2007 (I have to look at my notes), but my impression is that it wasn't terribly skittish. Remember in 2007 and 2008 aerial surveys saw feeding bowheads where whalers typically take their whales. In 2009, the Nuiqsut whalers say they saw whales feeding and they saw some food in that area. The whales seemed to be travelling through and the whalers said they were going fast. They only saw them once and then they went down. Skittish could be related to how long they stay in the area or where they going or whether they are feeding or not or how fast they are going. I will try to nail down a bit more.

Michael Macrander, Shell: A tribute to the whalers that they are participating in this. I don't want to put too fine a point on this and look like the industry hack in the room, I wanted to point out that 2007 and 2008 were active seismic activity in closer proximity in Cross Island and somewhat shallow site hazard work that proceeded shut down work and 2008 seismic work being done by Shell. A commendation to the effectiveness of CAA that industry and whalers can work together.

Matt Grund, JASCO Applied Sciences: The map where you overlaid BP acoustic and whaler local sightings was interesting. Do the whalers get that information?
Mike Galganitis, ASR: They will be. It is the first year I've done that, and the whalers will see that. They will probably also be frustrated when they see the peak on the 14th, and they stopped on the 13th.

George Edwardson, ICAS: Thank you for showing us. People mentioned about whales being skittish; when you look at the ESA if there are any right whales in there is a violation of the ESA has occurred before the whales got there. It is the government's responsibility to find out who caused it – it could be from offshore drilling, it could be barges. When we violate the ESA you lock us up real quick. Thanks for the presentation.
Mike Galganitis, ASR: Nuisqut whalers do say they have seen right whales but not when I was on Cross Island, and they don't specify the years, it is not a specific observation.

Traditional Knowledge Science Overview

Harry Brower and John Goodwin

[John Goodwin, ISC Chairman]: I am happy to hear that traditional knowledge is involved with the science. I'd like to acknowledge the indigenous people who passed this information down for years and for putting their dos and don'ts. We've heard about the ice conditions. We don't go out when the ice conditions are bad. We have to know the current conditions in our areas. One research that really impressed me was out trough near Little Diomede where the whales go up north and the

current is pretty strong. I thank everyone here for having traditional knowledge involved. From my area, the seals or walrus are seasonal. They come in the spring as the ice breaks up and they jump on the ice and go up north. In the fall, the spotted seals come by from up north, but they come in when the herring comes in. They are seasonal but occasionally they are around all summer. Ring seals are year around and are a vital resource for native people in the past. They can get them all year round and the ring seal is just as important as the (unable to understand) were. Ring seals are used for coats and containers. The two types of seals are important to our area. I am happy you guys have traditional knowledge involved because the experience in the past with some of our researchers...you know, I'm a go to guy in Kotzebue when research needs to be done. I've taken a lot of scientists out. The knowledge natives have, you would be surprised what we have in our heads. We know our areas, currents, elements and they are the ones you should talk to before doing your research. They will tell you when to go—you do it already, but traditional knowledge would simplify everything. Thank you.

