



2011 BeaufortSPAN West 2D Seismic Survey

NMFS 2011 Open Water Meeting

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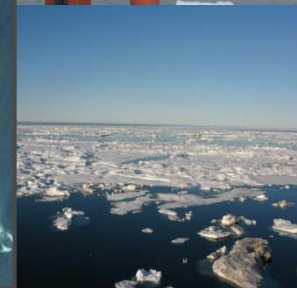
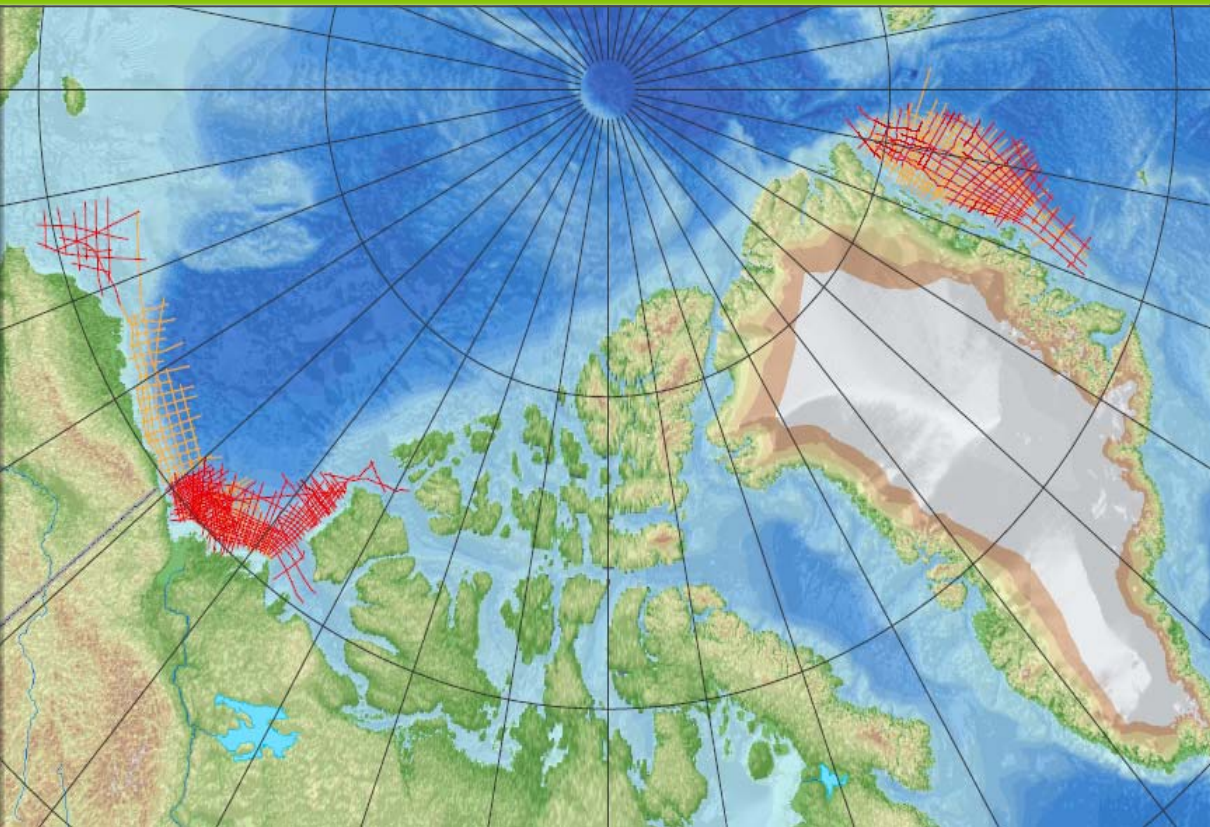
[IA] Arctic Solution & BeaufortSPAN™ West

- ION Arctic Experience.
- IA Arctic Solution Technology.
- 2011 BeaufortSPAN West 2D Survey.
- Stakeholder Outreach.
- Marine Mammal Monitoring and Mitigation.

