Alaska Outer Continental Shelf

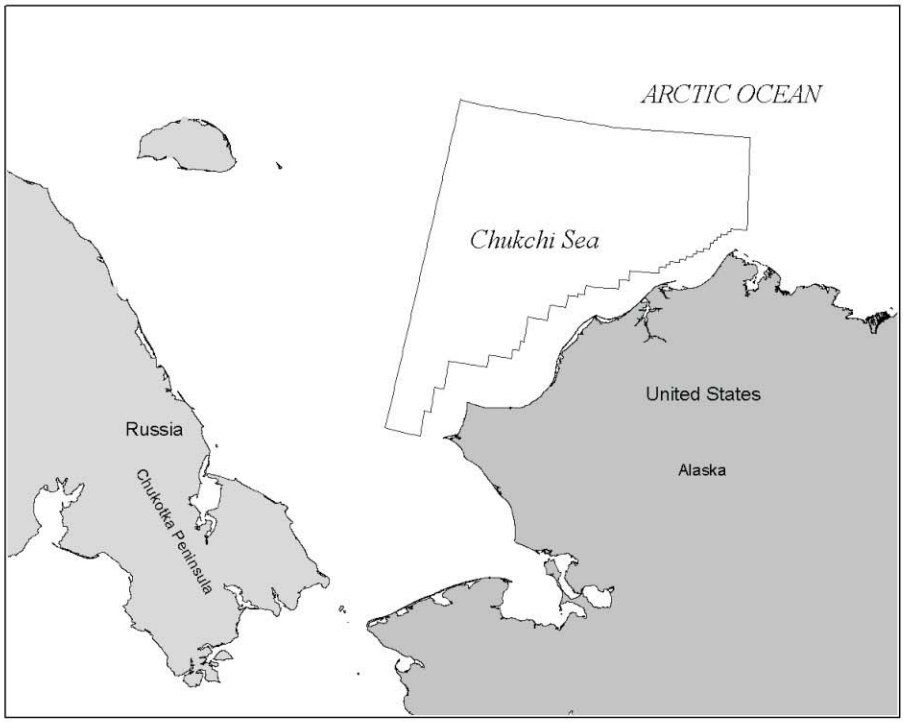
OCS EIS/EA
MMS 2006-060

Chukchi Sea Planning Area

Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea

Draft Environmental
Impact Statement

Volume II
Tables, Figures, Maps, and Appendices



MMS
U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Alaska Outer Continental Shelf

OCS EIS/EA
MMS 2006-060

Chukchi Sea Planning Area
Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea

Final Environmental Impact Statement

Volume II
(Tables, Figures, Maps, and Appendices)

Author
Minerals Management Service
Alaska OCS Region

Cooperating Agency
U.S. Department of Commerce,
National Oceanographic and Atmospheric Administration,
National Marine Fisheries Service

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

October 2006

TABLES, FIGURES, AND MAPS

Tables, Figures, and Maps

Tables

III.A-1	Community Climate Data
III.A-2	Temperature Departure for Barrow and Kotzebue
III.A-3	Mean Occurrence Dates (1996-2004) for Landfast Ice Conditions
III.A-4	Mean and Maximum Polynya Widths
III.A-5	Ambient Air Quality Standards Relevant to the Chukchi Sea Planning Area
III.A-6	Measured Air-Pollutant Concentrations at Prudhoe Bay, Alaska 1986-1995
III.B-1	Fish Resources of Arctic Alaska
III.B-2	Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Sea
III.C-1	Estimated Number of Jobs by Sector, North Slope Borough Residents Only
III.C-2	Employment of Residents by Sector, North Slope Communities, 2003
III.C-3	Employment Estimates (in thousands) (nonagriculture wage and salary employment)
III.C-4	Annual Bowhead Whale Subsistence Harvest for Chukchi Sea Villages, 1982-2005
III.C-5	Annual Beluga Whale Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1980-2005
III.C-6	Annual Walrus Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1985-2005
III.C-7	Annual Polar Bear Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1983-2005
III.C-8	Breakdown of Total Harvest by Subsistence-Harvest Category for Point Hope, Alaska, 1992
III.C-9	Top Five Species Harvested at Point Hope, Alaska during Calendar Year 1992
III.C-10	Participation in Subsistence-Harvest Activities, Point Hope, Alaska, 1992
III.C-11	Point Hope, Amount of Food Consumed Harvested from Local Sources
III.C-12	Point Hope Money Spent on Subsistence Activities, 2003
III.C-13a	Kivalina Marine Mammal Subsistence Harvests
III.C-13b	Kivalina Land Mammal Subsistence Harvests
III.C-13c	Kivalina Fish Subsistence Harvests
III.C-13d	Kivalina Bird Subsistence Harvests
III.C-13e	Kivalina Plant Subsistence Harvests
III.C-14	Importance of Subsistence Foods to Households in NANA Region
III.C-15	Ethnic Composition of Barrow, Atqasuk, Wainwright, Point Lay, and Point Hope – Percent by Race
IV.A-1	Exploration and Development Scenario, Chukchi Sea OCS
IV.A-2a	Possible Timetable for Development
IV.A-2b	Possible Timetable for Production
IV.A-3	Commercial Development Potential for Sale 193 Alternatives
IV.A-4	Large and Small Spill Sizes, Source of Spill, Type of Oil, Number and Size of Spill and Receiving Environment We Assume for Analysis in this EIS by Section
IV.A-5	Small Crude Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193
IV.A-6	Small Refined Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193
IV.C-1	Sale 193 Employment and Personal Income Effects
IV.C-2	Sociocultural Effects from Routine Activities
V-1	Alaska North Slope Oil and Gas Discoveries as of March 2006

V-2 Past Development: 2005 Production and Reserve Date
V-3 Present Development: Estimated Reserve Data
V-4 Future Lease Sales
V-5 Detailed Reserve and Resource Estimates for the Cumulative Analysis
V-6 Trans-Alaska Pipeline System and Proposed Future Natural Gas Projects
V-7a Oil and Gas Production 1969 to December 2005 on the North Slope of Alaska
V-7b Summary of Reserve and Resource Estimates for the Cumulative Analysis
V-7c Detailed Reserve and Resource Estimates for the Cumulative Analysis

Figures

III.A-1 Bathymetry Highs Contiguous to the Sale 193 Area
III.A-2 Coastal Physiography
III.A-3 Surficial Features
III.A-4 Ice Gouging
III.A-5 Distribution of Near-Surface Acoustic Anomalies Possibly Related to Shallow Gas
III.A-6 Barrow Mean Annual Temperature (°F)
III.A-7 Barrow Total Annual Precipitation (in)
III.A-8 Kotzebue Mean Annual Temperature (°F)
III.A-9 Kotzebue Total Annual Precipitation (in)
III.A-10 Mean Annual Temperature Departure for Alaska (1949-2004)
III.A-11 Generalized Maximum Retreat of Sea Ice 1996-2004
III.A-12 Generalized Location of Chukchi Polynyas
III.A-13 Maximum Polynya and Flaw Lead for 1995, 1997, 2003, and 2004
III.A-14 Monthly Recurrence Probability of Leads Derived from All Images for the Time Period 1993-2004.

III.B-1 The Distribution of Average Summer Chlorophyll Concentrations, or the "Greenness" of the Surface Water.
III.B-2 Abundance of Snails and Other Epifaunal Mollusks in the Northeastern Chukchi Sea.
III.B-3 Approximate Distribution of the Western Arctic Stock Bowhead Whales.
III.B-4 Counts of Bowhead Whales in the Chukchi Sea taken by the MMS Bowhead Whale Aerial Survey Project
III.B-5 Approximate Distribution of Fin Whales in the Eastern North Pacific.
III.B-6 Approximate Distribution of Humpback Whales in the Western North Pacific.
III.B-7 Approximate Areas used by Cape Lisburne and Cape Thompson Common and Thick-Billed Murre Colonies when Foraging in Summer and by the Juvenile and Attendant Males during the Postnesting Period
III.B-8 Approximate Sea Duck Migration Distances from Shore for King Eiders, Common Eiders, and Long-Tailed Ducks in Fall
III.B-9 Vegetation and Wetlands within a 50-km Belt from the Chukchi Shoreline

III.C-1 Point Hope Historic Subsistence-Harvest Areas: All Resources/All Seasons
III.C-2 Point Hope Subsistence-Use Areas: Bowhead Whale
III.C-3 Point Hope Subsistence-Use Areas: Seals
III.C-4 Point Hope Subsistence-Use Areas: Walrus
III.C-5 Point Hope Subsistence-Use Areas: Beluga
III.C-6 Point Hope Annual Subsistence Cycle
III.C-7 Point Hope: Changes in Subsistence Activity
III.C-8 The Past and Present Kivalina Hunting Areas for the Eastern Chukchi Sea (Summer) Stock of Beluga
III.C-9 Kivalina Hunting Area for Bowhead Whales
III.C-10 Kivalina Hunting Area for Pacific Walrus
III.C-11 Kivalina Hunting and Feeding Area of Bearded Seals

IV.C-1 Oil-Spill Impacts Model for Selected Fishes using Nearshore/Intertidal Substrates as Spawning and/or Rearing Habitats

Maps

Map 1 Program Area Chukchi Sea Sale 193
Map 2 Corridor I Deferral Chukchi Sea Sale 193
Map 3 Corridor II Deferral Chukchi Sea Sale 193
Map 4 Subsistence-Harvest Areas in the Chukchi Sea Sale 193 Area

Table III.A-1
Community Climate Data

Community	Temperature Range	Average Precipitation	Normal Snow Cover
Point Hope	-49 to 78 ºF	10.0 inches	36 inches
Point Lay	-55 to 78 ºF	6.9 inches	21 inches
Wainwright	-56 to 80 ºF	5.0 inches	12 inches
Barrow	-56 to 78 ºF	5.0 inches	20 inches

Source:
Alaska Department of Commerce, Community Online Database

Table III.A-2
Temperature Trend for Barrow and Kotzebue (1949-2004)

Station Information				Long-term mean, °F (1949 - 2004)					Total change, °F (1949 - 2004)				
Location	**Latitude**	**Longitude**	**Elev. (ft)**	**Annual**	**Spring**	**Summer**	**Autumn**	**Winter**	**Annual**	**Spring**	**Summer**	**Autumn**	**Winter**
Barrow	71°17'	-156°46'	30.8	10.0	1.7	37.4	15.2	-14.2	3.4	4.3	2.6	1.2	5.5
Kotzebue	66°53'	-162°36'	9.8	21.8	15	50.0	24.7	- 2.5	3.3	2.4	2.5	1.0	7.4

Source:
http://climate.gi.alaska.edu/ClimTrends/Change/4904Change.html

Table III.A-3
Mean Occurrence Dates (1996-2004) for Landfast Ice Conditions

	Eicken et al., 2006		Barry et al., 1979		
		Zone 1	Central Chukchi Sea	Central Beaufort Sea	
First Ice*	**Mean**	Dec 01	Early November	Mid-October	First continuous fast ice
	σ'	31.8			
Stable Ice	**Mean**	Feb 23	February	January February	Stable ice inside of 15-m isobath
	σ'	41.9			
Breakup	**Mean**	Jun 04	June 10	June 30	First openings and movement
	σ'	13.9			
Ice Free	**Mean**	Jun 18	July 05	August 01	Nearshore largely free of fast ice
	σ'	12.7			

Source:
Eicken et al. 2006; Barry et al. 1979

Table III.A-4
Mean and Maximum Polynya Widths

Year	Mean Polynya Width		Maximum Polynya Width	
	SSMI/I, km	W/C, km	SSMI/I, km	W/C, km
1990	33	8	94	37
1991	15	13	49	61
1992	29	11	151	39
1993	20	14	81	37
1994	39	12	138	50
1995	10	11	29	47
1996	22	12	128	42
1997	15	14	38	60
1998	15	15	54	47
1999	30	—	114	—
2000	20	—	72	—
2001	27	—	75	—
9-year mean	21.9	12.2	84.6	46.7
9-year σ	±9.8	±2.1	±45.8	±9.1
12-year mean	22.9	—	85.2	—
12-year σ	±8.8	—	±40.3	—

Source
Martin et al., 2004.