[Harry Brower, AEWC Chairman]: In parts of traditional knowledge, I have to repeat some of the comments that George Ahmaogak made today and hopefully some of you will understand and start picking up on that that even though it is occasionally mentioned. We've gone through many years of interaction with the federal government and industry operators to try to get traditional knowledge into the research, and it goes a long way when you take that step and include traditional knowledge into western science. I have to say that it is my observations growing up in Barrow it was already in the works with the Arctic research (unable to hear) operations when it was functioning up in Barrow and in outlying villages and into Canada. There was a lot of interaction between folks in the local communities and the federal government in the science and the sharing of traditional knowledge; scientist working with the local people to get knowledge of the conditions such as ice research, northern lights research like shooting missiles into the northern lights as to what occurs from expulsion of the missile. There was all kinds of research happening out there, including what's been mentioned in the past couple of days as well like ocean bottom critters and current, weather, climate and that has been an ongoing part of our way of life in the Arctic. We want to see that continue. I don't know to take to get you to acknowledge it more. Do you need to have a couple of whacks with a frying pan to understand that better? There are lessons learned and questions being repeated continuously but there seems like there is a lack of communication which leads to frustration at times. How do we communicate about the research being conducted? [Talks Yupik) I could speak in my native language and make this discussion shorter, but you wouldn't understand. It's the same for us to learn to understand western science and the scientific jargon. It's continuously learning of western knowledge and science and trying to interpret it in my native language, and it is difficult as sometimes we have no terms for it. And it is vice versa, we have terms that there are no English terms for. There is a mix of definitions and terms that are used that could be learned, shared and acknowledged through research. Some of the ice conditions and currents we have Inupiat names for and those names are not mentioned in these reports. We've talked about the direction of currents from one hunter to another hunter for years, and they'll understand each other like two scientists talking about research. It's this type of jargon we need to assert in making things more understandable for both communities – western science and native communities. That's been asked of by the local communities to have researchers come back and share their information, and, when this doesn't occur, people don't feel acknowledged, and we wonder why they don't bother to come back and share their findings. It needs to be a two-way street so we can share traditional knowledge to insert in to the context of the findings. These are some of the issues I wanted to share; my personal perspective on traditional knowledge. It's not an easy task – it is a multiple language terms that needs to be used to make it easier to get the message across or sharing information to others, even local folks. We, as local people, are interested in science. Even just in teaching my children the practice to hunt, once a marine mammal is harvested, preparing it for food, gutting it and learning about the internal organs and stomach contents, and where do we find the

food prey of the resources we hunt. If you just look at that compared to science, this is basically what we're teaching our children, but it's in the sense of the hunting community practice. We hunt for food, we take resources home, and we prepare them for later use and while in that practice, you are educating your children. That is why we need to have that interaction and share the resources. George has been pounding the table on including traditional knowledge and inserting it where it is due. There are caveats being put in place which changes the original intent of the comments which changes the understanding. This is what we've learned over many years of interacting with western science, the federal government and industry operators. It could make your research go a long way in terms of sharing the knowledge information. There is a lot of western science being inserted about the Beaufort and Chukchi seas and comments that say there's not a lot known about the Chukchi. I step back and ask why do you say that? There's lots of knowledge on the Chukchi. The hunters were in the ships moving back and forth sharing knowledge. We didn't have pens and paper to write on, but things were orally discussed and shared in a family setting. They would return to communicate and share what they saw and did on those ships. It's been learned over time and repeated use of the areas and hunting practices. This is how traditional knowledge can steer some of the research. One comment from a conversation yesterday about how western science took 40 years to confirm what traditional knowledge already knew; the amount of time, effort and money to learn what was already known through traditional knowledge. We have different names for the ice conditions, if it is tight or loose, we have terms in Yupik to say if it will be safe or dangerous, and we could share this between hunters and researchers. Relating to ice breaking vessels, I'm continually learning and sharing and interacting with the types of ice that's been described. Unless you see a picture of what you're talking about, you're not going to be familiar with your surroundings. When you're talking about 9/10th of ice, 7/10th, 6/10th, that description gives you some kind of rationale about how condensed the ice is. If you could use that in a hunting method that is applied (unable to hear) compressed, compact setting. It is much safer for us to be on ice at least 5/10th of ice coverage—that' s the type of conditions we'd like to hunt in. These are things I just wanted to share with you. Some of the research topics that were discussed in terms of providing names and subjects, titles in that sense. If there were more interactions, the research contents would have been addressed more thoroughly. There is a lot to be carried forward if traditional knowledge could be included, and how communities can come in and support efforts instead of having negative attitudes when researchers come into the area. That should be asserted and progressed on.

Questions/Comments:

Jeff Loman, MMS: Some of my thoughts in respect to language and the appreciation of traditional knowledge that came to mind are that I had the opportunity to be in Lithuania when the Soviet Union collapsed and watched a country change the names of everything and everything changed. It made me appreciate culture like no other when you see this happen and an appreciation for a lot of the things the Inupiat people and you have gone through. Some of the things that happened there before that came about were symbolic—a guy got up and set himself on fire, and another got up and waved a shovel around and said he wasn't going to go to work, and he was ran over with a tank—those were all symbolic acts and as time progressed, it meant a lot. These kind of symbolic acts have meaning. One thought was that if AEWC, for example, passed a resolution and asked those who name prospects because that's been acknowledged several times during this Open Water meeting with names like Popcorn and Snickers, we don't even know where these names came from, but if AEWC said we'd like you to rename Burger and you choose an appropriate name and the purpose of renaming it is so that all can be reminded from this day forward how important it is to consider traditional knowledge as you progress forward it is a symbolic thing that we can all benefit from.