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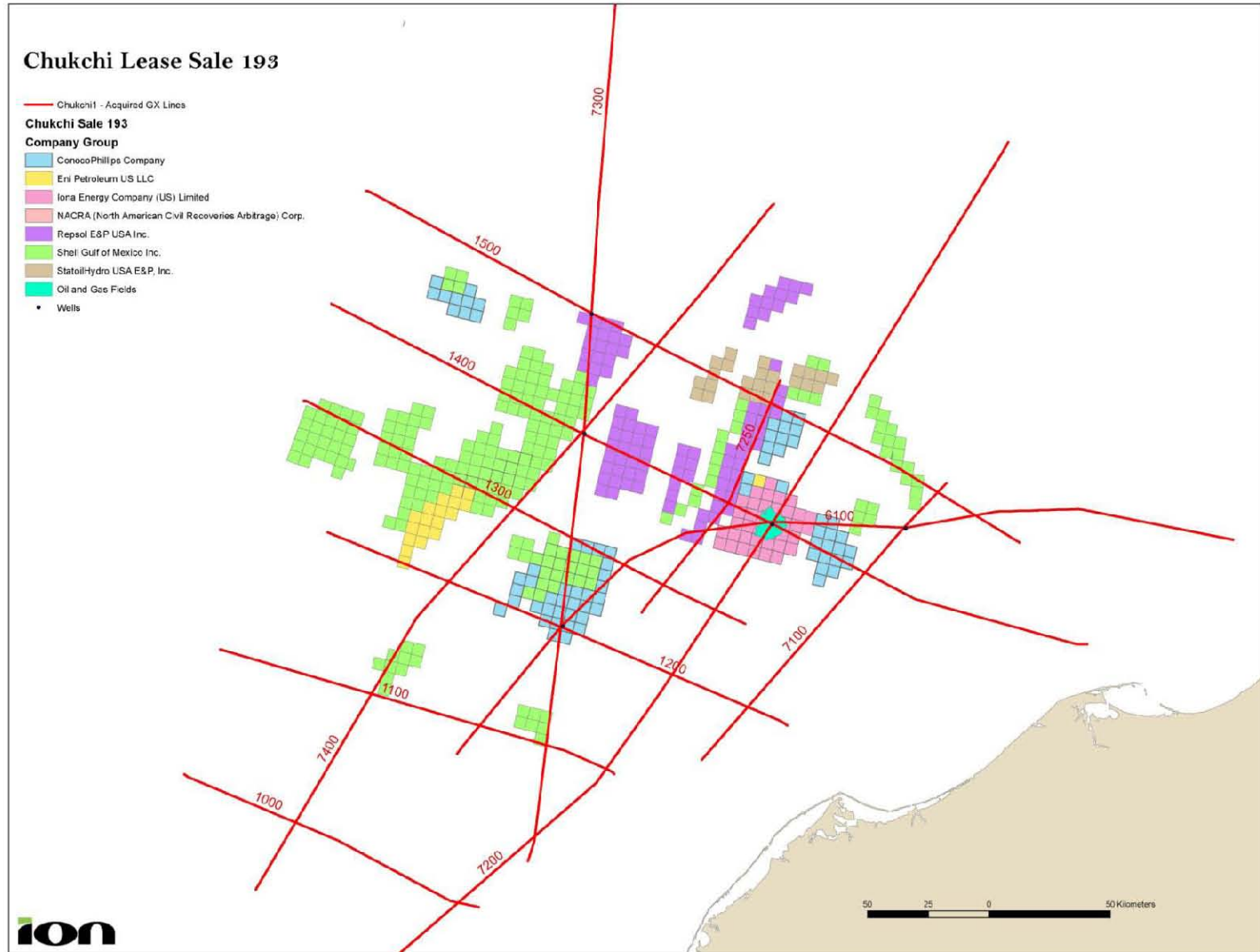
ION is Arctic Focused



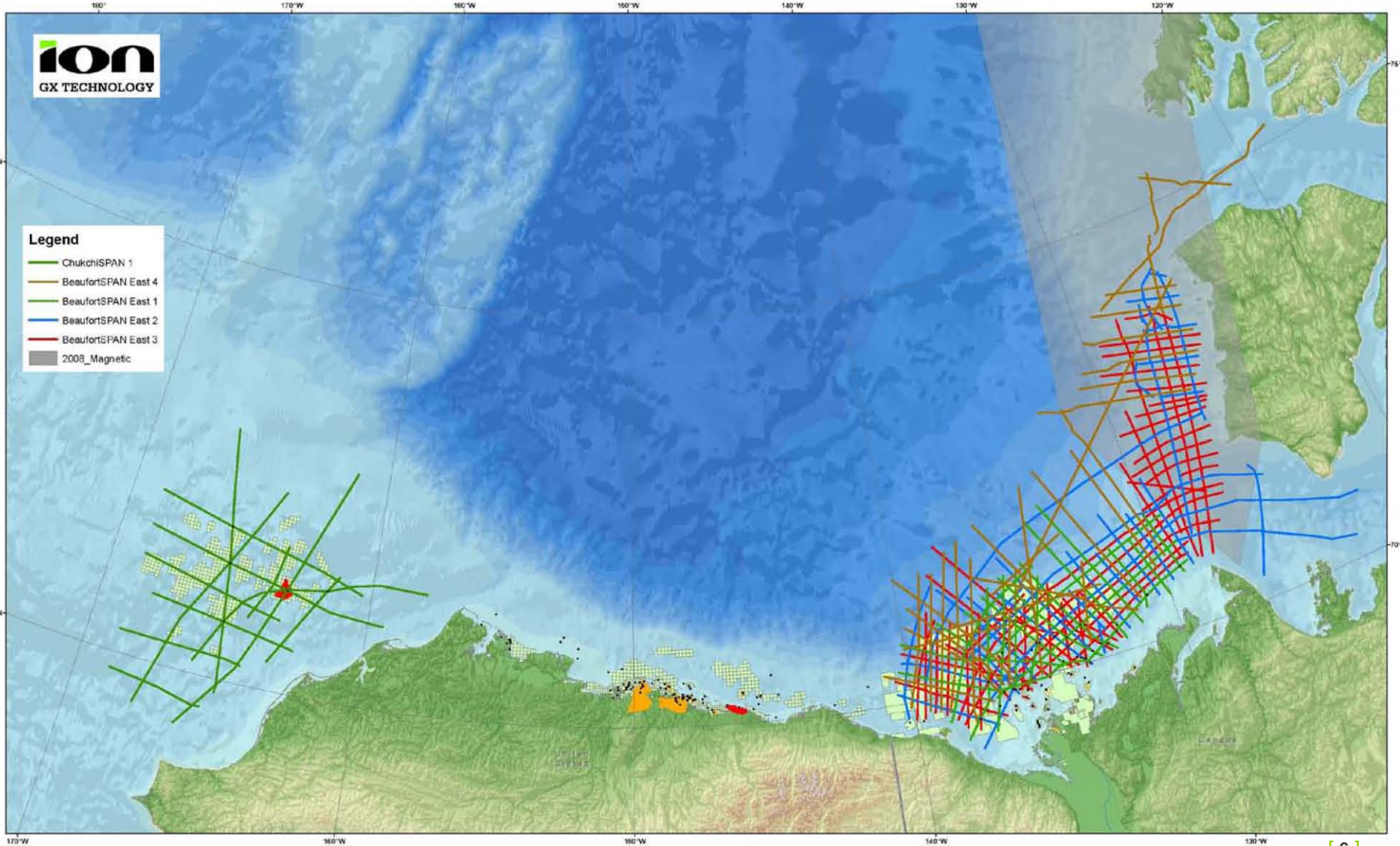
Project	KM Acquired	Project Start Date	Project Completion Date
Beaufort OBC (2010)	490	August	September
NE Greenland II (2010)	5,279	August	September
Beaufort IV (2010)	5,598	August	September
Flex Wave Test (2008)	6,535	July	September
Beaufort III (2008)	7,438	August	October
Beaufort II (2007)	5,645	August	September
Chukchi (2006)	3,129	October	November
Beaufort I (2006)	3,590	August	September
TOTAL	37,704		