Table III.A-5
Ambient Air Quality Standards Relevant to the Chukchi Sea Planning Area

Ambient Air Quality Standards				
Pollutant	**Averaging Period[1]**	**Alaska Standards**	**National Standards[2]**	**Standard Type**
Carbon Monoxide	8-hour	10 mg/m^3	9 ppm (10 mg/m^3)	Primary
	1-hour	40 mg/m^3	35 ppm(40 mg/m^3)	Primary
Nitrogen Dioxide	Annual	100 µg/m^3	.053 ppm (100 µg/m^3)	Primary & Secondary
Ozone	1-hour	235 µg/m^3	—	—
	8-hour	—	.08 ppm (157 µg/m^3)	Primary & Secondary
Lead	Quarterly	1.5 µg/m^3	1.5 µg/m^3	Primary & Secondary
Particulate Matter (PM10)	Annual	50 µg/m^3	50 µg/m^3	Primary & Secondary
	24-hour	150 µg/m^3	150 µg/m^3	Primary & Secondary
Particulate Matter (PM2.5)	Annual	—	15 µg/m^3	Primary & Secondary
	24-hour	—	65 µg/m^3	Primary & Secondary
Sulfur Dioxide	Annual	80 µg/m^3	.03 ppm (80 µg/m^3)	Primary
	24-hour	365 µg/m^3	.014 ppm (365 µg/m^3)	Primary
	3-hour	1300 µg/m^3	.5 ppm (1300 µg/m^3)	Secondary
Reduced Sulfur Compounds	30-minute	50 µg/m^3	—	—
Ammonia	8-hour	2.1 µg/m^3	—	—

Source:
State of Alaska, Dept. of Environmental Conservation (2005), 18 AAC 50.010; U.S. Environmental Protection Agency (40 CFR Part 50)
Notes:
(a dash [—] indicates that no standards have been established)
mg/m^3 = milligrams per cubic meter
µg/m^3 = micrograms per cubic meter
Footnotes:
[1]National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth high 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For $PM_{10,}$ the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is ≤1. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.
[2]Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 °C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25 °C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

Table III.A-6
Measured Air-Pollutant Concentrations at Prudhoe Bay, Alaska 1986-1996

Pollutant[1]	Monitor Sites					
	A[2]	B[3]	C[4]	D[5]	National Standards[6]	Class II Increments[7]
Ozone						
Annual Max. 1 hr	115.8	180.3	115.6	100.0	235	—
Nitrogen Dioxide						
Annual	26.3	11.9	16.0	4.9	100	25
Inhalable Particulate Matter (PM_{10})						
Annual	—	—	10.5	—	50	17
Annual Max. 24 hr	29.3	—	25.0 [8]	—	150	30
Sulfur Dioxide						
Annual	2.6	—	5.2	2.6	80	20
Annual Max. 24 hr	10.5	—	26.2[8]	13.1	365	91
Annual Max. 3 hr	13.1	—	44.5	55.0	1,300	512
Carbon Monoxide						
Annual Max. 8 hr	—	—	1,400	—	10,000	—
Annual Max. 1 hr	—	—	2,500 [8]	—	40,000	—

Sources:
ERT Company, Inc. (1987); Environmental Science and Engineering (1987); ENSR, (1996), as cited in U.S. Army Corps of Engineers (1999)
Note:
(measured in micrograms per cubic meter; absence of data is indicated by a dash [—])
Footnotes:
[1]Lead was not monitored.
[2]Site CCP (Central Compressor Plant), Prudhoe Bay monitoring program, selected for maximum pollutant concentrations. All data are for years 1992-1996.
[3]Site Pad A (Drill Pad A), Prudhoe Bay monitoring program, site of previous monitoring, selected to be more representative of the general area or neighborhood. All data are for years 1992-1996.
[4]Site CPF-1 (Central Processing Facility), Kuparuk monitoring program, selected for maximum pollutant concentrations. Ozone, nitrogen dioxide, and sulfur dioxide are for years 1990-1992; PM_{10} and carbon monoxide data are for 1986-1987.
[5]Site DS-1F, Kuparuk monitoring program site selected to be representative of the general area or neighborhood. All data are for years 1990-1992.
[6]Applicable National Ambient Air Quality Standards. Please refer to Table III.A-5 for more specific definitions of air quality standards.
[7]Class II PSD Standard Increments.
[8]Second highest observed value (in accordance with approved procedures for determining ambient air quality).

Table III-B-1
Fish Resources of Arctic Alaska

Fish Species				Distribution by Large Marine Ecosystem	
Order	**Family**	**Species Name**	**Common Name**	**Beaufort Sea**	**Chukchi Sea**
Petromyzontiformes					
	Petromyzontidae (lampreys)	*Lampetra tridentata*	Pacific lamprey	—	R
		Lampetra camtschatica	Arctic lamprey	W	W
Squaliformes					
	Dalatiidae (sleeper sharks)	*Somniosus pacificus*	Pacific sleeper shark	—	W
	Squalidae (dogfish sharks)	*Squalus acanthias*	spiny dogfish	—	R
Clupeoiformes					
	Clupeidae (herrings)	*Clupea pallasii*	Pacific herring	W	W
Osmeriformes					
	Osmeridae (smelts)	*Mallotus villosus*	capelin	W	W
		Osmerus mordax	rainbow smelt	W	W
Salmoniformes					
	Salmonidae/Coregoninae (whitefishes)	*Stenodus leucichthys*	inconnu	R	—
		Coregonus sardinella	least cisco	W	W
		Coregonus autumnalis	Arctic cisco	W	—
		Coregonus laurettae	Bering cisco	W	W
		Coregonus nasus	broad whitefish	W	W
		Coregonus pidschian	humpback whitefish	W	W
	Salmonidae/Salmoninae (trouts and salmons)	*Salvelinus alpinus*	Arctic char	W	W
		Salvelinus malma	Dolly Varden	W	W
		Oncorhynchus gorbuscha	pink salmon	W	W
		Oncorhynchus kisutch	coho salmon	R	W
		Oncorhynchus tshawytscha	Chinook salmon	R	W
		Oncorhynchus keta	chum salmon	W	W
		Oncorhynchus nerka	sockeye salmon	R	W
Myctophiformes					
	Myctophidae (lanternfishes)	*Benthosema glaciale*	glacier lanternfish	R	—
Gadiformes					
	Gadidae (cods)	*Boreogadus saida*	Arctic cod	W	W
		Arctogadus glacialis	polar cod	R	—
		Arctogadus borisovi	toothed cod	R	—
		Eleginus gracilis	saffron cod	W	W
		Theragra chalcogramma	walleye pollock	—	W
		Gadus ogac	ogac	W	—

Table III.B-1
Fish Resources of Arctic Alaska (continued)

Fish Species				Distribution by Large Marine Ecosystem	
Order	**Family**	**Species Name**	**Common Name**	**Beaufort Sea**	**Chukchi Sea**
Gasterosteiformes					
	Gasterosteidae (sticklebacks)	*Gasterosteus aculeatus*	threespine stickleback	R	R
		Pungitius pungitius	ninespine stickleback	W	W
Scorpaeniformes					
	Hexagrammidae (greenlings)	*Hexagrammos stelleri*	whitespotted greenling	U-R	W
	Cottidae (sculpins)	*Triglops pingelii*	ribbed sculpin	W	W
		Hemilepidotus papilio	butterfly sculpin	—	W
		Hemilepidotus jordani	yellow Irish lord	—	R
		Icelus spatula	spatulate sculpin	W	W
		Icelus bicornis	twohorn sculpin	R	—
		Gymnocanthus tricuspis	Arctic staghorn sculpin	W	W
		Cottus aleuticus	coastrange sculpin	—	LD
		Enophrys diceraus	antlered sculpin	—	W
		Megalocottus platycephalus	belligerent sculpin	—	W
		Myoxocephalus quadricornis	fourhorn sculpin	W	W
		Myoxocephalus scorpius	shorthorn sculpin	W	W
		Myoxocephalus scorpioides	Arctic sculpin	W	W
		Myoxocephalus jaok	plain sculpin	—	W
		Microcottus sellaris	brightbelly sculpin	—	R
		Artediellus gomojunovi	spinyhook sculpin	R	R
		Artediellus scaber	hamecon	W	W
		Artediellus pacificus	hookhorn sculpin	—	R
		Artediellus ochotensis	Okhotsk hookear sculpin	—	R
	Hemitripteridae (sailfin sculpins)	*Blepsias bilobus*	crested sculpin	—	W
		Nautichthys pribilovius	eyeshade sculpin	—	W
	Psychrolutidae (fathead sculpins)	*Eurymen gyrinus*	smoothcheek sculpin	—	R
		Cottunculus sadko	Sadko sculpin	R	—
	Agonidae (poachers)	*Hypsagonus quadricornis*	fourhorn poacher	—	R
		Pallasina barbata	tubenose poacher	—	R
		Occella dodecaedron	Bering poacher	—	R
		Leptagonus decagonus	Atlantic poacher	R	R
		Podothecus veternus	veteran poacher	U-R	R/P

Table III.B-1
Fish Resources of Arctic Alaska (continued)

Fish Species				Distribution by Large Marine Ecosystem	
Order	**Family**	**Species Name**	**Common Name**	**Beaufort Sea**	**Chukchi Sea**
Scorpaeniformes (continued)					
	Agonidae (poachers) (continued)	*Ulcina olrikii*	Arctic alligatorfish	W	W
		Aspidophoroides monopterygius	alligatorfish	—	LD
	Cyclopteridae (lumpsuckers)	*Eumicrotremus derjugini*	leatherfin lumpsucker	R/P	—
		Eumicrotremus andriashevi	pimpled lumpsucker	—	R
	Liparidae (snailfishes)	*Liparis gibbus*	variegated snailfish	W	W
		Liparis tunicatus	kelp snailfish	W	W
		Liparis bristolensis	Bristol snailfish	—	R
		Liparis fabricii	gelatinous seasnail	R/P	—
		Liparis callyodon	spotted snailfish	—	W
Perciformes					
	Zoarcidae (eelpouts)	*Gymnelus hemifasciatus*	halfbarred pout	R/P	R/P
		Gymnelus viridis	fish doctor	R/P	R/P
		Lycodes seminudus	longear eelpout	R	—
		Lycodes mucosus	saddled eelpout	R	R
		Lycodes turneri	estuarine eelpout	R	W
		Lycodes polaris	polar eelpout	W	W
		Lycodes raridens	marbled eelpout	—	W
		Lycodes rossi	threespot eelpout	R	R
		Lycodes sagittarius	archer eelpout	R	—
		Lycodes palearis	wattled eelpout	—	W
		Lycodes pallidus	pale eelpout	R	—
		Lycodes squamiventer	scalebelly eelpout	R	—
		Lycodes eudipleurostictus	doubleline eelpout	R	—
		Lycodes concolor	ebony eelpout	—	R
	Stichaeidae (pricklebacks)	*Eumesogrammus praecisus*	fourline snakeblenny	W	W
		Stichaeus punctatus	Arctic shanny	W	W
		Chirolophis snyderi	bearded warbonnet	—	R
		Leptoclinus maculatus	daubed shanny	R	R
		Anisarchus medius	stout eelblenny	W	W
		Lumpenus fabricii	slender eelblenny	W	W
	Pholidae (gunnels)	*Pholis fasciata*	banded gunnel	—	R
	Anarhichadidae (wolffishes)	*Anarhichas orientalis*	Bering wolffish	W	W
	Ammodytidae (sand lances)	*Ammodytes hexapterus*	Pacific sand lance	W	W