Candace Nachman, NMFS: Harry and John, thanks for everything that has been shared over the last three days. We hope to see John at future meetings.

John Isaacs, URS: For someone who has worked with traditional knowledge for the past 15 years, it's difficult for people to figure out how and when to apply it and who to go talk to. When you are planning research, it's a good time to involve traditional knowledge. One researcher working in Kotzebue started off by asking "I would like to do this, what do you recommend, and how do you think I should do it?" Then, when results come in, interpretation becomes an issue. (Unable to hear name) once asked the people in the Bristol Bay area "how do you know when the salmon come in?" and the response was "when the wind blows it in." The science then provided this theory. It takes communication and talking. Going back to the community and sharing what we learn is all key points. It's not easy for people to do, figuring out how to schedule it, who to who talk to, etc. I think the science and native communities need to work together to make it work sufficiently.

Arlene Thomas, Ukpeagvik Inupiat Corporation Umiaq: I have a comment on what Harry was sharing. It brought me back to when I was 12 coming back from east hunting. We had two snow machines, dad driving one and older sister driving one and it was early June, it was all melted, it was really slushy and it was too melted on the tundra. We decided to go on the ice and I said, "oh no. I don't want to drown. I don't want to fall through the ice." And my dad just knew which way to go, and we came back on June 14 and you can realize much it was melted. Native people really do know the ice. Joe Levitt was teaching us at the ASRC group about the ice conditions and how current moves under the ice. I said, "Joe, how do you find that out?" and he said "we use a hammer." We drop the hammer down on the ice with a heavy string or rope, and it shows which way the hammer is moving and whichever way that hammer is going, you better move off the ice if it is a particular direction. I just wanted to share that.

George Edwardson, ICAS: Thank you for your talk Harry. At the end of the 1970's at an Elders conference with people from Unalakleet to Canada on the coast we put them together, and this is where we obtained our traditional knowledge. I had two questions for them. My first question was to teach me ice. When they passed the third ice age of us living there, they said that's enough ice, you can figure it out from there. My second question I had was tell me what you don't want me to touch. They asked only one thing of me to leave where the fresh water touches the salt water because that is where the food chain begins. That food chain turns out to be the nurseries for the salmon stock of North America, the whales and that is what they taught me. Another thing they mentioned was we lived here on edge of this ocean starting from the time this ocean was a fresh water lake (the Arctic Ocean), and if you look at what they said and combine it today as a people, we are living at its most critical time when our ocean is at its most critical danger. Your actions are putting us in that situation, and, if we work together, we can walk around it.

Harry Brower, AEWC: We have to keep trying and keep communicating people's needs and how we get there in terms of language used. It's important to do that to work and do it properly. We probably spoke in Yupik, we would have been done five hours ago; scientific jargon, high level English - it is complicated. I have to say that English is my second language even though I come from a white family background. My first language is Yupik, and we went to school to learn English and are still learning today. I have to look through words that fit to my comments I am trying to generate. I don't know the proper words to use. I get jokes made of me anyway and I still continue. Just recently at a meeting with our legal counsel, a word just wouldn't come out of my mouth and it's just three little letters: pew. I couldn't say it. I said, "Earl, how do you say this word?" I showed him the paper and he turned and said "pe-ew"!

Parking Lot Issues

There are two things to "un-park" from the parking lot and wish bon voyage. There are timeframes on the two issues:

a) Pursuit of a towed passive acoustics (Duncan Eley brought it forth for information sharing)
b) CAA (George brought forth the issue to plant an idea and get feedback)

Pursuit of a Towed Passive Acoustics (Duncan Eley): When we looked at the objective of why it was parked and after speaking to several people offline, it sounded like best way to frame it was in terms of information sharing. There was an acoustic monitoring workshop in Boston at the end of 2009. The reason why this came up besides the themes from throughout these past few days is because of cumulative effects in terms of the combination of traditional knowledge and science knowledge, along with multiple data streams and that's where the question came up about where does towed passive acoustic monitoring sit in the future? There are some questions around the technology and the application of the technology and I thought it might be useful to hand it over to Sarah to share information.

