PUBLIC INFORMATION

Revised Outer Continental Shelf Lease Exploration Plan

Chukchi Sea, Alaska

Burger Prospect: Posey Area Blocks 6714, 6762, 6764, 6812, 6912, 6915

Chukchi Sea Lease Sale 193

Revision 1 (May 2011)

Revision 2 (March 2015)

Submitted to:

U.S. Department of the Interior

Bureau of Ocean Energy Management

Alaska OCS Region

Submitted by:

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ACRONYMS & ABBREVIATIONS

ACRONYMS & ABBREVIATIONS	
~	approximately
º	degree(s)
/	per
2D	two-dimensional
3D	three-dimensional
4MP	Marine Mammal Monitoring and Mitigation Plan
ac	acre(s)
ACMP	Alaska Coastal Management Program
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AES	ASRC Energy Services
AEWC	Alaska Eskimo Whaling Commission
APD	Application for Permit to Drill
API	American Petroleum Institute
APM	Application for Permit to Modify
AQRP	Air Quality Regulatory Program
ASA	Applied Science Associates, Inc.
ASRC	Arctic Slope Regional Corporation
bbl	barrel(s) – 42 U.S. gallons
BOEM	Bureau of Ocean Energy Management
BOP	blowout preventer
BSEE	Bureau of Safety and Environmental Enforcement
Burger #1 well	OCS-Y-1413 (legacy Burger #1 well)
BWASP	Bowhead Whale Aerial Survey Project
CDPF	catalytic diesel particulate filters
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
CLO	community liaison officer
cm	centimeter(s)
CO	carbon monoxide
COCP	Critical Operations and Curtailment Plan
Com Center	Communications and Call Centers
cu yd	cubic yard(s)
CZMA	Coastal Zone Management Act
dB	decibel(s)
DIMP	Drilling Ice Management Plan
Discoverer	M/V *Noble Discoverer*
DNV	Det Norske Veritas
DPP	development and production plan
E	east
EA	Environmental Assessment
EIA	Environmental Impact Analysis
EMP	Environmental Monitoring Program
ENE	east-northeast
EP	Exploration Plan

ACRONYMS & ABBREVIATIONS	
EP Revision 1	Chukchi Sea Exploration Plan Revision 1 (Shell 2011)
EP Revision 2	Chukchi Sea Exploration Plan Revision 2 (Shell 2015)
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	Federal Register
ft.	foot/feet
ft^3	cubic feet
FTP	Fuel Transfer Plan
gal	gallon(s)
GEMS	Geoscience Earth & Marine Services, Inc.
GOM	Gulf of Mexico
GP	General Permit
H_2S	hydrogen sulfide
hp	horsepower
hr.	hour(s)
HSWUA	Hanna Shoal Walrus Use Area
HSSE	Health, Safety, Security and Environment
IMO	International Maritime Organization
in.	inch(s)
Initial Chukchi Sea EP	Shell's initial Chukchi Sea Exploration Plan (Shell 2009)
IRA	Indian Reorganization Act
KDR	Kitchen/dining/recreation
KIC	Kikiktagruk Inupiat Corporation
kg	kilogram(s)
km	kilometer(s)
lb.	pound(s)
LBCHU	Ledyard Bay Critical Habitat Unit
m	meter(s)
m^3	cubic meter(s)
mi	statute mile(s)
mi^2	square miles
min	minute(s)
MARPOL	International Convention for the Prevention of Pollution from Ships
MAWP	maximum anticipated wellhead pressure
MD	measured depth
MLC	mudline cellar
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
MMS	U.S. Department of the Interior, Minerals Management Service
MODU	Mobile Offshore Drilling Unit
MSW	municipal solid waste
mt	metric ton(s)
M/V	Motor Vessel
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NaCl	sodium chloride
NAD 83	North American Datum 1983

ACRONYMS & ABBREVIATIONS	
NARL	Naval Arctic Research Laboratory
NE	northeast
NMFS	National Marine Fisheries Service
nmi	nautical mile(s)
NNE	north-northeast
NOI	Notice of Intent
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NSB	North Slope Borough
NTL	Notice to Lessee
NWAB	Northwest Arctic Borough
NWP	Nationwide Permit
OCS	Outer Continental Shelf
OSFR	oil spill financial responsibility
OSR	oil spill response
OSRO	Oil Spill Removal Organization
OSRP	Oil Spill Response Plan
OSRV	oil spill response vessel
OST	oil storage tanker
OSV	offshore supply vessel
OWS	oil-water separator
OxyCat	oxidation catalysts
PAEL	Preapproved Emission Limit
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
ppb	parts per billion
ppm	parts per million
PPOR	potential place of refuge
POC	Plan of Cooperation
Polar Pioneer	Mobile Offshore Drilling Unit (MODU) Transocean *Polar Pioneer*
PSD	Prevention of Significant Deterioration
PSO	Protected Species Observer(s)
PTD	proposed total depth
RKB	rotary kelly bushing
rms	root mean square
ROV	Remotely Operated Vehicle
RQ	reportable quantity
RS/FO	Regional Supervisor, Field Operations
SA	subsistence advisor
SAPP	sodium acid pyrophosphate
SAR	Search and Rescue
SCR	selective catalytic reduction
sec	second(s)
SEPCO	Shell Exploration & Production Company
Shell	Shell Gulf of Mexico Inc.
SO_2	sulfur dioxide
SS	subsea

ACRONYMS & ABBREVIATIONS	
SSV	sound source verification
TA	temporarily abandon
TBD	to be determined
TD	total depth
TDS	treatment/disposal/storage
TSP	Total Suspended Particulate
TVD	true vertical depth
UIC	Ukpeaġvik Iñupiat Corporation
ULSD	ultra-low sulfur diesel
UN	United Nations
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compound
V/V	volume/volume
VHF-AM	very high frequency – amplitude modulation
WBM	water based mud
WCD	Worst Case Discharge
WCP	Well Control Plan
WNW	west-northwest
XC	Xanthomonas campestris, also known as xanthan gum
YBP	years before present
ZVSP	zero-offset vertical seismic profile

GLOSSARY OF SELECTED DRILLING TERMS

GLOSSARY OF SELECTED DRILLING TERMS		
Item	**Definition/Description**	**Source**
Annular Blowout Preventer	Blowout preventer that uses a shaped elastomeric sealing element to seal the space between the tubular and the wellbore or to seal an open hole.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Barrels (bbl)	"Barrel (bbl)" means 42 U.S. gallons	Alaska Oil and Gas Conservation Commission, Definitions, Alaska Admin. Code tit. 20 § 25.990, December 7, 2012.
Blind Shear Ram	A closing and sealing component in a ram blowout preventer that first shears certain tubulars in the wellbore and then seals the bore, or acts as a blind ram if there is no tubular in the wellbore.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Blind Ram	A closing and sealing component in a ram blowout preventer that seals the open wellbore.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Blowout Preventer (BOP)	Equipment installed on the wellhead or wellhead assemblies to contain wellbore fluids either in the annular space between the casing and the tubulars, or in an open hole during well drilling, completion, and testing operations.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Capping Stack	A set of subsea devices (included but not limited to ram-type BOPs) assembled to provide direct surface intervention with the capability of capping and containing a well.	Shell Wells Department
Containment System	The containment system is a subsea spill collection system that provides the means to intercept uncontrolled well flows from subsea blowout situations as close to the source as possible. The containment system is housed on the Arctic Challenger barge and includes the containment dome, topside processing facilities, flare boom, an ROV, two workboats, and living quarters.	Shell Emergency Response Department