TableIII.B-1
Fish Resources of Arctic Alaska (continued)

Fish Species				Distribution by Large Marine Ecosystem	
Order	**Family**	**Species Name**	**Common Name**	**Beaufort Sea**	**Chukchi Sea**
Pleuronectiformes					
	Pleuronectidae (righteye flounders)	*Hippoglossus stenolepis*	Pacific halibut	—	U-R
		Hippoglossoides robustus	Bering flounder	—	W
		Reinhardtius hippoglossoides	Greenland halibut	R	U-P
		Platichthys stellatus	starry flounder	W	W
		Pleuronectes quadrituberculatus	Alaska plaice	—	W
		Pleuronectes glacialis	Arctic flounder	W	W
		Limanda proboscidea	longhead dab	—	W
		Limanda aspera	yellowfin sole	—	W
		Limanda sakhalinensis	Sakhalin sole	—	U-R

Note

Distribution Keys

LD = Limited distribution relative to available biotope (e.g., continental slope)
R = Rare (<5 records) and disjunct
E = Rare and endemic species
RS = Rare species known occurring only in one LME
R/P = Rare and patchy
U-R = Unverified record-rare and disjunct
U-P = Unverified and patchy
W = Widespread
— = Undocumented, no verified records

Sources:
Mecklenburg, Mecklenburg, and Thorsteinson, 2002; Stevenson,et al., 2004.
.

Table III.B-2
Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas

			Freshwater		Brackish Nearshore			Marine Neritic						Oceanic			Behavioral Stratification						
Species	Common Name	Principle Environment	Fluvial	Lacustrine	Estuarine	Intertidal	0-2m (Infralittoral Fringe)	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Demersal	Bathydemersal	Bentho-Pelagic	1-200m (epipelagic)	201-1000m (mesopelagic)	>1000m (bathypelagic)	cryopelagic
Lampetra tridentata	Pacific lamprey	A	X	X	X	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Lampetra camtschatica	Arctic lamprey	A	X	X	X	X	X	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Somniosus pacificus	Pacific sleeper shark	M	—	—	—	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—	—	—	—
Squalus acanthias	spiny dogfish	M	—	—	—	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—	—	—	—
Clupea pallasii	Pacific herring	M	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—
Mallotus villosus	capelin	M	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—
Osmerus mordax	rainbow smelt	A	X	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—
Stenodus leucichthys	inconnu	FW/A	X	X	X	X	X	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Coregonus sardinella	least cisco	A	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coregonus autumnalis	Arctic cisco	A	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coregonus laurettae	Bering cisco	A	X	—	—	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coregonus nasus	broad whitefish	FW/A	X	X	X	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Coregonus pidschian	humpback whitefish	A	X	—	—	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Salvelinus alpinus	Arctic char	A/FW	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—
Salvelinus malma	Dolly Varden	A	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—
Oncorhynchus gorbuscha	pink salmon	A	X	—	—	X	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—
Oncorhynchus kisutch	coho salmon	A	X	—	—	X	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—
Oncorhynchus tshawytscha	Chinook salmon	A	X	—	—	X	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—
Oncorhynchus keta	chum salmon	A	X	—	—	X	X	X	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—
Oncorhynchus nerka	sockeye salmon	A	X	X	X	X	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—
Benthosema glaciale	glacier lanternfish	M	—	—	—	—	—	—	—	—	—	X	X	X	X	X	—	—	—	—	—	—	—
Boreogadus saida	Arctic cod	M	—	—	—	X	—	—	X	X	X	X	X	X	X	—	—	X	—	—	—	—	—
Arctogadus glacialis	polar cod	M	—	—	—	—	—	—	X	X	X	X	X	X	X	—	—	X	—	—	—	—	—
Arctogadus borisovi	toothed cod	B/M	—	—	—	—	—	—	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—
Eleginus gracilis	saffron cod	M	X	—	—	X	X	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Theragra chalcogramma	walleye pollock	M	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—	—
Gadus ogac	ogac	M	—	—	—	—	—	X	X	X	X	—	—	—	—	—	X	X	—	—	—	—	—
Gasterosteus aculeatus	threespine stickleback	A/FW	X	X	X	X	X	X	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
Pungitius pungitius	ninespine stickleback	A/FW	X	X	X	X	X	X	X	X	—	—	—	—	—	—	X	—	X	—	—	—	—
Hexagrammos stelleri	whitespotted greenling	M	—	—	—	X	X	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Triglops pingelii	ribbed sculpin	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Hemilepidotus papilio	butterfly sculpin	M	–	–	–	X	X	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Hemilepidotus jordani	yellow Irish lord	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Icelus spatula	spatulate sculpin	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Icelus bicornis	twohorn sculpin	M	–	–	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–	–	–	–	–

Table III.B-2
Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas. (continued)

			Freshwater		Brackish			Marine									Behavioral Stratification						
					Nearshore			Neritic						Oceanic									
Species	Common Name	Principle Environment	Fluvial	Lacustrine	Estuarine	Intertidal	0-2m (Infralittoral Fringe)	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Demersal	Bathydemersal	Bentho-Pelagic	1-200m (epipelagic)	201-1000m (mesopelagic)	>1000m (bathypelagic)	cryopelagic
Gymnocanthus tricuspis	Arctic staghorn sculpin	M	—	—	—	—	—	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Cottus aleuticus	coastrange sculpin	B/FW	X	X	X	X	X	—	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Enophrys diceraus	antlered sculpin	M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Megalocottus platycephalus	belligerent sculpin	B	X	—	X	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Myoxocephalus quadricornis	fourhorn sculpin	B/M/FW	X	—	X	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Myoxocephalus scorpius	shorthorn sculpin	B/M	—	—	X	X	X	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Myoxocephalus scorpioides	Arctic sculpin	B/M	—	—	X	X	X	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Myoxocephalus jaok	plain sculpin	M	—	—	—	X	X	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Microcottus sellaris	brightbelly sculpin	B/M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Artediellus gomojunovi	spinyhook sculpin	M	—	—	—	—	—	X	X	X	X	X	—	—	—	—	X	—	—	—	—	—	—
Artediellus scaber	hamecon	B/M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Artediellus pacificus	hookhorn sculpin	M	—	—	—	—	—	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Artediellus ochotensis	Okhotsk hookear sculpin	M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Blepsias bilobus	crested sculpin	M	—	—	—	—	—	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Nautichthys pribilovius	eyeshade sculpin	M	—	—	—	—	—	X	X	X	X	X	—	—	—	—	X	—	—	—	—	—	—
Eurymen gyrinus	smoothcheek sculpin	M	—	—	—	—	—	X	X	X	X	X	—	—	—	—	X	—	—	—	—	—	—
Cottunculus sadko	Sadko sculpin	M	—	—	—	—	—	—	—	—	X	X	X	X	—	—	X	—	—	—	—	—	—
Hypsagonus quadricornis	fourhorn poacher	M	—	—	—	—	—	X	X	X	X	X	—	—	—	—	X	—	—	—	—	—	—
Pallasina barbata	tubenose poacher	M	—	—	—	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Occella dodecaedron	Bering poacher	M	—	—	—	—	—	X	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Leptagonus decagonus	Atlantic poacher	M	—	—	—	—	—	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Podothecus veternus	veteran poacher	M	—	—	—	—	—	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Ulcina olrikii	Arctic alligatorfish	B/M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Aspidophoroides monopterygius	alligatorfish	M	—	—	—	—	—	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Eumicrotremus derjugini	leatherfin lumpsucker	M	—	—	—	—	—	—	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Eumicrotremus andriashevi	pimpled lumpsucker	M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Liparis gibbus	variegated snailfish	M	—	—	—	—	—	X	X	X	X	—	—	—	—	—	X	—	—	—	—	—	—
Liparis tunicatus	kelp snailfish	M	—	—	—	—	—	X	X	X	—	—	—	—	—	—	X	—	—	—	—	—	—
Liparis bristolensis	Bristol snailfish	M	—	—	—	—	—	X	X	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Gymnelus viridis	fish doctor	M	–	–	–	X	X	X	X	X	X	–	–	–	–	–	X	–	–	–	–	–	–
Lycodes seminudus	longear eelpout	M	–	–	–	–	–	–	–	X	X	X	X	–	–	–	X	–	–	–	–	–	–
Lycodes mucosus	saddled eelpout	M	–	–	–	–	–	X	X	–	–	–	–	–		–	X	–	–	–	–	–	–
Lycodes turneri	estuarine eelpout	M	–	–	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–	–	–	–	–
Lycodes polaris	polar eelpout	M	–	–	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–	–	–	–	–

Table III.B-2

Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas. (continued)

			Freshwater		Brackish			Marine									Behavioral Stratification						
					Nearshore			Neritic						Oceanic									
Species	Common Name	.Principle Environment	Fluvial	Lacustrine	Estuarine	Intertidal	0-2m (Infralittoral Fringe)	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Demersal	Bathydemersal	Bentho-Pelagic	1-200m (epipelagic)	201-1000m (mesopelagic)	>1000m (bathypelagic)	cryopelagic
Lycodes raridens	marbled eelpout	M	–	–	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–	–	–	–	–
Lycodes rossi	threespot eelpout	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Lycodes sagittarius	archer eelpout	M	–	–	–	–	–	–	–	–	–	X	X	–	–	–	X	–	–	–	–	–	–
Lycodes palearis	wattled eelpout	M	–	–	–	–	–	X	X	X	–	–		–	–	–	X	–	–	–	–	–	–
Lycodes pallidus	pale eelpout	M	–	–	–	–	–	X	X	X	X	X	X	X	X	–	X	X	–	–	–	–	–
Lycodes squamiventer	scalebelly eelpout	M	–	–	–	–	–	–	–	–	–	X	X	X	X	–	X	X	–	–	–	–	–
Lycodes eudipleurostictus	doubleline eelpout	M	–	–	–	–	–	X	X	X	X	–	–	–	–	–	X	–	–	–	–	–	–
Lycodes concolor	ebony eelpout	M	–	–	–	–	–	X	X	X	X	X	X	X	X	–	X	X	–	–	–	–	–
Eumesogrammus praecisus	fourline snakeblenny	M	–	–	–	–	–	X	X	X	X	X		–	–	–	X	–	–	–	–	–	–
Stichaeus punctatus	Arctic shanny	M	–	–	–	–	–	X	X	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Chirolophis snyderi	bearded warbonnet	M	–	–	–	–	–	X	X	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Leptoclinus maculatus	daubed shanny	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Anisarchus medius	stout eelblenny	M	–	–	–	–	–	X	X	X	–	–	–	–	–	–	X	–	–	–	–	–	–
Lumpenus fabricii	slender eelblenny	M	–	–	–	X	X	X	X	–	–	–		–	–	–	–	–	X	–	–	–	–
Pholis fasciata	banded gunnel	M	–	–	–	–	–	X	–	–	–	–	–	–		–	X	–	–	–	–	–	–
Anarhichas orientalis	Bering wolffish	M	–	–	–	–	–	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Ammodytes hexapterus	Pacific sand lance	M	–	–	–	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hippoglossus stenolepis	Pacific halibut	M	–	–	–	–	–	X	X	X	X	X	X	X	X	–	X	–	–	–	–	–	–
Hippoglossoides robustus	Bering flounder	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Reinhardtius hippoglossoides	Greenland halibut	M	–	–	–		–	X	X	X	X	X	X	X	X	–	X	–	–	–	–	–	–
Platichthys stellatus	starry flounder	M/B	X	–	X	X	X	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Pleuronectes quadrituberculatus	Alaska plaice	M	–	–	–	–	–	X	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–
Pleuronectes glacialis	Arctic flounder	B/M	X	–	X	–	X	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Limanda proboscidea	longhead dab	M	X	–	X	–	X	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Limanda aspera	yellowfin sole	M	X	–	X	–	X	X	X	X	X	X	X	–	–	–	X	–	–	–	–	–	–
Limanda sakhalinensis	Sakhalin sole	M	X	–	X	–	X	X	X	X	–	X	–	X	–	–	X	–	–	–	–	–	–

Sources:

Moulton and George, 2000; Mecklenburg, Mecklenburg, and Thorsteinson, et al., 2002; Froese and Pauly, 2003.