[Sarah] There were quite a few of us in this room that were at the meeting MMS sponsored at the end of November, and we thought it would be useful to talk about it in terms of information sharing. We heard about the monitoring plans over the past three days, and there has been several questions about when there is low visibility and visual observers are out there and are limited, how do you monitor these proposed safety zones and what are the other tools. The MMS workshop looked at active acoustic methods, fixed passive acoustic methods, which is what we've been hearing about primarily during the past few days, and also towed passive acoustic methods. Or all of those methods MMS did an extraordinary job gathering scientists worldwide that are using the technologies and understanding of the limitations and capabilities. My message is that this is an example where they are working to identify those tools that could be used to assist in monitoring and again, as Duncan said, it will depend on the situation in the Arctic and the species of interest which makes certain acoustic systems more applicable than others. With towed acoustics behind the vessel, it works well in some areas in the world where it works well for certain species, i.e., sperm whales. For other species with lower frequency callers, if you have noise from the vessel, if there is flow and ambient noise, it can be difficult to detect calls of interest when those variables exist. Technology is improving though, and it could be in the future that the towed passive acoustic could be a monitoring technique that could be tested again and investigated. But, for any monitoring system, we need to make sure when designing that you first identify what the objectives are for your monitoring and mitigation purposes, what species and to what extent or are you just collecting baseline information. We should start thinking about developing standards on collecting and reporting acoustic data. For the systems themselves, we've heard about visual observers and what sort of training. They have traditional knowledge, or they may have a marine biology background or training process. We need to think about that for someone operating towed passive acoustic systems, and do we want standards developed? What do you want the system to do for you? Otherwise someone is reporting the data in this format or collecting under different formats, and, as a result, we might be comparing apples and oranges.

Bill Streever, BP: I just wanted to follow-up a little bit on the MMS conference. It worked because the facilitator was hired and the company (Resolve) set up an advisory committee of five well-connected people to help develop the conference, define the right people, the right technologies to look at in that setting. The report is in draft form and will be submitted to MMS with a short executive summary for the three technologies, which is well worth reading and is valuable. One of those points said that for bowheads, towed passive acoustic monitoring isn't ready for prime time,

but there was one system designed to get around low frequency masking. That system was designed by JASCO and tested on a BP shoot in Canada in the summer of 2009. I was hoping Dave will volunteer to talk about, and I just wanted to let you know more information is coming out on passive acoustic monitoring. How MMS handled that particular conference because there have been a lot of meetings on passive acoustic monitoring that weren't very good, and I felt that one was a very good one.

Dave Hannay, JASCO Applied Sciences: The experiment in the Beaufort in 2009 where we used a technology designed specifically for lower frequency callers instead of the sperm whale-type clicks. One problem with low frequencies is you need physically larger system to localize animals, and, because we are often in shallow water, the signals that arrive at your receiver are very significantly destructively interfered with by surface reflective energy. You need to use systems that are different. You need to move them away from the surface to avoid destructive interference and to get a signal on your receiver. We've been looking at using technology similar to what Greeneridge is using to localize bowhead, and it uses particle velocity (unable to hear) systems rather than hydrophones and we were able to ... while we didn't detect bowheads, we think the area had few bowheads around during operation but were able to detect low frequency sounds from other ships at actually quite significant distances and the levels we were able to detect were sufficient that we would be able to detect bowheads for a few km at least away from the system. This is still a system in development and a project in research but does show some promise.

Bill Streever, BP: The system used in gulf won't work for bowhead.
Dave Hannay, JASCO Applied Sciences: That's right. They won't work with bowhead and it won't detect them, as I said, because they are measuring pressure, and when you are dealing with a lot of flow noise you will mask a lot of your detectability, so we need to look at other technology other than standard towed hydrophone arrays used in the Gulf.