GLOSSARY OF SELECTED DRILLING TERMS		
Item	**Definition/Description**	**Source**
Lower Marine Riser Package (LMRP)	The upper section of a two-section subsea BOP stack consisting of the hydraulic connector, annular BOP, ball/flex joint, riser adapter, jumper hoses for the choke, kill and auxiliary lines and subsea control modules. The LMRP interfaces with the lower subsea BOP stack.	API SPEC 16D, Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment, Upstream Segment, Second Edition, July 2004.
Maximum Anticipated Surface Pressure (MASP)	A design load that represents the maximum pressure that can occur at the surface during well construction or production.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Maximum Anticipated Wellhead Pressure (MAWP)	The highest pressure predicted to be encountered at the wellhead in a subsea well. The MAWP may be calculated for each hole section during well construction.	API STD 53, Blowout Prevention Equipment Systems for Drilling Wells, Upstream Segment, Fourth Edition, November 2012.
Mobile Offshore Drilling Unit (MODU)	Facilities designed or modified to engage in drilling and exploration activities. The term MODU includes drilling vessels, semisubmersibles, submersibles, jack-ups, and similar facilities that can be moved without substantial effort. These facilities may or may not have self-propulsion equipment on board and may require dynamic positioning equipment or mooring systems to maintain their position.	API RP 54, Recommended Practice for Occupational Safety for Oil and Gas Well Drilling and Servicing Operations, Third Edition, August 1999 (2007).
Mudline Cellar (MLC)	A hole or excavation in the seafloor designed to protect the wellhead and attached BOP in areas where the seafloor is prone to scouring from ice floes (typically shallow waters in Arctic areas). The MLC (aka well cellar [30 CFR 250.451(h)]) is sufficiently deep such that the top of any wellhead equipment or a BOP attached to the wellhead situated in the MLC is sufficiently below the mudline and out of reach for potential ice scour from ice floes.	Shell Regulatory Affairs Department & 30 CFR 250.451 (h)
Permanent Guidebase	Structure that sets alignment and orientation relative to the wellhead system and provides entry guidance for running equipment on or into the wellhead assembly.	API STD 65 – Part 2, Isolating Potential Flow Zones During Well Construction, Upstream Segment, Second Edition, December 2010
Pipe Ram	Rams whose ends are contoured to seal around pipe to close the annular space.	API SPEC 16D, Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment, Upstream Segment, Second Edition, July 2004.

GLOSSARY OF SELECTED DRILLING TERMS		
Item	**Definition/Description**	**Source**
Ram BOP	BOP that uses two opposing metal elements (rams) with integral elastomer seals to contain pressure within a wellbore. Rams may be designed to close on a specific pipe size (fixed pipe rams), a range of pipe sizes (variable bore rams), or open hole (blind or blind/shear rams).	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Riser	See *Lower Marine Riser Package*	
Rotary Kelly Bushing (RKB)	Bushing that sits on top of the rotary table. It transmits torque from the rotary table to the kelly and is commonly used as a reference for vertical measurements from the drill-floor.	ISO 13624-1:2009, Petroleum and natural gas industries – Drilling and production equipment – Part 1: Design and operation of marine drilling riser equipment.
Semi-submersible	A floating offshore drilling vessel which is ballasted at the drilling location and conducts drilling operations in a stable, partly submerged position.	API RP 64, Recommended Practice for Diverter Systems Equipment and Operations, Second Edition, November 2001 (March 1, 2007).
Shear Ram BOP (Blind/Shear Rams)	Rams having cutting blades that will shear tubulars that may be in the wellbore. Shearing blind rams additionally close and seal against the pressure below. Casing shear rams are designed specifically to shear casing, and may not seal the well bore.	API SPEC 16D, Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment, Upstream Segment, Second Edition, July 2004.
Variable Bore Ram	A pipe ram that seals on more than one pipe size.	API RP 96, Deepwater Well Design and Construction, First Edition, March 2013.
Zero-Offset Vertical Seismic Profiling (ZVSP)	A geophysical technology for measuring the seismic properties in a profile of the earth using a set of sources and receivers, either of which are placed along the depth (vertical) axis and where the source is near the well-head above the vertical receiver array.	Rector, J. and M. Mangriotis. 2011. Encyclopedia of Solid Earth Geophysics. Harsh K. Gupta (ed.) Department of Civil and Environmental Engineering, University of California at Berkeley, Berkeley, CA, USA. Applied Geophysics, Institute of Engineering Seismology and Earthquake Engineering (ITSAK), Thessaloniki, Greece.

CROSS-REFERENCE TO APPLICABLE REGULATIONS

Regulation Section	Regulatory Information	Exploration Plan (EP) Section
Bureau of Ocean Energy Management (BOEM)		
30 Code of Federal Regulations (CFR) 550.211	**What must the EP include**	Section 1.0
(a)	Description, objectives and schedule	Section 1.0 b)
(b)	Location	Section 1.0 c)
(c)	Drilling Unit	Section 1.0 d)
(d)	Service fee	Section 1.0 e)
30 CFR 550.212	**What information must accompany the EP**	Sections 2.0-17.0
(a)	General information required by 550.213	Section 2.0
(b)	Geological and geophysical (G&G) information required by 550.214	Section 3.0[1]
(c)	Hydrogen sulfide information required by 550.215	Section 4.0
(d)	Biological, physical, and socioeconomic information required by 550.216	Section 5.0
(e)	Solid and liquid wastes and discharges information and cooling water intake information required by 550.217	Section 6.0
(f)	Air emissions information required by 550.218	Section 7.0
(g)	Oil and hazardous substance spills information required by 550.219	Section 8.0
(h)	Alaska planning information required by 550.220	Section 9.0
(i)	Environmental monitoring information required by 550.221	Section 10.0
(j)	Lease stipulations information required by 550.222	Section 11.0
(k)	Mitigation measures information required by 550.223	Section 12.0
(l)	Support vessel and aircraft information required by 550.224	Section 13.0
(m)	Onshore support facilities information required by 550.225	Section 14.0
(n)	Coastal zone management information required by 550.226	Section 15.0
(o)	Environmental impact analysis information required by 550.227	Section 16.0
(p)	Administrative information required by 550.228	Section 17.0
30 CFR 550.213	**General Information**	Section 2.0
(a)	Applications and permits	Section 2.0 a)
(b)	Drilling fluids	Sections 2.0 b), and 6.0
(c)	Chemical products	Section 2.0 c)
(d)	New or unusual technology	Section 2.0 d)
(e)	Bonds, oil spill financial responsibility (OSFR), and well control statements	Section 2.0 e)
(e)(1)	Activity and facility bonds (see 30 CFR 256, subpart I)	Section 2.0 e)
(e)(2)	Oil spill financial responsibility for facilities (30 CFR 553)	Section 2.0 e)
(e)(3)	Relief well financial capability and can conduct other emergency well control operations	Section 2.0 e)
(f)	Suspensions of operations	Sections 2.0 f) and 9.0
(g)	Blowout scenario	Sections 2.0 g) and 8.0 e)
(h)	Contact	Section 2.0 h)
30 CFR 550.214[1]	**G&G Information Required by 550.214[1]**	Section 3.0[1]
(a)	Geological description	Section 3.0 a)
(b)	Structure contour maps	Section 3.0 b)
(c)	Two-dimensional (2D) and three-dimensional (3D) seismic lines	Section 3.0 c)
(d)	Geological cross-sections	Section 3.0 d)
(e)	Shallow hazards reports	Sections 3.0 e), 3.0 f)