Note:

– = Absent	**B** = Brackish	**M** = Marine
A = Anadromous	**FW** = Freshwater	**X** = Present

Table III.C-1
Estimated Number of Jobs by Sector, North Slope Borough Residents Only

	1980	1988	1993	1998	2003
Federal Government	100	83	37	39	61
State Government	12	20	25	35	26
City Government	—	71	61	57	66
NSB Government	642	1,087	893	989	777
NSB School District	—	419	345	289	409
Private Construction	201	95	21	66	43
Regional/Village Corporation		311	304	407	383
Transportation	107	122	45	43	53
Oil Industry	30	46	21	16	23
Service	71	84	53	83	108
Other	176	168	138	368	242
Total	**1,689**	**2,506**	**1,943**	**2,392**	**2,191**

Sources:
NSB = North Slope Borough
Notes:
1) 1980 data from Alaska Consultants, Inc., 1981.
2) 1988, 1993, 1998, and 2003 data are from North Slope Borough Economic Profile and Census Reports.

Table III-Economics-2
Employment of Residents by Sector, North Slope Communities, 2003

Sector	Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Federal Government	1	0	45	1	0	10	2	2
State Government	2	0	22	0	1	0	1	0
City Government	12	1	21	3	5	14	2	8
NSB Government	51	20	464	27	29	44	24	48
NSB School District	30	20	194	21	27	62	29	44
NSB CIP	0	0	4	0	2	0	1	3
Oil Industry	3	0	14	1	3	2	0	0
Private Construction	4	0	23	5	3	1	4	4
ASRC	3	0	69	5	3	1	4	3
Village Corporation	19	27	87	18	37	60	9	38
Finance	0	0	5	0	0	0	1	0
Transportation	0	0	48	0	1	3	1	1
Communication	0	0	8	0	0	0	0	0
Trade	0	1	27	0	0	2	0	1
Service	4	0	103	0	0	0	1	0
Ilkisagvik College	0	0	58	0	0	2	1	1
Other	2	3	132	3	10	25	5	18
Total	**131**	**72**	**1,324**	**84**	**121**	**226**	**85**	**171**

Source:
2003 Economic Profile and Census Report, Volume IX, Department of Planning and Community Service North Slope Borough.

Table III.C-3
Employment Estimates (In thousands) (nonagricultural wage and salary employment)

	1995	1996	1997	1998	1999	2000	2005
Anchorage-Mat Su Region	131	132	135	141	144	148	157
Kenai Peninsula Borough	16	16	16	17	17	17	16
Fairbanks North Star Borough	31	31	32	33	33	34	36
Total for 3 Areas	178	178	183	191	194	199	209
Alaska Total	**261**	**261**	**269**	**275**	**278**	**284**	**292**

Source:
Alaska Department of Labor and Workforce Development, Research and Analysis Section.

Table III.C-4
Annual Bowhead Whale Subsistence Harvest for Chukchi Sea Villages, 1982-2005

Year	Barrow	Wainwright	Point Hope	Kivalina
1982	0	2	1	0
1983	2	2	1	0
1984	4	2	2	1
1985	5	2	1	0
1986	8	3	2	0
1987	7	4	5	1
1988	11	4	5	0
1989	10	2	0	0
1990	11	5	3	0
1991	12	4	6	1
1992	22	0	2	1
1993	23	5	2	0
1994	16	4	5	2
1995	19	5	1	1
1996	24	3	3	0
1997	30	3	4	0
1998	25	3	3	0
1999	24	5	2	0
2000	18	5	3	0
2001	27	6	4	0
2002	22	1	0	0
2003	16	5	4	0
2004	21	4	3	0
2005	29	3	7	0

Sources:
S.R. Braund and Assocs. 1984; Stoker and Krupnik, 1993; AEWC, 1993, 1994, 1995; Philo et al., 1994; Suydam et al., 1995; S.R. Braund and Assocs. 2002; S.R. Braund and Assocs. and North Slope Borough Department of Wildlife Management, 2006.

Table III.C-5
Annual Beluga Whale Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1980-2005

Year	Number of Whales				
	Barrow	Wainwright	Point Lay	Point Hope	Kivalina
1980	0	0	15-18	23-35	3-5
1981	5	0	29-38	4-7	10-15
1982	3-5	0	28-33	17	4-5
1983	3	0	18	20-31	24
1984	0	0	0	30	27
1985	0	0	18	30	120-200
1986	0	5	33	30	7
1987	0	47	22-35	40	4
1988	0	3	40	59	6
1989	1	0	16	17	0
1990	0	0	62	16	1
1991	1	5	35	39	1
1992	0	20	24	15	10
1993	2	0	77	79	3
1994	5	0	56	53	3
1995	0	0	31	40	3
1996	2	0	41	15	7
1997	8	4	3	32	1
1998	1	38	48	52	0
1999	1	3	47	33	1
2000	1	0	0	16	44
2001	1	23	34	24	0
2002	1	37	47	23	3
2003	2	38	36	34	0
2004	1	0	53	29	1
2005	7	1	41	?	2

Sources:
Alaska Beluga Whale Committee [ABWC], 2002, 2006, Fuller and George, 1997; Lowry et al., 1989; Burns and Frost, 1989; Impact Assessment, 1989; Burns and Seaman, 1986; Braund and Burnham, 1984.

Table III.C-6
Annual Walrus Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1985-2005

Harvest Season	Number of Walrus				
	Barrow	Wainwright	Point Lay	Point Hope	Kivalina
1985	--	--	--	--	--
1986	--	--	--	--	--
1987	54	--	6	--	--
1988	1-62	0-59	0	--	--
1989	14	43	0	2	46
1990	7	0	0	5	0
1991	23	32	0	0	0
1992	26	48	0	5	1
1993	27	44	1	5	12
1994	16	68	1	6	16
1995	12	83	4	0	38
1996	13	24	4	0	13
1997	48	50	7	3	2
1998	24	69	8	5	0
1999	17	48	6	5	0
2000	19	36	6	6	0
2001	37	94	3	2	0
2002	39	119	11	16	0
2003	51	29	9	12	0
2004	52	47	5	20	0
2005	5	21	5	0	4

Sources:
USDOI, FWS, 1997, 2002; FWS, MTRP Tagging Database, 1989-2005; Braund, 1993; Braund and Burnham, 1984; CPDB, 1996; Fuller and George, 1997.

Table III.C-7
Annual Polar Bear Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1983-2005

Harvest Season*	Number of Bears				
	Barrow	Wainwright	Point Lay	Point Hope	Kivalina
1983/84	27	34	8	30	3
1984/85	33	18	0	18	3
1985/86	14	8	6	17	2
1986/87	18	13	4	13	1
1987/88	15	9	2	9	5
1988/89	29	14	2	9	1
1989/90	14	9	1	23	5
1990/91	14	6	3	18	3
1991/92	22	3	0	9	2
1992/93	26	8	3	17	1
1993/94	30	10	1	8	1
1994/95	11	7	1	20	2
1995/96	18	14	1	7	0
1996/97	40	9	6	14	0
1997/98	18	6	3	12	0
1998/99	16	2	0	18	3
1999/00	17	5	4	10	0
2000/01	28	10	1	15	1
2001/02	25	2	1	9	0
2002/03	20	5	1	12	1
2003/04	10	13	3	10	0
2004/05	2	5	4	9	2
2005/06***	?	?	?	?	?

Source:
Schliebe, Amstrup, and Garner, 1995; Schliebe, 2006.
Notes:
* Harvest runs from 1 July to 30 June.
** Atqasuk harvested 2 bears during the 1988/89 season.
*** Harvest season incomplete.

Table III.C-8
Breakdown of Total Harvest by Subsistence-Harvest Category for Point Hope, Alaska, 1992. The 1993 Population of Point Hope was 699; The Total Number of Households was 156.

Subsistence Harvest Category	Total Weight	Pounds Per Household	Pounds Per Capita
Birds	9,429	60	13
Fish	30,589	196	44
Invertebrates	88	1	0
Marine Mammals	262,009	1,680	375
Plants	2,720	17	4
Terrestrial Mammals	35,548	228	51
Total	340,383	2,182	487

Source:
Fuller and George, 1997.

Table III.C-9
Top Five Species Harvested at Point Hope, Alaska during Calendar Year, 1992

Top Five Species Harvested	Edible Pounds Harvested	Number Harvested	Pounds Per Household	Pounds Per Capita	Percent of Total Harvest
Beluga	137,172	98	879	196	40.3%
Walrus	55,797	72	358	80	16.4%
Bearded Seal	28,242	160	181	40	8.3%
Caribou	26,303	225	169	38	7.7%
Bowhead	23,365	3	150	33	6.9%

Source:
Fuller and George, 1997.

Table III.C-10
Participation in Subsistence Harvest Activities, Point Hope Alaska, 1992, of 156 Households, 142 Households Participated in This Survey

Activity	Often	Sometimes	Sometimes	Not at All	% Often	% Sometimes	% Vacation	% Not at All
Fall Whaling	4	5	0	133	3%	4%	0%	94%
Fish	86	29	1	26	61%	20%	1%	18%
Helped Whaling Crew	92	27	2	21	55%	19%	1%	15%
Hunt Caribou	71	27	1	43	50%	19%	1%	30%
Hunt Moose, Bear, or Sheep	35	27	2	78	25%	19%	1%	55%
Hunt Seal	78	29	0	35	55%	20%	0%	25%
Hunt Walrus	70	33	0	39	49%	23%	0%	27%
Hunt Waterfowl and Eggs	81	27	1	33	57%	19%	1%	23%
Make Sleds or Boats	53	26	0	63	37%	18%	0%	44%
Pick Berries	81	39	1	21	57%	27%	1%	15%
Sew Skins, Make Parkas	49	35	0	58	35%	25%	0%	41%
Spring Whaling	98	16	4	24	69%	11%	3%	17%
Trap	14	22	0	106	10%	15%	0%	75%

Source:
Fuller and George, 1997.

Table III.C-11
Point Hope, Amount of Food Consumed Harvested from Local Sources*

Amount	1998		2003	
	Number	Percent	Number	Percent
None	4	2.9%	10	7.0%
Very Little	11	8.2%	16	11.3%
Less Than Half	23	17.2%	23	16.2%
Half	34	25.4%	28	19.7%
More Than Half	34	25.4%	30	21.1%
Nearly All	19	14.2%	15	10.6%
All	9	6.7%	20	14.1%
Total	134	100%	142	100%

Note:
* Results include only those households responding to the census survey and the query about the amount of subsistence harvested by the household.
Source:
Fuller and George, 1997.