Project	Man-Hours	TRIR	LTIF
NE Greenland (2009)	162,840	1.23	0.00
Flex Wave Test (2008)	24,092	0.00	0.00
Beaufort III (2008)	119,136	0.00	0.00
Beaufort II (2007)	77,412	0.00	0.00
Chukchi (2006)	52,992	0.00	0.00
Beaufort I (2006)	97,728	0.00	0.00
TOTAL	534,200	0.20	0

2006 ION's First Arctic Survey Acquired



2006 – 2008, 2010 Acquired Survey Maps



Experience In Management Of Surveys In Remote Locations And Harsh Environments

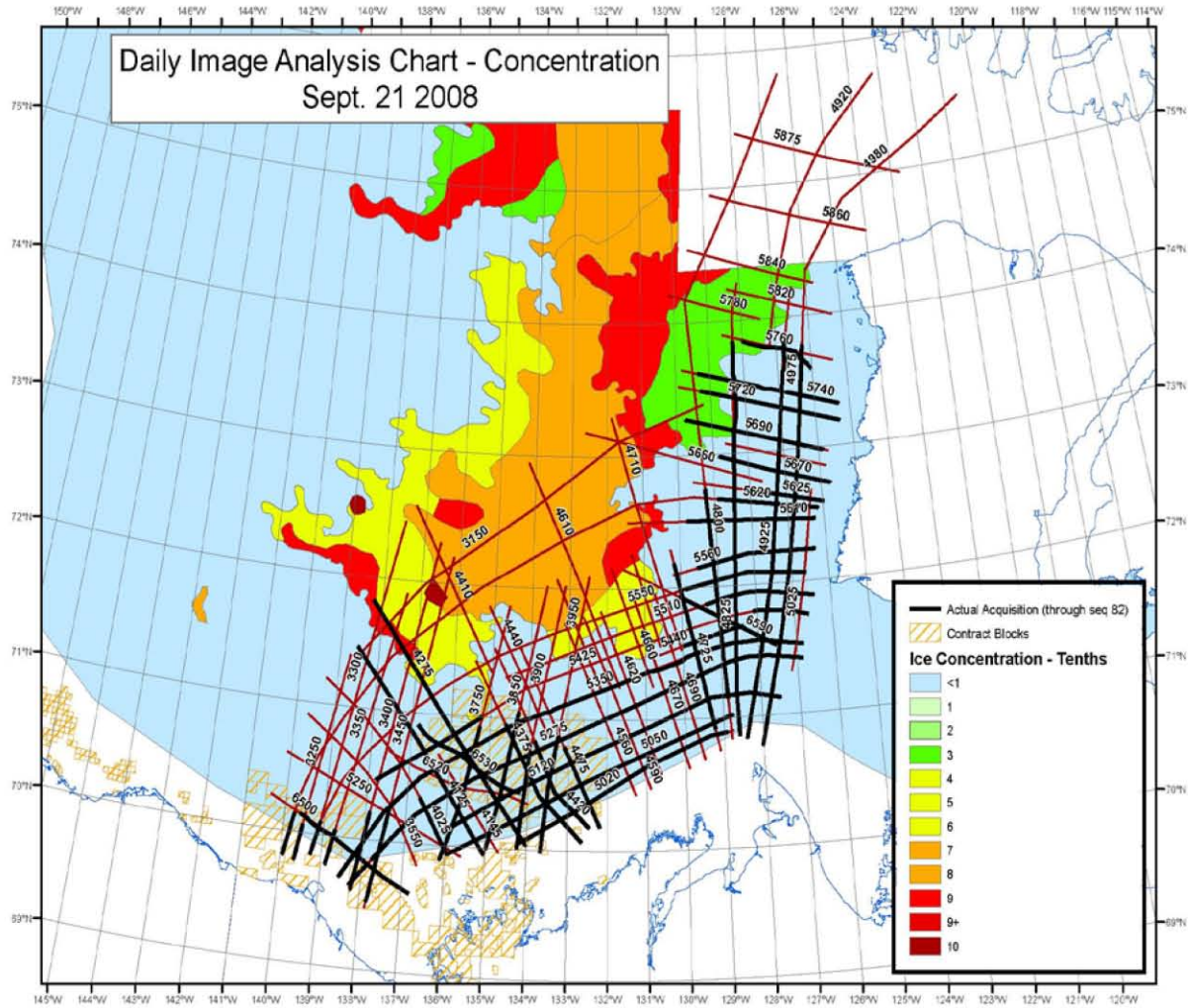


Experience with Permitting Seismic Surveys In Complex Marine Mammal Issues:

- Advance Mitigation Measures
- Complex Regulation: IHA's, LOA's, EA's
- New Species Listing
- New Research



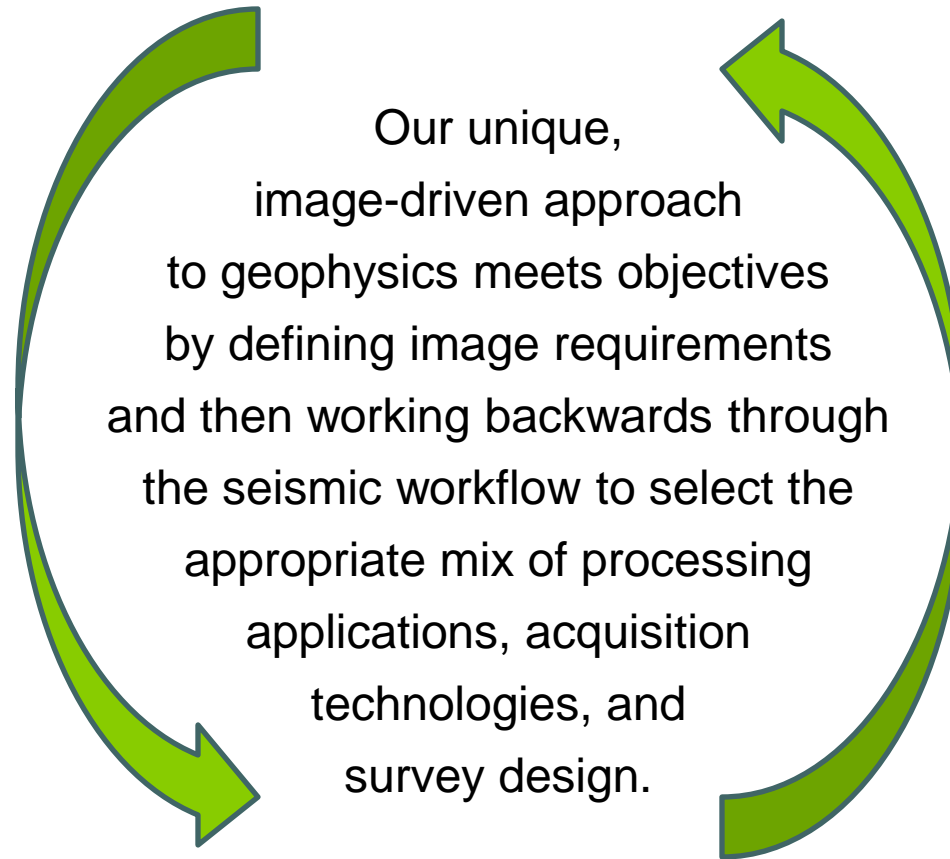
Dedicated Maritime Ice Management Expertise



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Unique, Image-Driven Approach