CROSS-REFERENCE TO APPLICABLE REGULATIONS

Regulation Section	Regulatory Information	Exploration Plan (EP) Section
(f)	Shallow hazards assessments	Section 3.0 f)
(g)	High resolution seismic lines	Section 3.0 g)
(h)	Stratigraphic column	Section 3.0 h)
(i)	Time-vs-depth charts	Section 3.0 i)
(j)	Geochemical information	Section 3.0 j)
(k)	Future G&G activities	Section 3.0 k)
30 CFR 550.215	**Hydrogen Sulfide (H_2S) Information**	Section 4.0
(a)	Concentration	Section 4.0 a)
(b)	Classification	Section 4.0 b)
(c)	Contingency plan	Section 4.0 c)
(d)	Modeling report	Section 4.0 d)
(d)(1)	Site specific and area analysis	not applicable (N/A)
(d)(2)	H_2S emissions	N/A
30 CFR 550.216	**Biological, Physical and Socioeconomic Information**	Section 5.0
(a)	Biological environment reports	Section 5.0 a)
(b)	Physical environment reports	Section 5.0 b)
(c)	Socioeconomic study reports	Section 5.0 c)
30 CFR 550.217	**Solid and Liquid Wastes and Discharges Information and Cooling Water Intake Information**	Section 6.0
(a)	Projected wastes	Section 6.0 a)
(a)(1)	Method used to determine this information	Section 6.0 a)
(a)(2)	Plans for treating, storing and downhole disposal of wastes	Section 6.0 a)
(b)	Projected ocean discharges	Section 6.0 b)
(b)(1)	Table of waste name, projected amounts, rate of discharge	Section 6.0 b)
(b)(2)	Description of discharge method	Section 6.0 a)
(c)	National Pollutant Discharge Elimination System (NPDES) permit	Section 6.0 c)
(c)(1)	Compliance discussion	Section 6.0 c)
(c)(2)	Copy of the application	Not part of this submission
(d)	Modeling report	Section 6.0 d)
(e)	Projected cooling water intake	Section 6.0 e)
30 CFR 550.218	**Air Emissions Information**	Section 7.0
(a)	Projected emissions	Section 7.0 a)
(a)(1)	For each source on the drill rig list the following:	
(a)(1)(i)	Projected peak hourly emissions	Section 7.0 a)
(a)(1)(ii)	Total annual emissions in tons per year	Section 7.0 a)
(a)(1)(iii)	Emissions over the duration of the EP	Section 7.0 a)
(a)(1)(iv)	Frequency and duration of emissions	Section 7.0 a)
(a)(1)(v)	Total of all emissions listed in (a)(1)(i) through (iv)	Section 7.0 a)
(a)(2)	Basis for emission calculations	Section 7.0 a)
(a)(3)	Base projected emissions on maximum rated capacity of the equipment	Section 7.0 a)
(a)(4)	Specific drill unit emissions	Section 7.0 a)
(b)	Emission reduction measures	Section 7.0 a)
(c)	Processes, equipment, fuels, and combustibles	Section 7.0 c)
(d)	Distance to shore	Section 7.0 d)
(e)	Non-exempt drilling units	Section 7.0 e)
(f)	Modeling report	Section 7.0 f)
30 CFR 550.219	**Oil and Hazardous Substance Spills Information**	Section 8.0

CROSS-REFERENCE TO APPLICABLE REGULATIONS

Regulation Section	Regulatory Information	Exploration Plan (EP) Section
(a)	Oil spill response planning	Section 8.0 a)
(a)(1)	Oil Spill Response Plan (OSRP)	Section 8.0 a)
(a)(2)	OSRP to include:	Section 8.0 a)
(a)(2)(i)	Discussion of regional OSRP	Section 8.0 a)
(a)(2)(ii)	Location of primary oil spill equipment base and staging area	Section 8.0 b)
(a)(2)(iii)	Name(s) of oil spill removal organizations for both equipment and personnel	Section 8.0 c), OSRP
(a)(2)(iv)	Calculated volume of the worst case discharge (WCD)	Sections 2.20 g) ,3.0 l), 8.0 d), e)
(a)(2)(v)	Description of the worst case scenario discharge	Section 8.0 e)
(b)	Modeling report	Section 8.0 f)
30 CFR 550.220	**Alaska Planning Information**	Section 9.0
(a)	Emergency plans	Section 9.0 a)
(b)	Critical operations and curtailment procedures	Section 9.0 b)
30 CFR 550.221	**Environmental Monitoring Information**	Section 10.0
(a)	Monitoring systems	Section 10.0 a)
(b)	Incidental takes	Section 10.0 b)
(b)(1)	Threatened and endangered species list under the Endangered Species Act (ESA)	Section 12.0 b)
(b)(2)	Marine mammals	Section 12.0 b)
(c)	Flower Garden Banks National Marine Sanctuary	N/A
30 CFR 550.222	**Lease Stipulations Information**	Section 11.0
	Stipulation No. 1	Section 11.0
	Stipulation No. 2	Section 11.0
	Stipulation No. 3	Section 11.0
	Stipulation No. 4	Section 11.0
	Stipulation No. 5	Section 11.0
	Stipulation No. 6	Section 11.0
	Stipulation No. 7	Section 11.0
30 CFR 550.223	**Mitigation Measures Information**	Section 12.0
(a)	Mitigation measure beyond those required by regulations	Section 12.0 c)
(b)	Mitigation measures to avoid/minimize incidental takes of:	Section 12.0 c)
(b)(1)	Threatened and endangered species list under the ESA	Section 12.0 b)
(b)(2)	Marine mammals	Section 12.0 b)
30 CFR 550.224	**Support Vessel and Aircraft Information**	Section 13.0
(a)	General	Section 13.0 a)
(b)	Air emissions	Section 13.0 b)
(c)	Drilling fluids and chemical products transportation	Section 13.0 c)
(d)	Solid and liquid wastes transportation	Section 13.0 d)
(e)	Vicinity map	Section 13.0 e)
30 CFR 550.225	**Onshore Support Facilities Information**	Section 14.0
(a)	General	Section 14.0 a)
(a)(1)	Onshore facility existing, to be constructed or expanded	Section 14.0 a)
(a)(2)	Onshore facilities in the western Gulf of Mexico (GOM)	N/A
(b)	Air emissions	Section 14.0 b)
(c)	Unusual solid and liquid wastes	Section 14.0 c)
(d)	Waste disposal	Section 14.0 d)
30 CFR 550.226	**Coastal Zone Management Information**	Section 15.0, N/A