Table III.C-12
Point Hope Money Spent on Subsistence Activities, 2003

Amount	Number	Percent
$0 to $100	27	22.5%
$200 to $400	9	7.5%
$500 to $700	10	8.3%
$800 to $1,200	11	9.2%
$1,200 to $3,000	22	18.3%
$3,100 to $9,500	22	18.3%
$9,600 to$20,000	18	15.1%
$21,000$	1	0.8%
Total	**120**	100%

Note:
Results include only those households responding to the census and the questions about money spent on subsistence.
Source:
Fuller and George, 1997.

Table III.C-13a
Kivalina Marine Mammal Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992

Resource	Number Taken				
	1964-1965	1965-1966	1982-1983	1983-1984	1991-1992
Bearded seal	153	119	134	60	139
Spotted seal	4	1	1	1	30
Ringed seal	908	467	172	109	110
Ribbon seal	NR	NR	1	NR	8
Walrus	0	3	51	4	28
Beluga	6	12	27	28	10
Bowhead whale [a]	0	0	0	1	1
Gray whale	0	0	0	part of carcass	0
Polar bear	NR	1	NR	2	8

Notes:
[a] Two additional bowhead whales were taken in 1994.
NR None reported.

Table III.C-13b
Kivalina Land Mammal Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992

Resource	Number Taken				
	1964-1965	1965-1966	1982-1983	1983-1984	1991-1992
Caribou	256	1,010	346	564	351
Moose	NR	4	6	6	17
Grizzly	1	2	NR	2	3
Fox	6	19	47	58	21
Sheep	NR	NR	2	NR	U
Wolf	1	1	NR	1	9
Wolverine	17	21	12	10	23
Lynx	NR	6	1	NR	0
Porcupine	1	1	1	NR	0
Mink	NR	1	NR	NR	2
Otter	NR	NR	1	NR	2
Hare	NR	NR	NR	NR	0
Squirrel	NR	NR	3	53	10

Notes:
NR None reported.

Table III.C-13c
Kivalina Fish Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992

Resource	Pounds Taken				
	1964-1965	1965-1966	1982-1983	1983-1984	1991-1992
Char	93,995	28,140	69,059	68,467	69,792
Cod	NR	6,955	9	4,299	6,095
Burbot	NR	2	2	2	516
Grayling	NR	40	290	968	644
Salmon	1,425	116	464	2,107	5,081
Whitefish	2,500	13	100	1,608	4,662
Sculpin	ND	ND	9	9	ND
Smelt	ND	ND	ND	20	22

Notes:
ND No data collected.
NR None reported.

Table III.C-13d
Kivalina Bird Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992

Resource	1964-1965 Number Taken	1965-1966 Number Taken	1982-1983 Number Taken	1983-1984 Number Taken	1991-1992 Number Taken
Geese	ND	ND	215	387	944
Ducks	ND	ND	134	210	609
Ptarmigan	ND	16	46	242	637
Cranes	ND	ND	4	4	12
Snowy Owls	ND	ND	15	26	29
Swans	ND	ND	1	NR	0
Murres	ND	10	ND	18	ND

Notes:
ND No data collected.
NR None reported.

Table III.C-13e
Kivalina Plant Subsistence Harvests for 1964-1965, 1984, 1965-1966. 1982-1983, 1983-1984, and 1991-1992

Resource	1964-1965 lbs taken	1965-1966 lbs taken	1982-1983 lbs taken	1983-1984 lbs taken	1991-1992 lbs taken
Blackberries	550	181	457	591	See mixed
Sourdock	260	213	85	NR	See mixed
Eskimo Potato	ND	ND	40	NR	See mixed
Salmonberries	ND	ND	1,721	14	See mixed
Blueberries	ND	ND	461	488	See mixed
Mixed	370 (salmonberries, blackberries, sourdock)	283 (berries)	ND	ND	4,615 (recorded as berries, not as type)

Notes:
ND No data collected.
NR None reported.
Sources of data for Tables III.C-14a-14e:
Burch, 1985. Also, Alaska Department of Fish and Game Community Profile Database.

Table III.C-14
Importance of Subsistence Foods to Households in NANA Region (Indicated by:
"How Much of Your Own Food Did Your Family Catch, Hunt. Or Fish for This Year?"

Response	Kivalina	Noatak	Kotzebue
"All of our food"	5.6%	—	5.6%
"Most of our food"	L6.7%	57.1%	14.9%
Half of our food"	38.9%	28.6%	16.1%
"Some of our food"	38.9%	14.3%	49.1%
"None of our food"	—	—	14.3%
Total	100.0%	100.0%	100.0%

Source:
NANA Regional Strategy, Community Survey, 1978, as reported in Red Dog Mine Project EIS, February, 1984.
Draft EIS Navigation Improvements Delong Mountain Terminal, Alaska.

Table III.C-15
Ethnic Composition of Barrow, Atqasuk, Wainwright, Point Lay, and Point Hope—Percent by Race

	State of Alaska		Barrow		Atqasuk		Wainwright		Point Lay		Point Hope	
	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent
Total	626,932		4,581		228		546		247		757	
Hispanic or Latino	25,852	4.1	153	3.3	0	0.0	0	0.0	6	2.4	13	1.7
Not Hispanic or Latino	601,080	95.9	4,428	96.7	228	100	546	100	241	97.5	744	98.2
Population of one race	570,626	91.0	4,063	88.7	227	99.6	531	97.2	233	94.3	728	96.1
White	423,788	67.6	972	21.2	11	4.8	37	6.7	28	11.3	66	8.7
Black or African-American	21,073	3.4	44	1.0	0	0.0	1	0.2	0	0.0	1	0.1
American Indian or Alaska Native	96,505	15.4	2,558	55.8	215	94.3	493	90.2	204	82.5	659	87.0
Asian	24,741	3.9	429	9.4	1	0.4	0	0.0	1	0.4	1	0.1
Native Hawaiian and Pacific Islander	3,181	0.5	59	1.3	0	0.0	0	0.0	0	0.0	0	0.0
Some other race	1,388	0.2	1	0.0	0	0.0	0	0.0	0	0.0	1	0.1
Two or more races	30,454	4.9	365	8.0	1	0.4	15	2.7	14	5.6	29	3.8

Source:
Census Table SF-1, http://146.63.75.45/census2000/Census_Iv2.asp

Table IV.A-1
Exploration and Development Scenario, Chukchi Sea OCS

Scenario Element	Range	Comments
Oil production (billion barrels)	1	First development project only
Natural gas production	0	Delayed for North Slope gas line; reinjected
Exploration wells	3-6	2-5 wells are dry holes or subcommercial shows
Delineation wells	4-8	Confirm and define the commercial discovery
Production platforms	1	Central platform with processing facility; supports 4-20 subsea satellite templates
Production wells	80-120	Total includes 20-80 subsea production wells
Service wells	20-40	All service wells are on platform
In-field flowlines (miles)	10-50	Gathering system from subsea wells
Offshore sales pipeline (miles)	30-150	Possible distance to landfall
Onshore sales pipeline (miles)	Up to 300	Connecting to existing/future North Slope pipelines
Peak production (thousand barrels per day)	200-250	Oil production only; associated gas is reinjected
New landfall	1	Point Belcher near Wainwright
New support shore base	1	Point Belcher near Wainwright
New processing facility	1	Collocated with shore base
New waste facility	1	Collocated with shore base
Drilling-fluid discharge by exploration wells (tons)	665-1330	475 tons/well with 80% recycled for all exploration and delineation wells (95 tons discharged for 7-14 wells)
Rock-cutting discharge by exploration wells (tons)	4200-8400	600 tons/well (7-14 wells total)
Discharges during development drilling	0	80% of drilling fluids are recycled; remaining waste fluids and rock cuttings for on-platform wells will be disposed of in service wells. Drilling wastes from subsea wells will be barged to an onshore disposal facility.
Years of activity	30-40	Period from lease sale to end of oil production

Source:
USDOI, MMS

Year	Seismic Surveys	Exploration Wells	Delineation Wells	Exploration Drilling Rigs	Production Platforms	On-Platform Wells	Subsea Wells	Service Wells	Production Drilling Rigs	In-Field Flowlines (miles)	Offshore Pipelines (miles)	New Shorebases	Annual Oil Production (MMbbl)	Daily Oil Production (bopd)
2005														
2006	4													
2007	4													
2008	4													
2009	3	1		1										
2010	3	1		1										
2011	2		2	1										
2012	1		2	1										
2013	1		2	1										
2014	1	1		1										
2015	1	1		1								1		
2016	1													
2017											30			
2018											30			
2019							8		2	5	30			
2020					1	6	8	3	3	5			54.0	147,945
2021						18	8	5	4	5			70.0	191,781
2022						18	8	5	4	5			82.0	224,658
2023						18	8	5	4	5			82.0	224,658
2024						10	8	6	3	5			82.0	224,658
2025						10		4					82.0	224,658
2026													72.2	197,699
2027													63.5	173,975
2028													55.9	153,098
2029													49.2	134,726
2030													43.3	118,559
2031													38.1	104,332
2032													33.5	91,812
2033													29.5	80,795
2034													26.0	71,099
2035													22.8	62,567
2036													20.1	55,059
2037													17.7	48,452
2038													15.6	42,638
2039													13.7	37,521
2040													12.1	33,019
2041													10.6	29,057
2042													9.3	25,570
2043													8.2	22,501
2044													7.2	19,801
2045														
2046														
2047														
	25	4	6	7	1	80	48	28	20	30	90		1000	

notes: (1 mo/yr) (4 mo/yr) (30 inj wells) (rig/years)

.

T

Table IV.A-2a. Possible Timetable for Development

Year	Seismic Surveys	Exploration Wells	Delineation Wells	Exploration Drilling Rigs	Production Platforms	On-Platform Wells	Subsea Wells	Service Wells	Production Drilling Rigs	In-Field Flowlines (miles)	Offshore Pipelines (miles)	New Shorebases	Annual Oil Production (MMbbl)	Daily Oil Production (bopd)
2005														
2006	4													
2007	4													
2008	4													
2009	3	1		1										
2010	3	1		1										
2011	2		2	1										
2012	1		2	1										
2013	1		2	1										
2014	1	1		1										
2015	1	1		1								1		
2016	1													
2017											30			
2018											30			
2019							8		2	5	30			
2020					1	6	8	3	3	5			54.0	147,945
2021						18	8	5	4	5			70.0	191,781
2022						18	8	5	4	5			82.0	224,658
2023						18	8	5	4	5			82.0	224,658
2024						10	8	6	3	5			82.0	224,658
2025						10		4					82.0	224,658
2026													72.2	197,699
2027													63.5	173,975
2028													55.9	153,098
2029													49.2	134,726
2030													43.3	118,559
2031													38.1	104,332
2032													33.5	91,812
2033													29.5	80,795
2034													26.0	71,099
2035													22.8	62,567
2036													20.1	55,059
2037													17.7	48,452
2038													15.6	42,638
2039													13.7	37,521
2040													12.1	33,019
2041													10.6	29,057
2042													9.3	25,570
2043													8.2	22,501
2044													7.2	19,801
2045														
2046														
2047														
	25	4	6	7	1	80	48	28	20	30	90		1000	
notes:	(1 mo/yr)			(4 mo/yr)		(30 inj wells)			(rig/years)					

Table IV.A-2b. Possible Timetable for Production.