Duncan Eley: Hopefully this was an information update, and, as a new arrival to this forum, I heard the comments over the past several days, and it was the update from the few people involved directly. But to get back to the origins of why it was raised in terms of multiple data sets, it is amazing that there are so many different combinations of data being used for monitoring and mitigation. The more efficient the operation, the fewer vessels that we can have exposed in the environment and crews exposed out there, the more efficient the operation with the optimum monitoring and mitigation and using these different toolkits would be useful in the future.

Conflict Avoidance Agreement – George Ahmaogak
I'm coming at this on a positive note. We are in the middle of oil and gas development, and we're looking at production further down as we go. A lot of us here are doing mitigation and monitoring and the reason for this report but we still have potential adverse impacts out there. The CAA, we can't solve it here tonight, but I want to throw it out there to think about and look for the common goal. Being a mayor, I have walked the fine line in trying to make exploration and development issues work and to meet with the communities. We view the CAA as a toolkit. The bottom line is that the whalers are allowed to safely harvest quota under the quota system of the International Whaling Commission. The CAA is that voluntary agreement between the whaler community and producers towards whaling and subsistence, to allow them to continue the harvest and so forth. They work the schedules out for when everybody's out in the water and then lay out framework. Or whaling, it has worked beautifully. The irony is NMFS doesn't recognize this as something that the community is really focusing and debating. It's the only leg we have in the MMPA that we pushed. NMFS, regulatory body and also MMS has got to look at the idea of CAA rather than saying it's not required and voluntary. It's depressing to those trying to balance these needs. An example is Kaktovik. When they start whaling September 1st, they have a black out period where no activity

takes place until their quota is reached; same thing for Cross Island Nuiqsut whalers and also for Barrow whaling captains. And if there is mitigation to be had and if there is seismic there to be had, Nuiqsut and Kaktovik have had the producers work with them and that's why the communication centers are there. Bottom line – be positive. This is the only missing element that regulatory agency has got to recognize. All I'm asking is you recognize that this is a tool for both of our protection. The Letters of Authorization (LOA) process or IHA authorization process that NMFS issues that permit, oftentimes a lot of the producers will run only to secure that without signing a CAA. The producers are doing what they can to the best of their ability, but there's a loop hole and they don't need the CAA , only the LOA and IHA to operate. The CAA is a living document that can mitigate adverse impact to the whales, the whaling community and the subsistence community. NMFS but also MMS ... I am fully aware of stipulation five that there is only wording on "not to harm the subsistence bowhead whale" and all the subsistence on "stip five" but no mention of CAA under oil and gas lease stipulations, but let's work towards that. I'm sure Harry, being the chairman of AEWC, is inundated when we have seven operators going from village to village talking about CAA when seven operators all want CAAs and meetings and even one is stressed out and doesn't even care about CAAs, that's how stressful the process is. Even the LOA process – they are stressed out. I'm only offering a toolkit that works for us. The Barrow whaling captains wholeheartedly endorse this concept and the CAA. I'm only asking to plant that seed in to your regulatory process, to give it serious thought and recognition.

Questions/Comments:

George Edwardson, ICAS: Our AEWC was created by the Inupiat community and given the responsibility of taking care of whales. We've respected that. There is a CAA they signed with the industry producers, and let's see if it works. I want to see if it works. What I'm asking is of the producers and the ones that have signed the CAA, can you do an oil spill study sample, a practice run? Let's have a community watch to see if it works.

Jeff Loman, MMS: My question is for Mayor Ahmaogak. You used two terms: recognizing the CAA and acknowledgement of the CAA. How do you see the agencies recognizing or otherwise acknowledging the CAA ... is it through stipulation, some other form of regulation, the permit? Do you want MMS, NMFS or both to be a party to the CAA?

George Ahmaogak, Ahmaogak Associates: As it stands, it is a voluntary document. There is no statutory authority for these to be put in place. Is there some authority that can be looked at by some agency; I think this is what is needed. We only have it in the local permitting system. The borough as a public policy has already adopted. If there is some regulatory agency or statutory authority, there needs to be something done to recognize this formally instead of just verbally saying it's voluntary. We have nothing to stand on. All I'm asking is for some authority to hang our hats on. It's a tool in the toolbox we need.