CROSS-REFERENCE TO APPLICABLE REGULATIONS

Regulation Section	Regulatory Information	Exploration Plan (EP) Section
(a)	Consistency certification	N/A
(b)	Other information	N/A
30 CFR 550.227	**Environmental Impact Analysis Information**	Section 16.0
(a)	General requirements	Appendix C
(a)(1)	Assess the potential environmental impacts	Appendix C
(a)(2)	Be project specific	Appendix C
(a)(3)	Be as detailed as necessary	
(b)	Resources, conditions and activities	Appendix C
(b)(1)	Meteorology, oceanography, geology, and shallow hazards	Appendix C
(b)(2)	Air and water quality	Appendix C
(b)(3)	Benthic communities, marine mammals, sea turtles, coastal and marine birds, fish and shellfish, and plant life	Appendix C
(b)(4)	Threatened and endangered species and their critical habitat	Appendix C
(b)(5)	Sensitive biological resources or habitats	Appendix C
(b)(6)	Archaeological resources	Appendix C
(b)(7)	Socioeconomic resources	Appendix C
(b)(8)	Other coastal and marine uses	Appendix C
(b)(9)	Other resources, conditions, and activities identified by the Regional Supervisor	N/A
(c)	Environmental impacts	Appendix C
(c)(1)	Analyze the potential direct and indirect impacts	Appendix C
(c)(2)	Analyze and potential cumulative impacts	Appendix C
(c)(3)	Describe the potential impacts and their consequences and implications	Appendix C
(c)(4)	Describe potential mitigation measures	Appendix C
(c)(5)	Summarize information incorporated by reference	Appendix C
(d)	Consultation	Appendix C
(e)	References cited	Appendix C
30 CFR 550.228	**Administrative Information**	Section 17.0
(a)	Exempted information description	Section 17.0 a)
(b)	Bibliography	Section 17.0 b)
(b)(1)	List of all report and materials referenced	Section 17.0 b)
(b)(2)	Location of referenced materials not submitted with EP	Section 17.0 b)
Notice to Lessee (NTL)-2015-N01	Blowout scenario required by 30 CFR 550.213 and 219	Section 2.0 d), and Section 8
	Assumptions & calculations used to determine WCD volume	Section 3.0 l), Section 8 d)
United States (U.S.) Environmental Protection Agency (EPA) – NPDES		
40 CFR 122.21	Application for a permit	Separate document
National Marine Fisheries Service (NMFS)		
MMPA Sections 101(a)(5)(D)	Marine Mammal Protection Act Incidental Take Authorization for Whales & Seals	Separate document
U.S Fish and Wildlife Service (USFWS)		
MMPA Sections 101(a)(5)(A) and (D)	Marine Mammal Protection Act Incidental and Intentional Take Authorizations for Polar Bear & Pacific Walruses	Separate document
U.S. Army Corps of Engineers (USACE)		
33 CFR 325.1	Applications for permits	Separate document

[1] Section 3 is not included in the public version of the Chukchi Sea EP Revision 2 (See Proprietary Version)

SECTION 1.0 REVISED EXPLORATION PLAN CONTENTS

Shell Gulf of Mexico Inc. (Shell) submitted its initial Chukchi Sea Exploration Plan (EP) (Initial Chukchi Sea EP; Shell 2009) to the former U.S. Department of the Interior Minerals Management Service (MMS), now Bureau of Ocean Energy Management hereinafter collectively referred to as BOEM, in May of 2009. The initial Chukchi Sea EP was deemed submitted by BOEM on 20 October 2009. BOEM subsequently prepared a draft Environmental Assessment (EA) wherein it analyzed the potential impacts of the proposed exploration drilling program, and it released that draft for public review and comment. On 7 December 2009, following the close of public comment, BOEM issued a final EA and Finding of No Significant Impact (FONSI), and approved Shell's initial Chukchi Sea EP. In that initial Chukchi Sea EP, Shell identified seven Outer Continental Shelf (OCS) lease blocks (Posey Area Blocks 6713, 6714, 6763, 6764, 6912 and Karo Area Blocks 6864 and 7007) of interest in three prospects (Burger, Crackerjack, and Southwest Shoebill) that contained five potential drill sites (Burger C, F, J, Southwest Shoebill C, and Crackerjack C). The exploration drilling activities contemplated by the initial Chukchi Sea EP included the drilling of an exploration well at up to three of the above-referenced potential drill sites using the drillship Motor Vessel (M/V) *Frontier Discoverer*, which is now known as the M/V *Noble Discoverer* (*Discoverer*). Shell planned to initiate exploration drilling activities under the initial Chukchi Sea EP in the summer of 2010, but the exploration drilling activities were postponed when BOEM suspended all exploration drilling activities in the Arctic following the Deepwater Horizon (BP Macondo blowout) incident in the Gulf of Mexico (GOM).

In 2011, Shell submitted to BOEM a revised EP (EP Revision 1, Shell 2011). This revision included Shell's plan to drill six exploration wells at only the Burger Prospect starting in 2012. This EP was subsequently approved by the BOEM 16 December 2011. In 2012, Shell mobilized the *Discoverer* and its support vessels to the Burger A drill site on the Burger Prospect. Burger A was drilled to a depth of 1,505 feet (ft.) and was temporarily abandoned (TA) according to the Bureau of Safety and Environmental Enforcement (BSEE) regulations at 30 CFR 250.1721-1723. In accordance with the terms and conditions of BOEM's prior approval of EP Revision 1, Shell plans to continue exploration drilling operations at its Burger Prospect (Figures 1.b-1 and 1.b-2).

This final document (EP Revision 2) includes Shell's plans to resume drilling operations at the currently approved drill sites located at the Burger Prospect (Table 1.a-1). A draft version of EP Revision 2 was submitted to BOEM on 28 August 2014 for review. Where appropriate, Shell has addressed BOEM review comments into the final version of EP Revision 2 and its appendices. EP Revision 2 includes the addition of another drilling unit, the Mobile Offshore Drilling Unit (MODU) Transocean *Polar Pioneer* (*Polar Pioneer*), plus some additional support vessels. Differences between this EP Revision 2 and the approved EP Revision 1 are included in Table 1-1.

Differences between EP Revision 1 and EP Revision 2

The following are the most salient differences between EP Revision 1 and EP Revision 2. A larger list of changes is located in Table 1-1.

Additional Drilling Unit

Under Chukchi Sea EP Revision 2, Shell plans to drill all six exploration wells using either the *Discoverer* and/or the *Polar Pioneer*. EP Revision 2 includes simultaneous use of both drilling units whereas in EP Revision 1 only the drillship *Discoverer* was used. The *Discoverer* is ice-strengthened for operating in Arctic OCS waters. The *Discoverer* includes state of the art drilling and well control equipment. The *Polar Pioneer* is a non-self-propelled semi-submersible drilling unit capable of drilling in harsh environments, and also includes state of the art drilling and well control equipment. In the event of a well control incident that requires drilling a relief well, each drilling unit will serve as its own primary relief well drilling unit and as the secondary relief well drilling unit for the other drilling unit.