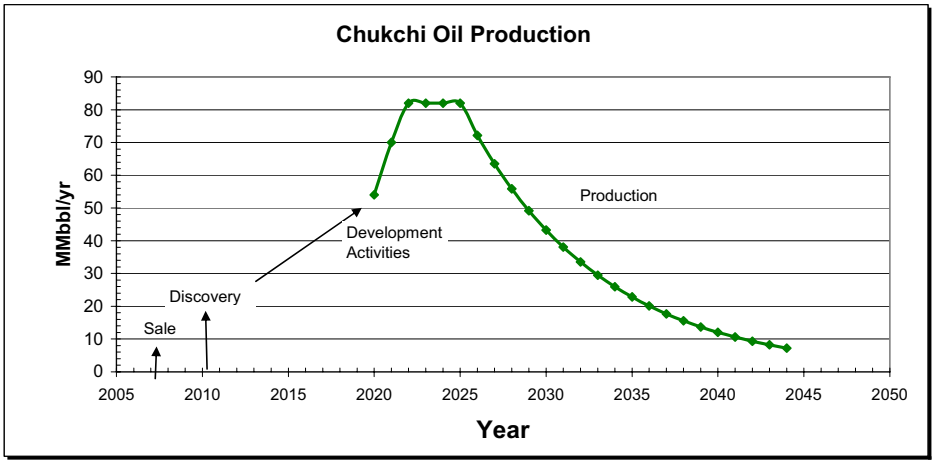


Table IV.A-3
Commercial Development Potential for Sale 193 Alternatives

Chukchi Sea, Sale 193 Alternatives	Opportunity Index (Commercial Chance)
Alternative 1 (Full Program Area Proposal)	1.0
Alternative 2 (No Lease Sale)	0.0
Alternative 3 (Corridor I Deferral)	0.64
Alternative 4 (Corridor II Deferral)	0.85

Table IV.A-4
Large and Small Spill Sizes, Source of Spill, Type of Oil, Number and Size of Spill and Receiving Environment We Assume for Analysis in this EIS by Section

EIS Section	Source of Spill	Type of Oil	Number and Size of Spill(s)	Receiving Environment
Large Spills (≥1,000 barrels)				
IV.C	**Offshore** Pipeline Platform/Storage Tank	Crude Or Diesel	1 spill 4,600 Or 1,500 barrels	Open Water Under Ice On Top of Sea Ice Broken Ice Coastal Shoreline
Small Spills[1] (< 1,000 barrels)				
IV.C	**Offshore and/or Onshore** Operational Spills from All Sources	Diesel or Crude	133 spills <1 barrel 43 spills ≥1 barrel but <25 barrels 2 spills ≥25 and <500 barrels 1 spill ≥500 and <1,000 barrels	Open Water On Top of Sea Ice Broken Sea Ice Snow/Ice Tundra Coastal Shoreline
	Onshore and/or Offshore			
	Operational Spills from All Sources	Refined	440 spills of 0.7 barrels each	

Table IV.A-5
Small Crude Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193

Sale 193 Alternative	Assumed Small Crude-Oil Spills <500 barrels				
	Resources (Bbbl)[1]	**Spill Rate (Spills/Bbbl)**	**Assumed Spill Size (bbl)**	**Estimated Number of Spills**	**Estimated Total Spill Volume (bbl)**
I Proposed Action	1	178	3	178	534
II No Lease Sale	0	178	3	0	0
III Corridor I	0.640	178	3	114	342
IV Corridor II	0.845	178	3	152	453
Alternative	**Assumed Small Crude-Oil Spills ≥ 500 and ≤1,000 barrels**				
I Proposed Action	1	0.64	680	0.64	680
II No Sale	0	0.64	680	0	0
III Corridor I	0.640	0.64	680	0.41	680
IV Corridor II	0.845	0.64	680	0.54	680

Note:
[1]The estimation of oil spills is based on the estimated resources. If these resources are not produced then no oil spills occur.
Source:
USDOI, MMS, Alaska OCS Region (2006).

Table IV.A-6
Small Refined Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193

Sale193 and its Alternatives	Resource Range (Bbbl)	Spill Rate (Spills/Bbbl)	Average Spill Size (bbl)	Estimated Number of Spills[1]	Estimated Total Spill Volume (bbl)[1]
I Proposed Action	1	440	0.7 (29 gal)	440	308
II No Sale	0	440	0.7 (29 gal)	0	0
III Corridor I	0.6402	440	0.7 (29 gal)	282	197
IV Corridor II	0.8457	440	0.7 (29 gal)	373	250

Note:
[1] The fractional estimated mean spill number and volume is rounded to the nearest whole number.

Key:

Bbbl = Billion barrels.
bbl = barrel.
gal = gallon.

Source:
USDOI, MMS, Alaska OCS Region (2006)

Table IV.C-1
Sale 193 Employment and Personal Income Effects

Area of Residence// Phase of OCS Activity	Employment Annual Average Jobs			Total Personal Income Annual Average in Millions of Constant 2006 $		
	Direct	Indirect and Induced	Total	For Direct Workers	For Indirect and Induced Workers	Total
North Slope Borough (a)						
Exploration	2	1	3	2	1	3
Development	22	8	30	14	5	19
Production	8	3	11	6	2	8
South Central Alaska and Fairbanks (b)						
Exploration	215	108	323	94	19	113
Development	1,054	527	1,581	108	22	130
Production	502	251	753	43	9	52

Sources:
Jack Faucett Associates, Inc. (2000); USDOI, MMS (2006).

Table IV.C-2
Sociocultural Effects from Routine Activities

Characteristic	Phase of Project			
	Seismic Survey	**Exploration**	**Development and Production**	**Decommissioning**
Social Organization Households, families, and also wider networks of kinship and friends, which in turn are embedded in groups that are responsible for acquiring, distributing, and consuming subsistence resources.				
Employment/Income Characteristics	Measurable but little effect. See Section IV.C.10, Economy. Indirect and negligible effect to extent that project revenues accrue to Alaska Permanent Fund (APF) which is an important source of income to households in North Slope Borough (NSB) communities or are allocated to the Capital Improvement Program (CIP), which has been an important source of employment in NSB communities. See Section V.C-13, Cumulative Effects for further discussion.			
Demographics Change in population size, density, and rate of change Ethnic and racial composition Residential Stability	Negligible effect in Point Lay and Point Hope, as no project-related activity is anticipated for these locations. Negligible effect in Barrow, as it has a large population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base, with an increase in residential stability if employment reverses recent trend of outmigration of residents looking for work.			
Workforce Changes Influx and outflow of temporary workers Changes to age structure of community due to outmigration of adults to project-related employment Outmigration of higher trained or skilled labor force Removal of adults and especially harvesters from community for employment in remote project areas Removal of trained individuals from community to work in project-related employment	Some employment opportunities for Alaskan Native as observers on seismic-survey vessels and during other activities. Temporary workers should see a negligible effect in Point Lay and Point Hope , as no project-related activity is anticipated for these locations. Negligible effect in Barrow, as it has a large population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base and use of airport as transfer point. Use of construction enclaves should minimize the movement of temporary workers through the communities. Communities have experienced influx of and outmigration of temporary and resident workers as a result construction. Workforce changes could be measurable in Wainwright because of proximity to supply base to the extent that residents seek and secure employment. Petroleum employment generally has not translated to employment for Native residents. Programs and policies are in place to provide the opportunities.			
Employment/Income Characteristics	Measurable but little effect. See Section IV.C.10, Economy. Indirect and negligible effect to extent that project revenues accrue to APF, which is an important source of income to households in NSB communities or are allocated to NSB CIP, which has been an important source of employment in NSB communities.			
Social Well Being Risk, safety and health Displacement/relocation concerns The ability of future Alaskan Native to care for themselves in either traditional way or cash economy Community leadership, family, and/or kinship networks destabilized	Perception about potential deflection of subsistence resources which cause harvest to occur farther offshore, leading to greater risk for hunters; change pattern of onshore distribution, leading to displacement from traditional subsistence areas and decline in the availability of wild foods; and induce health concerns from ingesting food contaminated from oil spill and discharges. Effects would be most pronounced in the Wainwright area because of the presence of onshore infrastructure. Indirect effects proportional to effects of project-related activities on subsistence harvest, with effects realized beyond the immediately affected area. For example, disruption of sharing networks and task groups could occur if a community was not successful in the bowhead whale harvest or food was perceived to be contaminated.			

Table IV.C-2
Sociocultural Effects from Routine Activities
(continued)

Cultural Values Close relationship with natural resources, emphasis on kinship, maintenance of the community, cooperation, and sharing. Subsistence is a central activity that embodies these values, with bowhead whale hunting the paramount subsistence activity.		
Subsistence Values Loss or damage to property or equipment used in wildlife harvesting Present or future loss of income and/or income-in-kind from wildlife harvesting	Potential effects directly related to effects on subsistence harvest. See Section IV.C.1.I. Highest potential for change is in Wainwright area. Conflict avoidance agreement should eliminate the potential loss or damage to property. Indirect effects could be realized, if disturbance or displacement of subsistence resources requires traveling farther distances or greater times. Indirect effects proportional to effects of project-related activities on subsistence-distribution network. For example, disruption of sharing networks from disturbance would reflect a loss of income-in-kind from wildlife harvesting.	
Known Cultural, Historical, and Archaeological Resources	None. Operations do not disturb sites.	Potential effects to sites from disturbance are mitigated.
Cultural Continuity Language, spiritual teachings, knowledge transfer Conflicts with newcomers with different values	No adverse impacts to language, spiritual teachings, or knowledge transfer are anticipated. Conflicts with values of newcomers should negligible at Point Lay and Point Hope, as no project-related activity is anticipated for these locations and in Barrow as it has a diverse population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base. Wainwright's previous experience with newcomers as part of the CIP and Industry Orientation Program should moderate the effects.	
Institutional Organization Structure of Borough, City, and Tribal government, and the Native Alaskan Regional and various village for-profit and not-for-profit corporations, and nongovernmental organizations.		
Governmental Functions Size, structure, and functions of local government Land use, planning, zoning and permitting Community infrastructure and services	None. Short-term activity with no onshore industrial activity or service demands.	Negligible at the NSB level as this is a continuation of primary industrial activity. Significant change near Wainwright from presence of nearby supply base—new industrial infrastructure for the area. Considerable planning and zoning actions for Wainwright/Peard Bay area from placement onshore of industrial facilities such as the new supply base and onshore pipeline, similar to other projects that are routinely considered by NSB departments. For other services, effect is negligible as the onshore industrial activity is not expected to generate service demands. Stress caused by project could marginally increase demand for public mental health services.

Table IV.C-2
Sociocultural Effects from Routine Activities
(continued)

Non-Governmental Organizations Organizational capability and characteristics Distribution of power and authority Interorganizational cooperation	Considerable effort expended by existing organizations, such as Alaska Eskimo Whaling Commission effort in conflict avoidance negotiations. Once project construction completed, the agreement and monitoring will become routine as in the Northstar annual-open-water meeting. Opportunities for participation structured under NEPA and other statutes should not change. Capacity and characteristics of other organizations could be affected to the extent that the activity represents a new activity for them to consider and they must develop the expertise and financial resources to participate which could cause organizational stress. High level of interorganizational cooperation and integration currently exists at the regional level, although this may need to accommodate organizations for which the activity represents a new activity. Cooperative management policies implemented by the Department of the Interior should moderate these effects.

Source:
Characteristics derived from "Principles and guidelines for social impact assessment in the USA" in Impact Assessment and Project Appraisal, v. 21, no. 3, pp 231-250, (September 2003); Determining Significance of Environmental Effects: An Aboriginal Perspective. Canadian Environmental Assessment Agency's Research and Development Program, Research and Development Monograph Series, 2000 (http://www.ceaa-acee.gc.ca) and Socioeconomic and Resource Use Considerations in The Norton Basin Environment and Possible Consequences of Planned Offshore Oil Development. 1984. Outer Continental Shelf Environmental Assessment Program.