Survey Operations

Ice Escort Operations



Survey Operations



Ice Conditions Expected



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2011 Survey Vessels

- Suitable Vessels

- Boss Atlantic - Seismic Vessel
 - DNV 1A1 ICE-1A

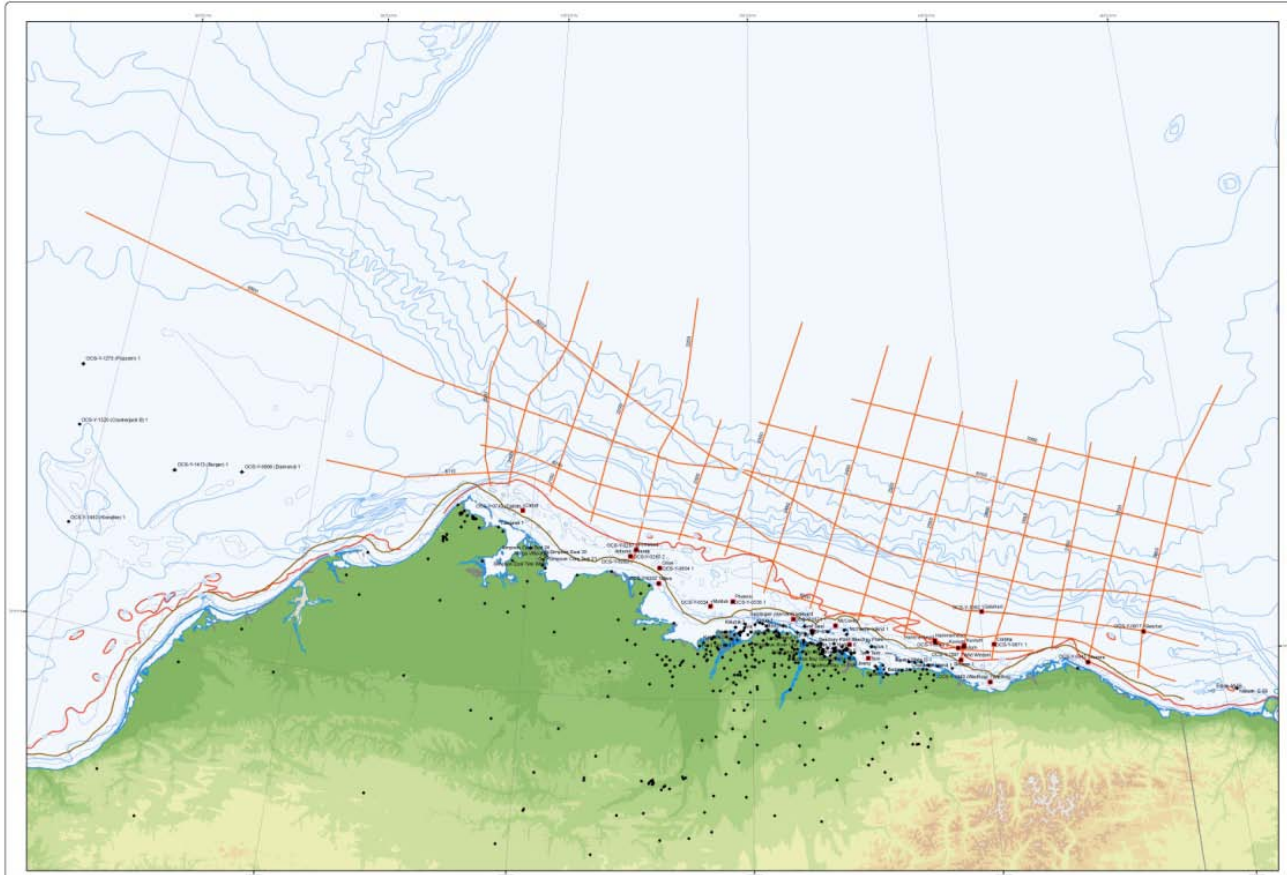


- Polar Prince – Ice Breaker
 - Lloyds Class 100A Medium Duty Ice Breaker (Arctic Class 1+)

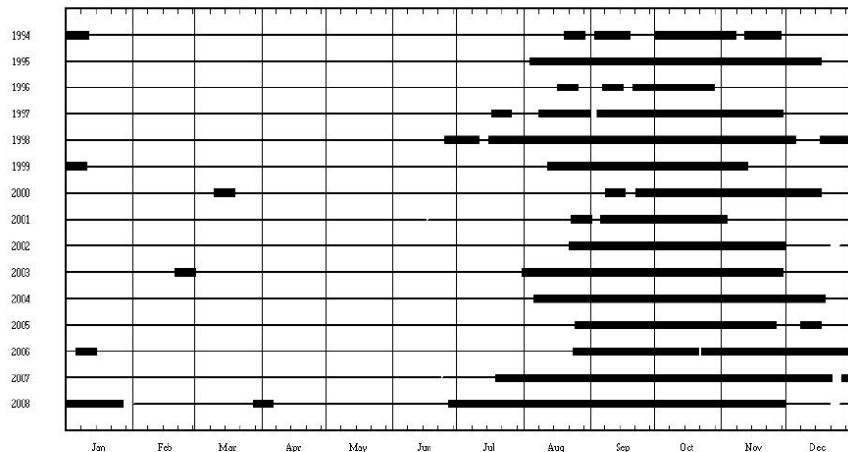


2011 BeaufortSPAN™ West Program

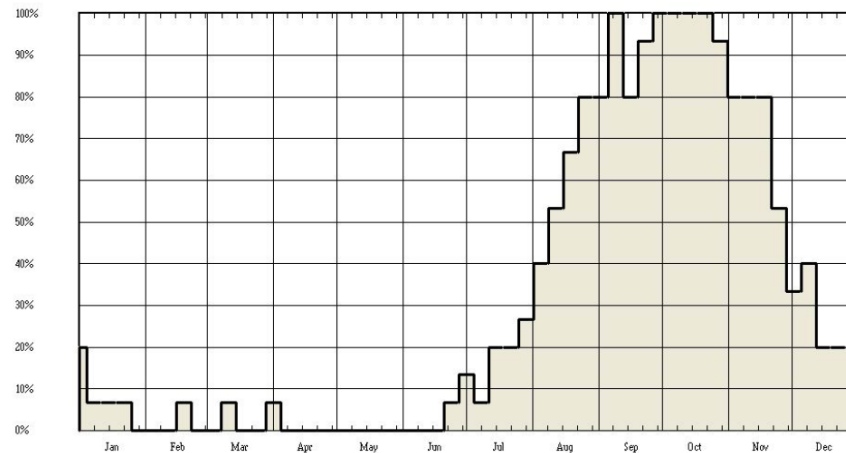
- Proposed 6,811 kms or 4,232 miles



2011 BeaufortSPAN™ West Trafficability



Fat Bars show when Defined Conditions Occur. Thin lines when they don't occur. Gaps = no data.
 Latitude 71° 30'N and Longitude 148° 30'W
 Fat bars indicate when All Ice is $\leq 3/10$ in spring and when First Year Ice = to and > 30 cm is $\leq 8/10$ in fall.



Percentage Probability that Defined Operating Conditions Occur
 Latitude 71° 30'N and Longitude 148° 30'W
 Probability that concentration of All Ice is $\leq 3/10$ in spring and First Year Ice = to and > 30 cm is $\leq 8/10$ in fall.

- The thick bars indicate when seismic could have been conducted over the past 15 years
- The mean season start date is Aug 2nd and end date is Nov 29th.

Forecast % chance of successes for an [IA] Arctic Solution survey during October & November 2011

Calculated based on when ALL ICE is $\leq 3/10$ in spring and when First Year Ice is ≤ 30 cm and is $\leq 8/10$ ths in the fall.