Additional Support Vessels and Trip Frequencies

Vessel changes between EP Revision 1 and EP Revision 2 include the use of additional support vessels and oil spill response (OSR) equipment for Shell's exploration drilling program in the Chukchi Sea (Table 1-1). These adjustments have been made in direct response to Shell's experiences during the 2012 season, the planned use of a second drilling unit, and discharge monitoring requirements under the new National Pollutant Discharge System (NPDES) exploration facilities general permit (GP). Vessel types identified may be used to support exploration drilling activities in the Chukchi Sea (e.g., ice management, anchor handling, offshore supply, and OSR augmentation) and are therefore included in the Chukchi Sea EP Revision 2. The use of all vessel types identified is analyzed in the Environmental Impact Analysis (EIA) (Appendix C). EP Revision 2 also includes the potential use of a mudline cellar (MLC) Remotely Operated Vehicle (ROV) system housed on an offshore supply vessel (OSV). The MLC ROV system, if permissible under applicable permits or authorizations and available, will be capable of constructing an MLC prior to the arrival of a drilling unit.

Under EP Revision 2, the expected frequency of visits by OSVs to the drilling units has been increased from 17 round trips per season to 30 round trips per season.

There have also been changes in the designated locations of some support vessels and the frequency of their use, with some being moored in Kotzebue Sound. Further information regarding the location and specifications of all vessel types proposed for use is provided in Section 13.

Additional Aircraft and Flight Frequencies

Under EP Revision 2, Shell plans to utilize an additional helicopter for crew changes from Barrow to the Burger Prospect and increase the frequency of crew change flights from 12 round trips per week up to an estimated 40 round trips per week (Table 13.a-3). An additional fixed wing aircraft is provided for in EP Revision 2 as the platform for conducting ice reconnaissance flights. Further information regarding the location and specifications of all aircraft types proposed for use is provided in Section 13.

Exploration Drilling Changes

Under EP Revision 2, Shell will not recycle drilling fluids from one drill site to the next. Spent drilling fluids will be discharged after each well is drilled to total depth (TD) because of space restrictions on the drilling units and the need for multiple types of drilling fluids.

Also under EP Revision 2, drilling fluid will not be cooled. This mitigation measure was removed as no permafrost has been observed in the five historical wells, recognized in the modern shallow hazards surveys, or encountered in the Burger A well during exploration drilling in 2012. A drilling fluid chiller will be present on both drilling units in the event that it is needed.

A third change involves Shell's blowout prevention program. Shell will modify the blowout preventer (BOP) pressure test frequency from once every 7 days to once every 14 days. This change is consistent with 30 CFR 250.447(b), which requires a BOP system test before 14 days have elapsed since the last pressure test.

Similarities between EP Revision 1 and EP Revision 2

In comparison to the differences noted between EP Revision 1 and EP Revision 2, many aspects of the proposed drilling program remain similar. The following are the most salient items that have not changed from EP Revision 1 to EP Revision 2:

- Burger Prospect drill sites – the number (six) and locations (Table 1.a-1 and Figure 1.b-1) of drill sites, remain the same;
- Worst Case Discharge (WCD) – the calculated WCD flow rates and volumes (Table 2.g-1) for each of the six potential Burger Prospect wells remain the same;
- Oil Spill Response Plan (OSRP) – although some administrative changes are noted in the Chukchi Sea OSRP and the addition of the second drilling unit *Polar Pioneer* (Section 8), Shell's response in the event of a loss of well control remains the same;
- Well Control Plan (WCP) – the WCP was changed to incorporate language more familiar to Shell's well engineers and responders to a well control event; however, there have been no changes to the substance of Shell's well control procedures (Appendix H);
- Critical Operations and Curtailment Plan (COCP) – the text has been updated to include the second drilling unit *Polar Pioneer*, key personnel titles have changed, and the curtailment decision protocol has been updated to include the new key personnel; however, there have been no changes to the quality or substance of Shell's COCP (Appendix F); and
- Drilling Ice Management Plan (DIMP) – contains minor changes and updates; ice management objectives and principles are clearly defined, the drilling units and attending ice management vessels have been updated; however, there have been no changes to the quality or substance of Shell's approach to ice management (Appendix G).

In addition to the EP changes, since EP Revision 1 was approved, several actions from the federal government may shape how Shell will operate under EP Revision 2. These actions include:

- Polar Bear Critical Habitat was vacated in January 2013 when the U.S. District Court for the District of Alaska ruled that the U.S. Fish and Wildlife Service (USFWS proposed critical habitat designation did not meet the requirements of the Endangered Species Act (ESA);
- Change in ESA status of certain ice seals – the bearded seal (Beringia distinct population segment) and the ringed seal were listed as threatened in December 2012; in July 2014 the threatened listing for the bearded seal was vacated and remanded by the U.S. District Court for the District of Alaska to NMFS;
- Addition of the Hanna Shoal Walrus Use Area (HSWUA) – this is a large area (approximately 9,500 square miles [mi^2]) to the northeast of the Burger Prospect that the USFWS designated as an area utilized by Pacific walrus during the summer months (Incidental Take Regulations Federal Register (FR) notice 78 FR 35364, 12 June, 2013); and
- Air emissions regulations are now administered by BOEM rather than the Environmental Protection Agency (EPA). In December 2011, jurisdiction for regulating air emissions for projects on the OCS in areas off the coast of the North Slope Borough (NSB) in Alaska was changed from the EPA to BOEM (Consolidated Appropriations Act, Page 1048). As a result, the

air permit for the Discoverer drill ship in the Chukchi Sea was terminated by the EPA in January 2014 (79 FR, Page 2442). Shell now seeks authorization from BOEM for air pollutants emitted during the activities described in EP Revision 2.

Table 1-1 Comparison of the Exploration Drilling Program Under Shell's Approved EP Revision 1 and EP Revision 2

Parameter	Approved EP Revision 1	EP Revision 2
Drilling Units	*Discoverer*	*Discoverer* and *Polar Pioneer*
MLC Construction	*Discoverer*	*Discoverer, Polar Pioneer, MLC ROV system*
Support Vessels	Drilling Support Vessels: • Ice Management vessel (x1) • Anchor handler (x1) • OSVs (x2) • Shallow water landing craft (x1) Oil Spill Response Support Vessels: • Oil spill response vessel (OSRV) (x1) • OSR tug (x1) and barge (x1) • Oil storage tanker (OST) for recovered liquids (x1) • Oil spill containment system tug (x1) and barge (x1) • Oil spill containment system Anchor handler (x1)	Drilling Support Vessels: • Ice Management Vessels (x2) • Anchor Handlers (x3) • Supply Tugs (x2) and barges (x2) • OSVs (x3) • Support Tugs (x2) • Science vessels (x2) • Shallow water vessels (x2) • MLC ROV system vessel (x1) Oil Spill Response Support Vessels: • OSRV (x1) • OSR tug (x1) and barge (x1) • OSTs (x2) • Oil spill containment system tugs (x2) and barge (x1) • OSR tug (x1) and barge for nearshore response (x1)
Aircraft	• S-92 or AW139 for crew change • S-61, S92 or EC225 for Search and Rescue (SAR) • Fixed wing aircraft for protected species observer (PSO) flights • Fixed-wing aircraft – crew change from Wainwright to regional jet service in Barrow	• S-92 Helicopters (or similar) for crew change (x3) • S-92 Helicopter (or similar) for SAR • Fixed wing aircraft for PSO and ice monitoring flights (x2) • Fixed-wing– crew change from Wainwright to regional jet service in Barrow
Aircraft Flights	• Helicopter Crew Change Flights- Approximately 12 round trips/week for crew change/resupply • Fixed wing aircraft for PSO • Fixed wing aircraft crew change between Barrow & Wainwright up to 4 times per week	• Helicopter Crew Change Flights- Approximately 40 round trips/week for crew changes/resupply • Fixed wing aircraft for PSO and ice monitoring flights daily • Fixed wing aircraft crew change between Barrow and Wainwright once every 3 weeks
Drilling Unit Discharges	Discharges as listed in Section 6 of EP Revision 1	Revised discharges volumes/rates in Section 6 of EP Revision 2
Drilling Unit Authorizations	Burger drill sites were authorized under National Pollutant Discharge Elimination System (NPDES) exploration facilities General Permit (GP) AKG-28-0000	Notices of Intent (NOI) to discharge certain wastes at the Burger drill sites werefiled under the new NPDES exploration facilities GP AKG-28-8100
Drilling Fluid Components	List of approved components are in Table 6.c-1 of EP Revision 1	Additional drilling components have been added and are in Tables 6.c-1 and 6.c-2 of EP Revision