Harry Brower, AEWC: I support George's comments regarding the CAA and how it's recognized by industry operators. It's a voluntary tool to help minimize impact on subsistence hunt, and yet participants don't want to take part because language doesn't meet their processes to conduct offshore activities. We need something to strengthen the use of the conflict avoidance agreement instead of it just being voluntary. Put more backing to the use of that tool. I have to say I've been overwhelmed for several years with taking part in these community meetings (plan of cooperation meetings) that are being proposed by operators and accommodate those needs. I don't have the time or staff to keep up with all the issues that come up at multiple times, especially this time of year when we should be preparing for our hunts. These are impacts to us, but in terms of George's comments, I support them. I heard a lot as George said from my whaling communities, that it is only voluntary. I share that sentiment.

Jim Lecky, NMFS: I wanted to take a bit of an exception. I think NMFS does recognize the CAA and in some respects rely on the CAA as a way to demonstrate that there is adequate mitigation in place so

we don't have an unmitigable adverse impact on availability of resources for subsistence use. We've, in the past, even tried to facilitate discussion between communities and industry to encourage folks to enter in to CAAs. We have to have authority to require people to do things, and we can't create authority that aren't in regulation. Our regulations merely interpret and implement authorities that derive from statutes. There isn't language in our statutes that currently give us that authority. We do have an obligation to ensure no unmitigable adverse impact. How do we do that? We look to the CAA as a voluntary measure that demonstrates an agreement between the communities and industry that they sign on reaching an agreement that there aren't adverse impacts but by that nature it is a voluntary agreement. A number of measures in those CAAs have found their ways into our LOA as conditions that we can place on the industry and it is a mechanism. As we look forward, are there a reliable set of conditions that we would like everyone to comply with that are contained in current CAAs to apply to IHAs. We can be supportive of that as we get to a long term permit program and have a consistent set of agreement and not have to go through this year after year. Those are some ideas. We need to think about how to go about this. I understand your concerns. I hear what you are saying and what position it places on the communities to deal with each company over and over again.

Harry Brower, AEWC: Your comments you just provided... my immediate thought is to ask the federal agencies here is there a way we could have you think about a process that we could start looking into to help steer us into that setting to move forward on federal regulations and putting them in so it is something that industry has to abide by?

Jim Lecky, NMFS: We could explore some alternatives with an EIS for example. Some regulations are hard to put in place, but terms and conditions on permits are easier, so somewhere between the two is where we're looking if that's how we want to do this.

John Goll, MMS: George, you did say something about whalers safely allowed to harvest. We agree with that; it's the bottom line. We don't want the harvest disturbed, that's everyone's goal but it's how to get there. With regard to putting something into regulations, it would be difficult because we can't give our responsibility to another group, i.e., going to the AEWC. Developing standards might be something to work towards. The last couple of years as I see what is being proposed in the CAA, in the past it is more about timing and that was relatively straight forward and easy to do. It seems the last couple of years other issues have started to get into the agreement such as zero discharge, and I think those are a little more difficult from a couple of standpoints: 1) the issue itself and the responsibility of the agencies but 2) also enforceability and who will enforce them. One has to make sure there is enforceability. If a company signs a CAA, the way the MMS regulations work is whatever is in an exploration plan, we would require the company to do. What we require both in our regulations, the Outer Continental Shelf Lands Act uses the term "no unreasonable conflicts with other users of the outer continental shelf," and that is one avenue that we have used connected with that. Our stipulation five does not mention conflict avoidance, but we tell the operator they have to tell us how they are going to avoid that conflict, and, again, I think it is similar to NMFS with no unmitigable adverse impacts. We will look at ways to partner with NMFS more with regards to the terms of the MMPA to see if we can use the same standards so at least there's one out there. The bottom line goal is to protect subsistence hunt, and I think everyone would agree with that. It's the difficulty of coming up with a process, the timing. We encourage our operators to meet at the same time, there are new operators coming up that aren't used to, but it is something we can all work towards.