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Stakeholder Outreach 2010

- Met with NSB Wildlife Department (Robert Suydam) on December 15, 2009
- Attended AEWC 2010 Annual Captains' Mini Convention to discuss 2010 CAA (February 12 & 13, 2010)
- Leadership meetings March 16, 17, & 18, 2010 (details on next page)
- NMFS Open Water Meeting (March 22 – 24, 2010)
- NMFS Peer Review Meeting (March 25, 2010)
- Public meeting in Barrow, Nuiqsut, and Kaktovik (scheduled for April, 2010)
- Attended AEWC 2010 4th Quarter Meeting

Stakeholder Outreach – Leadership Meetings 2010

- Met with Special Assistant to NSB Mayor Itta (March 16th)
- Nuiqsut (joint meeting March 17th)
 - KSOP, Inc.
 - Native Village of Nuiqsut
 - Mayor of City of Nuiqsut (Mr. Thomas Napageak, Jr., Mayor)
 - Representative of Kuukpik Corporation
- Barrow (March 18th)
 - NSB Planning Commission
 - Native Village of Barrow
 - ICAS
 - NSB Department of Wildlife Management (Taquulik Hepa, Harry Brower)

Stakeholder Outreach – Leadership Meetings 2010



- Kaktovik
 - Scheduled meeting with Kaktovik Mayor (Annie Tikluk) and Kaktovik Inupiat Corporation (Phillip Tikluk) for March 16th, but it was canceled due to illness
 - Was unable to schedule appropriate date/time to meet with Native Village of Kaktovik in March due to other planned activities in Kaktovik – they requested we meet with them in April.

Stakeholder Outreach 2011

- Attended AEWC 2011 Annual Captains' Mini Convention (Feb 18).
- Held public meeting in Barrow (Feb 19) and Nuiqsut (Feb 21). Planned public meeting in Kaktovik (Feb 22) was canceled due to weather.
- Presented project to the NSB Planning Commission (Feb 24).
 - ION will return to the NSB Planning Commission responses to questions asked (anticipated April).
- Will meet with ICAS, Native Village of Barrow, and NSB SAR in April.
- Will hold a public meeting in Kaktovik in April.
- Will present update to communities in August 2011.

Conflict Avoidance Agreement

- ION will not participate in the open water CAA that has been drafted and distributed to the 2011 operators.
- ION's 2011 Plan of Cooperation includes
 - Sharing all collected 4MP data
 - ION Comuncation center operated 24hrs a day during the survey.
 - Community liaisons based in each effected community while the crew is operating
 - Inupiat Communicators on each vessel
 - IC have unrestricted rights to report to impacted communities

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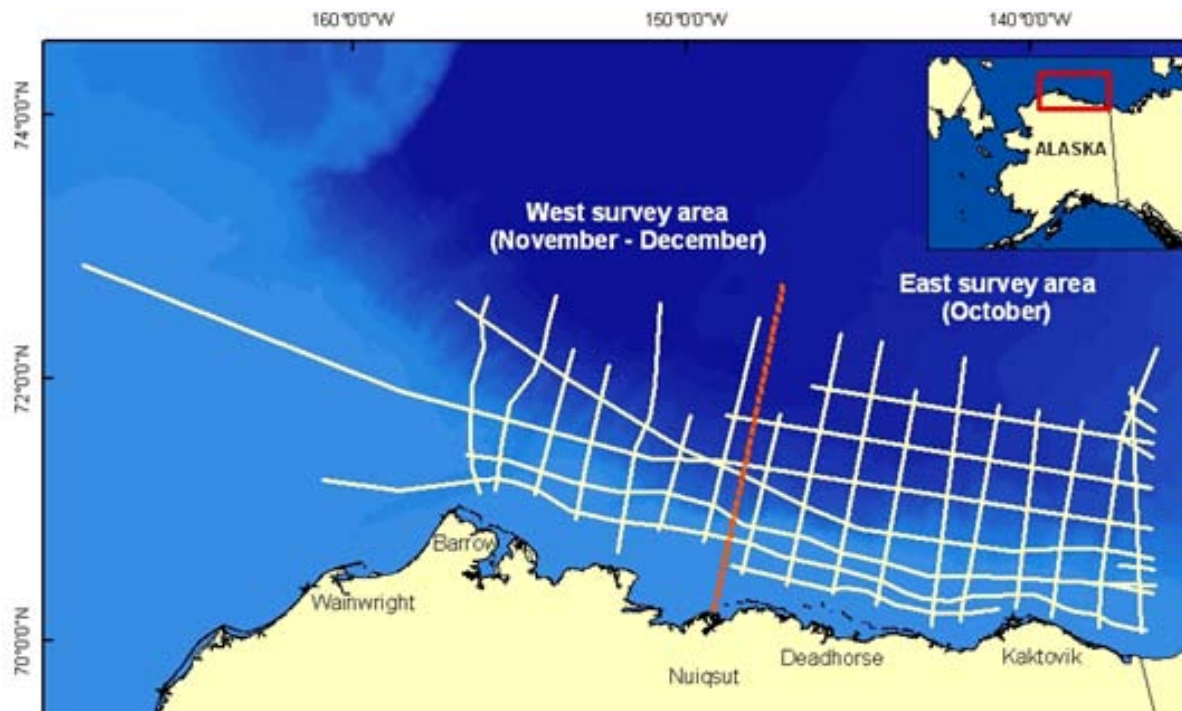
Marine Mammal Monitoring

- Overall objectives:
 - Minimize impacts
 - Document marine mammal behavior near seismic operations
 - Collect baseline data on marine mammal occurrence in study area