Table 1-1 Comparison of the Exploration Drilling Program Under Shell's Approved EP Revision 1 and EP Revision 2

Parameter	Approved EP Revision 1	EP Revision 2
Drilling Fluid Recycling	Drilling fluids to be recycled from well to well as practicable.	Drilling fluids will not be recycled from well to well.
Drilling Fluid Cooling	Drillings fluids will be cooled.	Drilling fluids will not be cooled.
BOP Test Frequency	Performance (pressure) test every 7 days	Pressure test every 14 days as per BSEE regulation 30 CFR 250.447(b)
Shorebase	Barrow – 75 person man camp	• Barrow – lease 40 person man camp; add a kitchen unit to the 75 person man camp; add hangar space for an additional helicopter • Wainwright – additional existing yard space has been leased for response equipment storage
Secondary Relief Well Unit for the *Discoverer*	*Kulluk*	*Polar Pioneer* will serve as secondary relief well unit for *Discoverer*, and *Discoverer* will serve as secondary relief well unit for *Polar Pioneer*
Air Emissions Authorization	Air emissions approved by EPA under authorization R10OCS/PSD-AK-09-01	Jurisdiction for regulating air emissions for projects on the OCS in areas off the coast of the NSB in Alaska was changed from EPA to BOEM (Consolidated Appropriations Act)
Containment System Location	Centrally located in the Chukchi Sea or Beaufort Sea	Located in or near Goodhope Bay within Kotzebue Sound
H_2S Classification	Requested 'H_2S Unknown' classification	Requests 'H_2S Absent' classification; H_2S Contingency Plan removed

As required by 30 CFR 550.212-228, details of the planned exploration drilling program are provided in the following sections and associated appendices. While this submission is a plan revision, Shell acknowledges that pursuant to 30 CFR 550.285(c), the plan revision could be subject to all of the procedures under 30 CFR 550.231 through 30 CFR 550.235, and has provided a complete EP that meets all the requirements of 30 CFR 550.212. This EP Revision 2 also meets the requirements of NTL 2015-N01.

a) Description, Objectives, and Schedule for the Exploration Drilling Program

This EP Revision 2 and its appendices, including the comprehensive EIA (Appendix C), describe the exploration drilling activities Shell plans to resume in 2015 at six lease blocks within the Burger Prospect for its exploration drilling program in the Chukchi Sea (Figure 1.b-1). Each of the identified lease blocks (Fig 1.b-2) contain a single drill site (Table 1.a-1) which are described and analyzed herein. Shallow hazards data has been collected at each of these drill sites and each drill site has been reviewed for potential shallow hazards and archaeological evidence. Formal shallow hazards reports and archaeological assessments have been submitted to the BOEM in advance of this submission under separate cover for each of the drill sites.

Table 1.a-1 Shell Lease Blocks and Drill Sites Covered in the EP Revision 2 for the Exploration Drilling Program Started in 2012 (Protraction NR03-02, Posey Area Block)

Proposed Drill Site	Block	Lease Number	Coordinates (meters [m])[1]		Latitude	Longitude
			X	Y		
Burger A	6764	OCS-Y-2280	563945.26	7912759.34	N71° 18' 30.92"	W163° 12' 43.17"
Burger F	6714	OCS-Y-2267	564063.30	7915956.94	N71° 20' 13.96"	W163° 12' 21.75"
Burger J	6912	OCS-Y-2321	555036.01	7897424.42	N71° 10' 24.03"	W163° 28' 18.52"
Burger R	6812	OCS-Y-2294	553365.47	7907998.91	N71° 16' 06.57"	W163° 30' 39.44"
Burger S	6762	OCS-Y-2278	554390.64	7914198.48	N71° 19' 25.79"	W163° 28' 40.84"
Burger V	6915	OCS-Y-2324	569401.40	7898124.84	N71° 10' 33.39"	W163° 04' 21.23"

[1] Coordinate system is North American Datum 1983 (NAD 83) UTM Zone 3
' = minute
" = second

The drilling units will move through the Bering Strait and into the Chukchi Sea on or about 1 July and then onto the Burger Prospect as soon as ice and weather conditions allow. Exploration drilling activities will continue until on or about 31 October, and the drilling units and support vessels will exit the Chukchi Sea at the conclusion of each exploration drilling season.[1]

Shell plans to drill exploration wells to a TD below objective depth at each of the six possible drill sites. Shell may also elect to construct additional MLCs, using the drilling units or the MLC ROV system, and upper hole segments (i.e., "partial holes") using the drilling units, depending on the available time remaining through the drilling season. The purpose of the MLC is to ensure that the top of any portion of the wellhead and BOP is located below the maximum ice keel gouge depth, as per 30 CFR 250.451(h). Shallow hazards surveys (GEMS 2009; Fugro GeoConsulting, Inc. 2010a,b,c,d,e,f; Fugro GeoConsulting, Inc. 2011a,b) conducted in the area of the planned exploration drill sites in the Burger area, indicate a maximum ice keel gouge depth of about 5.0 ft. (1.5 m) below the seafloor. If the final well in a drilling season cannot reach objective depth by the end of the drilling season, the well will be suspended in compliance with applicable BSEE regulations and with the approval of the Regional Supervisor, Field Operations (RS/FO)[2].

No unfinished wellbore will remain open at the end of the final drilling season except in an emergency, but any well drilled during any season will be left at the end of any season in a status approved by the RS/FO of BSEE. If a hazardous condition occurs while drilling and requires curtailment of critical operations (or prevents initiating them, depending on the time available) per the provisions of the COCP (Appendix F), the well will either be drilled to objective well depth or secured and permanently abandoned prior to lease termination. Any well on which exploration drilling operations are suspended at the end of any drilling season will be secured and permanently abandoned prior to lease termination.

[1] Shell may, depending on seasonal ice conditions, marine mammal distributions, and planned subsistence harvest in the area of interest, request permission from the USFWS and the NMFS to transit through the Bering Strait and into the Chukchi Sea prior to 1 July.