Table V-1
Alaska North Slope Oil and Gas Discoveries as of March 2006

	Name	Location of Field or Pool	Production Oil, Gas	Location of Production Facility	Discovery	Production Began	Category	Ranking Criteria
Past Development And Production								
1	South Barrow	Onshore	Gas	Onshore	1949	1950	Field	—
2	Prudhoe Bay	Onshore	Oil	Onshore	1967	1977	Field	—
3	Lisburne	Onshore	Oil	Onshore	1967	1981	Field	—
4	Kuparuk	Onshore	Oil	Onshore	1969	1981	Field	—
5	East Barrow	Onshore	Gas	Onshore	1974	1981	Field	—
6	Milne Point	Onshore	Oil	Onshore	1969	1985	Field	—
7	Endicott	Offshore	Oil	Offshore	1978	1986	Field	—
8	Sag Delta	Offshore	Oil	Onshore	1976	1989	Field	—
9	Sag Delta North	Offshore	Oil	Offshore	1982	1989	Satellite[1]	—
10	Schrader Bluff	Onshore	Oil	Onshore	1969	1991	Satellite[2]	**When**
11	Walakpa	Onshore	Gas	Onshore	1980	1992	Field	**Production**
12	Point McIntyre	Offshore	Oil	Onshore	1988	1993	Field	**Began**
13	North Prudhoe Bay	Onshore	Oil	Onshore	1970	1993	Field	—
14	Niakuk	Offshore	Oil	Onshore	1985	1994	Field	—
15	Sag River	Onshore	Oil	Onshore	1969	1994	Satellite[3]	—
16	West Beach	Onshore	Oil	Onshore	1976	1994	Field	—
17	Cascade	Onshore	Oil	Onshore	1993	1996	Field	—
18	West Sak	Onshore	Oil	Onshore	1969	1997	Satellite[2]	—
19	Badami	Offshore	Oil	Onshore	1990	1998	Field	—
20	Eider	Offshore	Oil	Offshore	1998	1998	Satellite[1]	—
21	Tarn	Onshore	Oil	Onshore	1991	1998	Field	—
22	Tabasco	Onshore	Oil	Onshore	1992	1998	Satellite[2]	—
23	Midnight Sun	Onshore	Oil	Onshore	1998	1999	Satellite[4]	—
24	Alpine	Onshore	Oil	Onshore	1994	2000	Field	—
25	Northstar	Offshore	Oil	Offshore	1984	2001	Field	—
26	Aurora	Onshore	Oil	Onshore	1999	2001	Satellite[4]	—
27	NW Eileen/Borealis	Onshore	Oil	Onshore	1999	2001	Field	—
28	Polaris	Onshore	Oil	Onshore	1999	2001	Satellite	—
29	Meltwater	Onshore	Oil	Onshore	2000	2001	Pool	—
30	Palm	Onshore	Oil	Onshore	2001	2002	Pool	—
31	Orion	Onshore	Oil	Onshore	2000	2003	Satellite	
32	Raven	Onshore	Oil	Onshore	?	2006	Pool	
Present Development								
33	Fiord (CD 3)	Onshore	Oil	Onshore	1992	(2006)	Pool	**Production**
34	Nanuq (CD 4)	Onshore	Oil	Onshore	1996	(2006)	Pool	**When**
35	Oooguruk	Offshore	Oil	Offshore	2003	**(2008)**	Pool	**Is Expected**
Reasonably Foreseeable Future Development								
36	Nikaitchuq	Offshore	Oil	Offshore	2004	—	Pool	
37	Alpine West (CD 5)	Onshore	Oil	Onshore	1998	—	Pool	
38	Lookout (CD 6)	Onshore	Oil	Onshore	2001	—	Pool	**Ranked in order of**
39	Tuvaaq	Offshore	Oil	Offshore	2005	—	Prospect	**the chance and**
40	Liberty	Offshore	Oil	Offshore	1983	—	Pool	**timing of**
41	Spark (CD 7)	Onshore	Gas & Oil	Onshore	2000	—	Pool	**future development**
42	Carbon	Onshore	Oil & Gas	Onshore	2004	—	Prospect	
43	Moose's Tooth	Onshore	Gas & Oil	Onshore	2001	—	Prospect	**(highest = first)**
44	Rendezvous	Onshore	Gas & Oil	Onshore	2000	—	Pool	
45	Kalubik	Offshore	Oil	Onshore	1992	—	Prospect	
46	Thetis Island	Offshore	Oil	Offshore	1993	—	Prospect	
47	Sikulik	Onshore	Gas	Onshore	1988	—	Pool	
48	Gwydyr Bay	Offshore	Oil	Onshore	1969	—	Pool	
49	Pete's Wicked	Onshore	Oil	Onshore	1997	—	Prospect	
50	Point Thomson	Onshore	Gas & Oil	Onshore	1977	—	Pool	
51	Sandpiper	Offshore	Gas & Oil	Offshore	1986	—	Pool	
52	Mikkelson	Onshore	Oil	Onshore	1978	—	Prospect	
53	Kaktovik (Hammerhead)	Offshore	Oil	Offshore	1985	—	Pool	
54	Sourdough	Onshore	Oil	Onshore	1994	—	Show	
55	Yukon Gold	Onshore	Oil	Onshore	1994	—	Show	
56	Flaxman Island	Offshore	Oil	Offshore	1975	—	Prospect	
57	Stinson	Offshore	Oil	Offshore	1990	—	Prospect	
58	Kuvlum	Offshore	Oil	Offshore	1987	—	Prospect	

Table V-1
Alaska North Slope Oil and Gas Discoveries as of March 2006 (continued)

	Name	Location of Field or Pool	Production Oil, Gas	Location of Production Facility	Discovery	Production Began	Category	Ranking Criteria
Speculative Future Development								
59	Hemi Springs	Onshore	Oil	Onshore	1984	—	Pool	—
60	Ugnu	Onshore	Oil	Onshore	1984	—	Pool	—
61	Umiat	Onshore	Oil	Onshore	1946	—	Pool	—
62	Fish Creek	Onshore	Oil	Onshore	1949	—	Show	—
63	Simpson	Onshore	Oil	Onshore	1950	—	Prospect	—
64	East Kurupa	Onshore	Gas	Onshore	1976	—	Show	**Insufficient**
65	Meade	Onshore	Gas	Onshore	1950	—	Prospect	**Information to**
66	Wolf Creek	Onshore	Gas	Onshore	1951	—	Show	**Estimate Chance**
67	Gubik	Onshore	Gas	Onshore	1951	—	Pool	**of Development**
68	Square Lake	Onshore	Gas	Onshore	1952	—	Show	—
69	East Umiat	Onshore	Gas	Onshore	1964	—	Prospect	—
70	Kavik	Onshore	Gas	Onshore	1969	—	Show	—
71	Kemik	Onshore	Gas	Onshore	1972	—	Show	—

Notes:
Field information is taken from State of Alaska, Dept. of Natural Resources Annual Report December, 2004 and Petroleum News
Footnotes for Satellites identify the associated production unit:
[1]Duck Island Unit;
[2]Kuparuk River Unit;
[3]Milne Point Unit;
[4]Prudhoe Bay Unit.
Parentheses indicate when production startup is expected.
Definitions: Field—infrastructure (pads/wells/facilities) installed to produce one or more pools.
Satellite—a pool developed from an existing pad.
Pool—petroleum accumulation with defined limits.
Prospect—a discovery tested by several wells.
Show—a one-well discovery with poorly defined limits and production capacity.

Table V-2
Past Development: 2005 Production and Reserve Data

				Produced				Reserves[2]	
Unit or *Area*	Field	Type (Oil or Gas)	Discovery	Began	Gas (Bcf)	2005 Oil (MMbbl)[1]	Production to	Oil (MMbbl)[1]	Gas (Bcf)
Duck Island									
—	Endicott	O	1973	1987	–	454.988710	Endicott	"	"
—	Sag Delta North[2]	O	1989	1989	–	"	Endicott	"	"
—	Sag Delta[2]	O	1976	1989	–	"	Endicott	"	"
—	Eider	O	1998	1998	–	2.718,616	Endicott	"	"
—	Ivishak	O	–	–	–	8.102,357	Endicott	"I	"I
Duck Island Unit	–	–	–	–	–	–	–	131	843
Prudhoe Bay									
—	Prudhoe Bay	O	1967	1977	–	1,283.684.252	Prudhoe	"	"
—	Lisburne	O	1968	1981	–	156.991045	Lisburne	41	"
—	Niakuk	O	1985	1994	–	83.893006	Lisburne	41"	"
—	West Beach	O	1976	1994	–	3.581710	Lisburne	"	"
—	N. Prudhoe Bay	O	1970	1993	–	2.070780	Lisburne	"	"
—	Point McIntyre	O	1988	1993	–	396.736189	Lisburne	"211	"
—	Prudhoe Bay IPA's	O	–	–	–	–	–	2,839	23,000
—	Midnight Sun	O	1998	1999	–	13.474471	Prudhoe	"	–
—	Aurora	O	1999	2001	–	14.849654	Prudhoe	"	–
—	NW Eileen/Borealis	O	1999	2001	–	37.925608	Prudhoe	"	–
—	Polaris	O	1999	2001	–	4.786145	Prudhoe	"	–
—	Orion	O	1968	2003	–	5.206855	Prudhoe	"	–
—	P. Bay Satellites	O	–	–	–	– "	Prudhoe	473	–
Kuparuk River									
—	Kuparuk River	O	1969	1981	–	2,024.989583	Kuparuk	956	1,000
—	Tabasco	O	1992	1998	–	11.264871	Kuparuk	15	–
—	Tarn	O	1992	1998	–	72.680379	Kuparuk	71	50
—	West Sak	O	1969	1998	–	–	Kuparuk	528	100
—	Meltwater	O	—	2001	–	9.757986	Kuparuk	–	–
—	Palm	O	—	2002		–	Kuparuk	–	–
Milne Point									
—	Milne Point	O	1969	1985	–	18.9794041	Milne Point	–	–
—	Cascade[4]	O	1993	1996	–	–	Milne Point	–	–
—	Schrader Bluff	O	1969	1991	–	44.534458	Milne Point	–	–
—	Sag River	O	1968	1994	–	1.677089	Milne Point	–	–
Milne Point Uni	–	–	–	–	–	–	–	479	14
Badami	Badami	O&G	1990	1998	–	4.498862	TAPS	2	–
Colville River	Alpine	O	1994	2000	–	184.716137	Kuparuk	450	400
Northstar	Northstar	O	1984	2001	–	89.636187	TAPS	152	450
NPR-A[1]	East Barrow	G	1974	1981	0.081	–	Barrow	–	5
—	South Barrow	G	1949	1950	0.2.25	–	Barrow	–	4
—	Walakpa	G	1980	1993	1.5167	–	Barrow	–	25
All Units or Areas Total		–	–	–	–	–	–	**6.4**	**33**

Notes:

[1] Production information is from State of Alaska, Oil and Gas Conservation Commission (2005)
[2] Reserves were estimated by subtracting 2005 production from State of Alaska, Oil and Gas Conservation Commission (2005) from the Reserve Data in State of Alaska, Dept. of Natural Resources (2005).
[3]Endicott includes Endicott, Sag Delta and Sag Delta North. Prudhoe Bay satellites include Midnight Sun, Aurora, Borealis, Polaris and Orion
[4] Cascade is included in Milne Point.