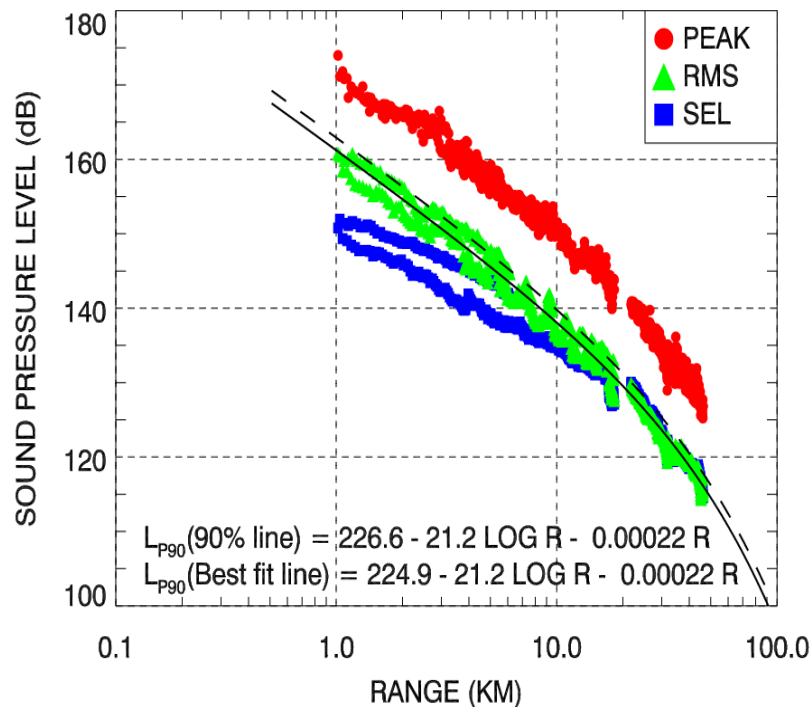
Marine Mammal Monitoring

- Primary mitigation measure is timing
 - Start 1 Oct; end late Nov-Dec
 - Avoid Oct bowhead hunt in Barrow and most migrating whales by working East to West



Marine Mammal Monitoring

- Sound Source Verification
 - Conducted prior to or early in the survey
 - Revise safety radii as needed for implementation by MMOs



Marine Mammal Monitoring

- Vessel based observers
 - 3 on ice-breaker (operating ahead of source vessel)
 - 2 on source vessel
- On watch for:
 - all daylight seismic operations
 - most daylight non-seismic operations
 - 30 min before, and during ramp ups



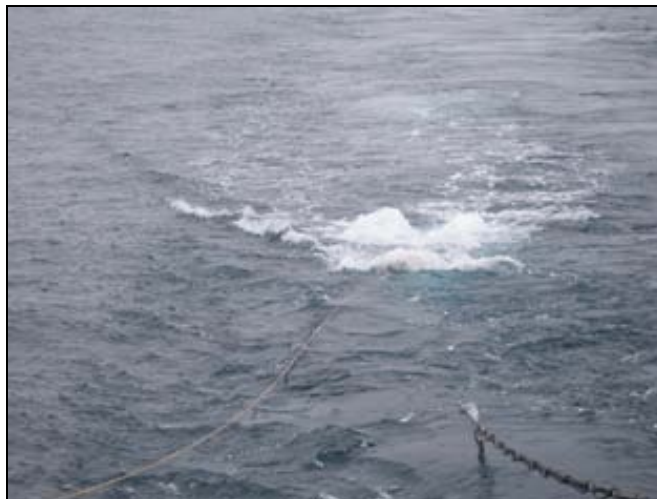
Marine Mammal Monitoring

- Ensure safety radii are clear of respective marine mammals for 30 minutes prior to and during ramp ups
 - 180 dB zone for cetaceans and walruses
 - 190 dB zone for pinnipeds and polar bears
 - Start ups only performed when full safety radii are visible during daylight for ≥ 30 min



Marine Mammal Monitoring

- Continually monitor safety zones during daylight airgun activity
 - Power down to mitigation gun if a marine mammal is sighted within or likely to enter the full airgun array safety radii
 - Shut down of all airguns if a marine mammal is sighted within or likely to enter the mitigation airgun safety radii



Marine Mammal Monitoring

- Implement any additional mitigation measures stipulated by NMFS and USFWS IHAs
- Big-eye binoculars for use during daylight
- Infrared camera (FLIR) and night-vision on ice-breaker for monitoring during darkness
- Collect ice-breaking sounds using seismic streamer on an hourly basis throughout the survey