[2] During the 2012 exploration drilling season, Shell initiated drilling at the Burger A well. The well was drilled to a MD of 1,505 feet (ft.) rotary kelly bushing (RKB) and is TA according to the BSEE regulations at 30 CFR 250.1721-1723.

A well may also be started, TA due to ice, weather, or other conditions, and finished later in the same drilling season during the period covered by this EP Revision 2. This was an operational reality during the 1989–1991 Chukchi Sea exploration drilling campaign.

The actual number of wells that will be drilled in a season will depend upon ice conditions and the length of time available in each exploration drilling season. The predicted "average" drilling season, constrained by prevailing ice conditions and regulatory restrictions, is long enough for a drilling unit to drill an exploration well from spud to proposed total depth (PTD) and possibly construct an additional MLC or drill and secure a partial well. Once the objective intervals are fully evaluated, each exploration well will be plugged and abandoned in compliance with BSEE regulations.

Shell plans to drill six exploration wells to TD over the duration of this EP Revision 2. Any or all of these six possible drill sites may be permitted for drilling by BSEE via Applications for Permits to Drill (APD) to allow for operational flexibility in the event sea ice conditions prevent access to one or more locations.

b) Location

OCS Lease Sale 193 was held in February 2008 and Shell was subsequently awarded 275 OCS leases (blocks) through a competitive bidding process. The locations of these lease blocks in the Burger Prospect are depicted in Figure 1.b-1 and listed above in Table 1.a-1. Locations of the six drill sites within the blocks are depicted in Figure 1.b-2. Planned drilling unit maximum anchor radii and bathymetry are indicated for each drill site in Figure 1.b-3 through Figure 1.b-8. Surface and bottomhole coordinates, OCS area name and block number, lease number, distance from block line, and other information for each of the drill sites are provided on the respective OCS Plan Information Forms (BOEM-0137) attached to this EP Revision 2 in Appendix A. Public and proprietary versions of the BOEM-0137 forms are part of this EP Revision 2 submission. Proprietary information withheld from the public version includes bottomhole location, true vertical depth (TVD) and measured depth (MD).

Shell is aware that under 30 CFR 550.160 Shell must submit a request to BOEM for right-of-use and easement authorization if Shell wants to place one or more anchors on an adjacent lease block. Regarding the Burger S drill site (Figure 1.b-7), Shell will apply for right-of-use and easement if any proposed anchor location would reside on an adjacent lease block.

Resupply will be from Dutch Harbor using OSVs. Additional resupply support may be provided via Kotzebue Sound. Aviation operations will be conducted primarily from Barrow. These are the plans only for the exploration drilling program covered by this EP Revision 2.