Table V-3
Present Development: Estimated Reserve Data

Unit or Area	Field	Type (Oil, Gas)	Discovery	Status	Oil Reserves (MMbbl)
Colville River	CD 3 Fiord	Oil	1992	Present Development	50
Colville River	CD 4 Nanuq	Oil	1996	Present Development	38
Oooguruk	Oooguruk	Oil	–	Present Development	50-90a
Total for All Units or Areas		–	–	–	158

Note:

For purposes of analysis we use70 MMbbl.

Table V-4
Future Lease Sales

Sale	Proposed Sale Date(s)	Area/Description	Resources or *Hydrocarbon Potential*
Federal			
2002-2007 5-Year Program – Beaufort Sea OCS Sale 202	May 2007	As much as 9.9 million acres from the Canadian border on the east to Barrow on the west in the Beaufort Sea (*Federal Register,* 2001c).	340-557 mmbbl Oil (Estimated)
2007-2012 5-Year Program – Beaufort Sea OCS Sales 208 and 216	2009 and 2011, respectively	As much as 33.29 million acres from the Canadian border on the east to Barrow on the west	0.5-1.0 BBO
2007-2012 5-Year Program – Chukchi Sea OCS Sales 193, 212, and 221	November 2007, 2010, and 2012, respectively	As much as 46.75 million acres from Barrow on the east to Point Hope on the south	1.0 BBO
Northeast NPR-A	September 2006	As much as 3 million acres of the Northeast NPR-A Planning Area (USDOI, BLM, 2005).	0.50-2.2 Bbbl Oil (Estimated)
Northwest NPR-A	September 2006	As much as 9.98 million acres of the Northwest NPR-A Planning Area (*USDOI, BLM and MMS 2003)*).	0.00-0.735 Bbbl Oil Estimated
South NPRA	To Be Determined		
State Of Alaska			
North Slope Areawide	March 2006[1] October 2006-2010	As much as 5,100,000 acres of State-owned lands between the Canning and Colville rivers and north of the Umiat Baseline (about 69° 20' N.).	*Moderate to High*
Beaufort Sea Areawide	March 2006[1] October 2006-2010	Unleased State-owned tide- and submerged lands between the Canadian border and Point Barrow and some coastal uplands acreage located along the Beaufort Sea between the Staines and Colville rivers. The gross proposed sale area is in excess of 2,000,000 acres and is divided into 576 tracts..	*Moderate to High*
North Slope Foothills Areawide	May 2006 February 2007-2010[1]	State-owned lands lying between the National Petroleum Reserve-Alaska and the Arctic National Wildlife Refuge south of the Umiat Baseline and north of the Gates of the Arctic National Park and Preserve. The gross proposed sale area is in excess of 7,000,000 acres.	*Moderate*
Canada	—	—	—
Beaufort Sea	May 2006	Petroleum exploration rights on a total of two (2) parcels of land in the Beaufort Sea/Mackenzie Delta region of the Northwest Territories covering 156,348 hectares, more or less.	*?*

Note:
1 Other than the March and May 2006 sales, no decision has been made on whether these sales will be held
Bbbl = billion barrels.
Source:
State of Alaska (2006) Five Year Oil and Gas Leasing Program; USDOI, MMS (2006).

Table V-5
Detailed Reserve and Resource Estimates for the Cumulative Analysis

Activity	Oil (billions of barrels)	Gas (trillions of cubic feet)
Production of remaining reserves (Past and Present)	**6.6**	—
Onshore–past (Prudhoe Bay and surrounding fields on State lands)	6.15	—
Offshore–past (Duck Island Unit and Northstar)	0.28	—
Onshore Present (CD3, CD4,)	0.08	—
Offshore Present (Oooguruk)	0.07	—
Reasonably Foreseeable Future Production (resources total)	**3.5**	**32.0**
Onshore discovered gas	—	32.0
Onshore discovered, satellites, heavy oil, and reserve growth	2.0	—
Offshore discovered (Beaufort)	0.5	—
Undiscovered Offshore (Chukchi Sale 193)	1.0	
Speculative Production (resources total)	**7.7**	**13.3**
Onshore	5.7	9.0
Offshore	2.0	4.3

Notes:

1. Reserves are proven and economically recoverable oil or gas produced through existing infrastructure.
2. Resources are unproven (undiscovered) oil and gas that could be produced with new infrastructure.
3. Reasonably foreseeable gas production includes gas from stranded reserves in Prudhoe Bay area fields. We subtract the gas consumed for field use (300 Bcf per year) from reserves (35 Tcf) until the expected startup of a North Slope gas pipeline in 2015.
4. Speculative production is entirely from undiscovered oil and gas resources with development delayed several decades in the future. Onshore gas resources are from NPRA as associated and non-associated pools. Offshore gas resources are from associated gas reinjected during oil production. Offshore gas would then be recovered through existing oil field infrastructure. Associated gas estimates assume a GOR of 1000 cf/bbl.

Table V-6
Trans-Alaska Pipeline System and Proposed Future Natural Gas Projects

Name	Estimated Pipeline Length (miles)	Project Description and Route
		Active Project
Trans-Alaska Pipeline (TAPS)	800	The TAPS is the key transportation link for all North Slope oil fields. It has been in operation since 1977 and to date, has carried nearly 15 billion barrels of oil. Approximately 16.3 square miles are contained in the pipeline corridor that runs between Prudhoe Bay and Valdez. The Dalton Highway (or Haul Road) was constructed parallel to the pipeline between Prudhoe Bay and Fairbanks. The pipeline design capacity is 2 million barrels per day, and it reached near peak capacity in 1988. The TAPS 2005 year to date average barrels of oil pumped through pump station 1 was just under 900,000 barrels. The lower operational limit generally is thought to be between 200,000 and 400,000 barrels per day. If oil production from northern Alaska cannot be sustained above this minimum rate, the TAPS will become non-operational, and all oil production is likely to be shut in. Alyeska Pipeline Service Company is planning pipeline reconfiguration efforts between 2005 and 2011 to extend the economic life of the TAPS and North Slope oil fields.
		Future Natural Gas Projects
All-Alaska Gas Pipeline	800	The "All Alaska Gas Pipeline" is similar to the old "Trans-Alaska Gas System" project. The route would originate in the Prudhoe Bay Unit and run parallel to the Trans-Alaska oil pipeline to Valdez, then jog to the east to Anderson Bay to an LNG plant. There are "variations" on this project depending on whether it is standalone or is connected, at Delta Junction, to a transportation pipeline coming from Prudhoe Bay that goes into Canada.
Alaska Natural Gas Transportation System (ANGTS)[1]	2,102	The ANGTS plan is a pipeline system connecting Alaska North Slope gas production through Canada to the lower 48. The new pipeline would run parallel to the TAPS from the North Slope to interior Alaska and then cross the Yukon Territory to connect to existing pipelines in Alberta. The primary market would be consumers in the U.S. Numerous permits, rights-of-way, and approvals have been obtained for the proposed pipeline route through Alaska and Canada. Downward revisions to construction costs and the recent increase in gas prices into the $3-$4-million/cubic-foot range make this project more appealing today. Currently, several variations to routes are being considered for the overland gas-pipeline system.
Natural Gas to Liquids Conversion[2]	Will use existing TAPS pipeline	Atlantic Richfield Co. (ARCO) and Syntroleum Corp constructed a pilot-scale, natural gas to liquids (GTL) conversion facility in Puget Sound, Washington. BP began production at the GTL pilot project on the Kenai Peninsula in Alaska in July 2003. This plant is expected to operate at least through 2006[3]. All of the major North Slope gas owners (BP-Amoco, Exxon-Mobil, and Connoco-Phillips-Alaska) are studying the feasibility of various gas-commercialization projects. GTL is an attractive option because it will use the existing TAPS pipeline (extending its life and lowering future tariffs) and produce clean-burning fuels to meet more stringent Environmental Protection Agency emission standards for vehicles. At the present time, the overall cost of a full-scale gas to liquids project is comparable to a similar sized LNG project. As an emerging technology, new cost-reduction breakthroughs are expected for gas to liquids processing, improving the economic potential for future gas to liquid projects.
Mackenzie Gas Pipeline	1,300	The Mackenzie Gas Project is a proposed 1220-kilometre natural gas pipeline system along the Mackenzie Valley of Canada's Northwest Territories to connect northern onshore gas fields with North American markets.. The industries goal is to have natural gas moving through the pipeline by 2010.

Notes:
[1] Thomas et al. (1996).
[2] Alaska Report (1997).
3 Hult, J. (2006)

Table V-7a
Oil and Gas Production 1969 to December 2005 on the North Slope of Alaska

Production To Date	Oil (billions of barrels)	Gas (trillions of cubic feet)	Reference
Onshore	14.5	—	State of Alaska,Alaska Oil and Gas Conservation Commission (2005) State of Alaska, DNR (2005)
Offshore	0.5	—	
Total	**15.0**	**51.6**	

Notes:

1. Oil production includes both crude oil and natural gas liquids that are blended into the stream carried by TAPS.
2. Large volumes of associated natural gas has been recovered with oil production, however 90% of it has been reinjected to increase oil recovery. In 2003, North Slope gas production was 3.3 Tcf (average 9.1 Bcf per day) and a total of 297 Bcf was consumed as fuel for facilities. Small amounts of natural gas have been produced fields in the Barrow area since the mid-1940's largely to supply energy for the village of Barrow.

Table V-7b
Summary of Reserve and Resource Estimates for the Cumulative Analysis

Production Activity	Oil (billions of barrels)	Contribution of by Volume of OCS Oil (%)	Gas (trillions of cubic feet)	Contribution of by Volume of OCS Gas (%)
Low End of the Range (Past and Present)	6.6	15%	0	0
Middle Portion (Past, Present, and Reasonably Foreseeable)	10.1	10%	32.0	0
High End (Past, Present, Reasonably Foreseeable, and Speculative)	17.8	5.6%	45.3	9.5

Source**: .USDOI, MMS 2006**

Table V-7c
Detailed Reserve and Resource Estimates for the Cumulative Analysis

Activity	Oil (billions of barrels)	Gas (trillions of cubic feet)
Production of remaining reserves (Past and Present)	**6.6**	—
Onshore–past (Prudhoe Bay and surrounding fields on State lands)	6.15	—
Offshore–past (Duck Island Unit and Northstar)	0.28	—
Onshore Present (CD3, CD4,)	0.08	—
Offshore Present (Oooguruk)	0.07	—
Reasonably Foreseeable Future Production (resources total)	**3.5**	**32.0**
Onshore discovered gas	—	32.0
Onshore discovered, satellites, heavy oil, and reserve growth	2.0	—
Offshore discovered (Beaufort)	0.5	—
Undiscovered Offshore (Chukchi Sale 193)	1.0	—
Speculative Production (resources total)	**7.7**	**13.3**
Onshore	5.7	9.0
Offshore	2.0	4.3

Notes:

1. Reserves are proven and economically recoverable oil or gas produced through existing infrastructure.
2. Resources are unproven (undiscovered) oil and gas that could be produced with new infrastructure.
3. Reasonably foreseeable gas production includes gas from stranded reserves in Prudhoe Bay area fields. We subtract the gas consumed for field use (300 Bcf per year) from reserves (35 Tcf) until the expected startup of a North Slope gas pipeline in 2015. Speculative production is entirely from undiscovered oil and gas resources with development delayed several decades in the future. Onshore gas resources are from NPRA as associated and non-associated pools. Offshore gas resources are from associated gas reinjected during oil production. Offshore gas would then be recovered through existing oil field infrastructure. Associated gas estimates assume a GOR of 1000 cf/bbl.