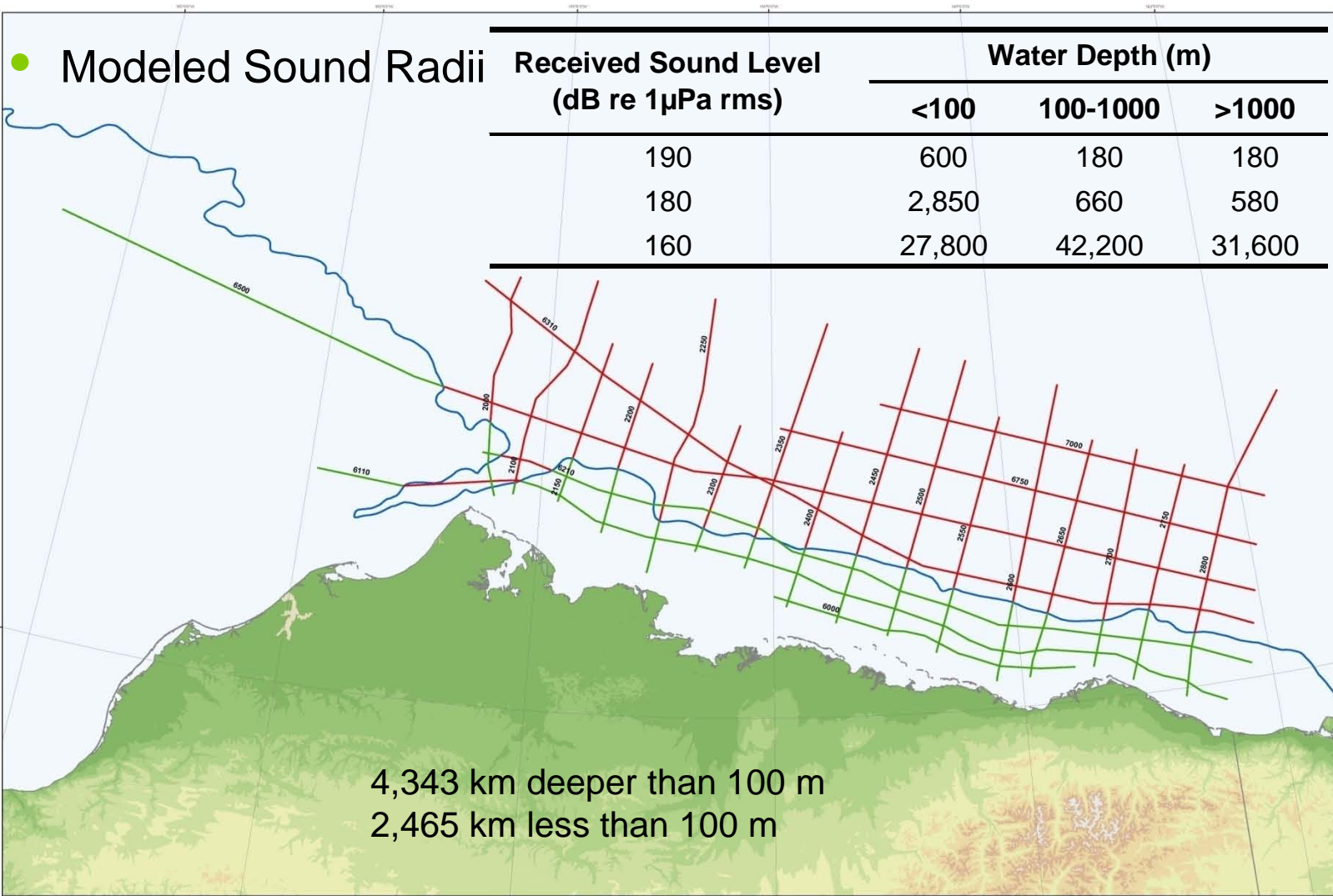
Marine Mammal Monitoring

- 90-day technical report
 - Address requirements of permits and agreements
 - Monitoring effort
 - Marine mammal sightings (e.g., species, numbers, locations, age/size/gender, environmental correlates)
 - Description of power downs, shut downs, ramp up delays
 - Analyses of factors influencing detectability of marine mammals
 - Estimate exposure of marine mammals to industry sounds
 - Analyses of effects of seismic operations (e.g., on sighting rates, sighting distances, behaviors, movement patterns)

Marine Mammal Monitoring

- Modeled Sound Radii

Received Sound Level (dB re 1µPa rms)	Water Depth (m)		
	<100	100-1000	>1000
190	600	180	180
180	2,850	660	580
160	27,800	42,200	31,600



4,343 km deeper than 100 m
2,465 km less than 100 m

Legend
BeaufortWest_v6 100 m break
Deep
Greater than 100 meters (4,343 km)
Less than 100 meters (2,465 km)
100 meters

Marine Mammal Monitoring

- Estimated Exposures to ≥ 160 dB rms

Species	Water Depth						Total	
	<200 m		200–1000 m		>1000 m			
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
East survey area								
Odontocetes								
Beluga	48	190	376	1502	965	3859	1388	5551
Harbor porpoise	3	12	1	4	6	25	10	40
Mysticetes								
<i>Bowhead whale</i>	748	2992	7	28	6	25	761	3045
Gray whale	3	12	1	4	6	25	10	40
Minke whale	3	12	1	4	6	25	10	40
<i>Humpback whale</i>	3	12	1	4	6	25	10	40
West survey area								
Odontocetes								
Beluga	7	29	27	107	60	241	94	377
Harbor porpoise	4	18	1	3	4	16	9	36
Mysticetes								
<i>Bowhead whale</i>	114	457	1	2	4	16	119	475
Gray whale	4	18	1	3	4	16	9	36
Minke whale	4	18	1	3	4	16	9	36
<i>Humpback whale</i>	4	18	1	3	4	16	9	36

Marine Mammal Monitoring

- Estimated Exposures to ≥ 160 dB rms

Species	Water Depth						Total	
	<200		200–1000		>1000		Avg.	Max.
	Avg.	Max.	Avg.	Max.	Avg.	Max.		
East survey area								
Ringed seal	2448	9793	773	3093	25	100	3246	12985
Bearded seal	12	47	4	15	25	100	40	161
Spotted seal	3	12	1	4	6	25	10	40
Ribbon seal	3	12	1	4	6	25	10	40
West survey area								
Ringed seal	13072	14955	37800	48510	16	62	50887	63527
Bearded seal	3	11	15	60	16	62	33	133
Spotted seal	1	3	4	15	4	16	8	33
Ribbon seal	1	3	4	15	4	16	8	33

ion

[CHARGED WITH INNOVATION]



vision



evolution



innovation



solution



collaboration