George Edwardson, ICAS: The AEWC has the ability to conduct government-to-government meetings with the federal government where you two, the commission and federal government agencies, can come up with a workable solution. The AEWC has the full authority of the Inupiat community to conduct a government-to-government meeting, so there is a mechanism to find solutions.

George Ahmaogak, Ahmaogak Associates: John, you are correct in terms of CAA where zero discharge was part of the discussions and the debate that went on in the Barrow whaling captains struck a lot of that out, meaning the AEWC is not a governmental or permitting agency. Barrow whaling captains was very adamant and wanted to see CAA come together, and, after no signatures for two consecutive years, the Barrow whaling captains went line item by line item at our last convention, and we took a lot of that out. But the bottom line is that looking at it from NMFS years ago while the CAA was negotiating for LOA/IHA for one of the operators and they released the federal permit while the CAA was still negotiating. That was years ago. That raised a lot of blood pressure on our part, and industry cut negotiations right there as soon as they got their permit.

John Richardson, LGL: A question for NMFS. I seem to remember that there is or used to be language in the instructions concerning applicants for IHA to demonstrate they made a good faith effort to obtain a plan of cooperation. Am I imagining this or how does this enter in to the picture?
Jolie Harrison, NMFS: You are right, it says they either put forth a plan of cooperation or otherwise explain what they are doing to minimize impacts.

John Goll, MMS: When I mentioned zero discharge, there are other forums to address this in. We'll be meeting with the NSB on this issue, and we can address it in a different forum.

Closing Remarks

Lisa O'Brien, Facilitator: I have a few closing remarks. I want to talk about Conflict Avoidance Agreements. That is why we're in the room. I got a call four years ago because you couldn't avoid conflict. Using the last four years as a baseline, I believe there has been a huge shift in this meeting. I've been thinking about this shift and in my estimation the shift is for three reasons: 1) you are listening to each other. We haven't had to go back to the ground rules; I haven't had to intervene or get in someone's face; 2) your objective of having civilized discourse has been achieved, and 3) finally started to acknowledge each other. You started to say thanks and good job. This is a huge shift. I started validating this with Ron and Brenda. I'm glad for the shift and want to end with my own thanks. I thank Candace for putting this together year after year. I thank Brenda for her magic fingers. If you've ever bothered to read the report, you're going to say how could she sit there, listen to that and make it coherent. I want to thank Stephen Robey for helping make this a seamless meeting and also to Ron for helping facilitate.

John Goll, MMS: Thank you everyone for being here. I thought this was a tremendous one for the amount of information, and thanks to NMFS for the great organization of this meeting that helped make it so successful.

Mike Payne, NMFS: Thanks to Candace for her organizing skills in getting the conference together. Thank you to Steve at URS; he has done a wonderful job to make this run so smoothly, and he has done a tremendous job. I want to thank Lisa and Ron. These meetings have gotten easier and in my experience, whether you know it or not, facilitators play no small role in that. Thanks to those who attended the scoping meetings and the discussions and comments were helpful. Something else that makes a meeting very successful and the government can't do it and that is providing coffee, tea, food and oil companies have done that without fail, so thank you! They volunteer this each year, we don't ask for it, and it really helps the meeting go smoothly because it keeps people on site and talking to each other. Thank you also to the presenters. The quality gets better every year, and the meeting is almost fun because the information transfer is so interesting. Also for those of you whalers, good luck throughout the rest of the summer. At meetings in the communities they start and end each meeting with a traditional prayer ... I'm not going to ask anyone to do this on the spur

of the moment, but we might consider this for the future as another step towards traditional knowledge.

Jim Lecky, NMFS: Thank you to everyone that travelled here and taking time to be here. Thanks to the native representatives who share their traditional knowledge and concerns. I appreciate the open and honest discussion that you brought to the meeting. Presentations were exceptional, and I appreciated sharing that information. Hope we all learned a lot, and we continue to stay engaged in this process. The applications will be published as they come through, and hopefully they will help inform, and you can provide comments before final permits are issued. Thanks for coming.

Candace Nachman, NMFS: I wanted to say that I will probably be creating a website for the report and presentation for easy access, and I'll let you know when that's done.

Appendix A: Attendance

NAME	ORGANIZATION	EMAIL
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