Figure 1.b-1 Location Map Exploration Drilling Program

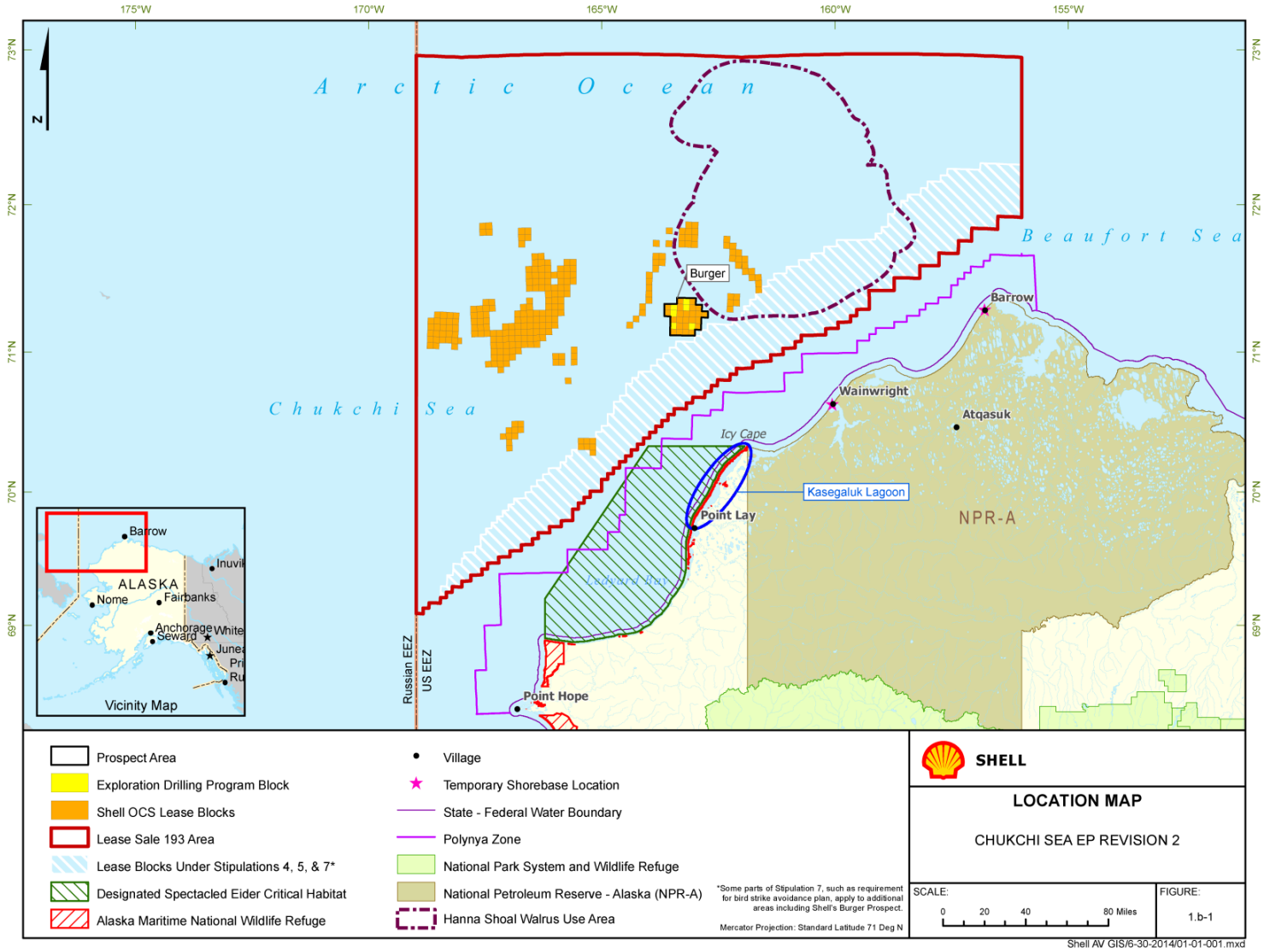


Figure 1.b-2 Burger Prospect Location Map

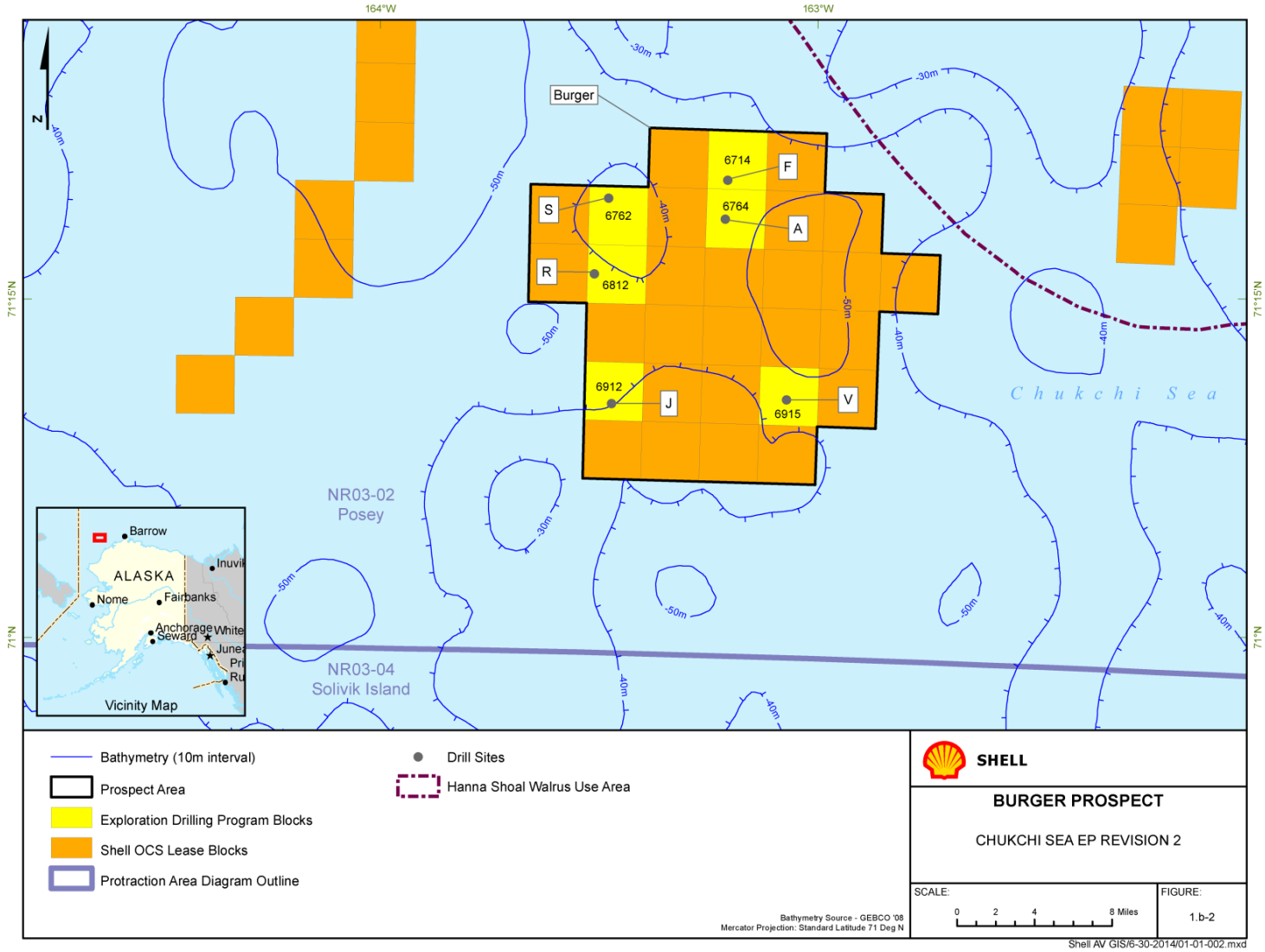


Figure 1.b-3 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger A

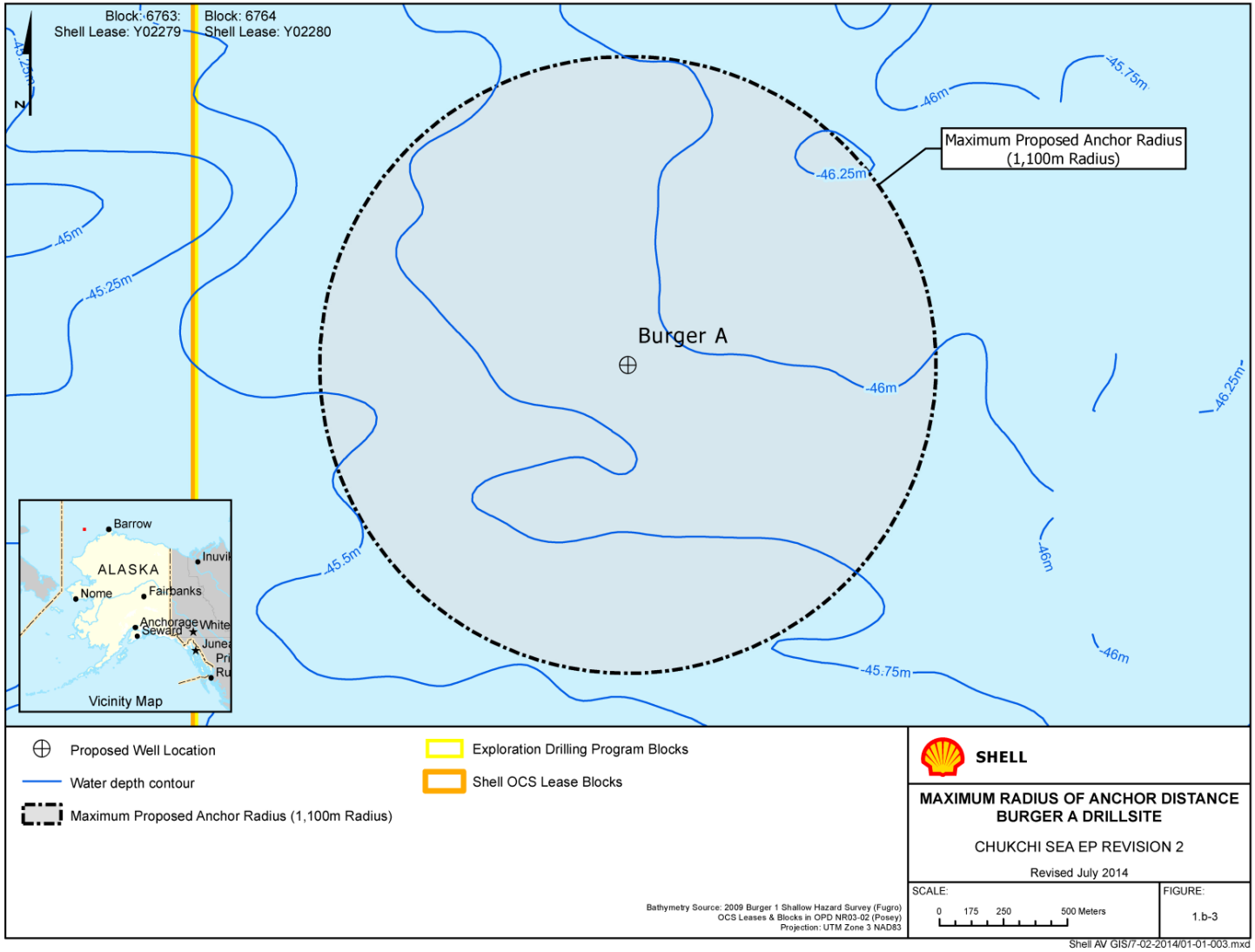


Figure 1.b-4 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger F

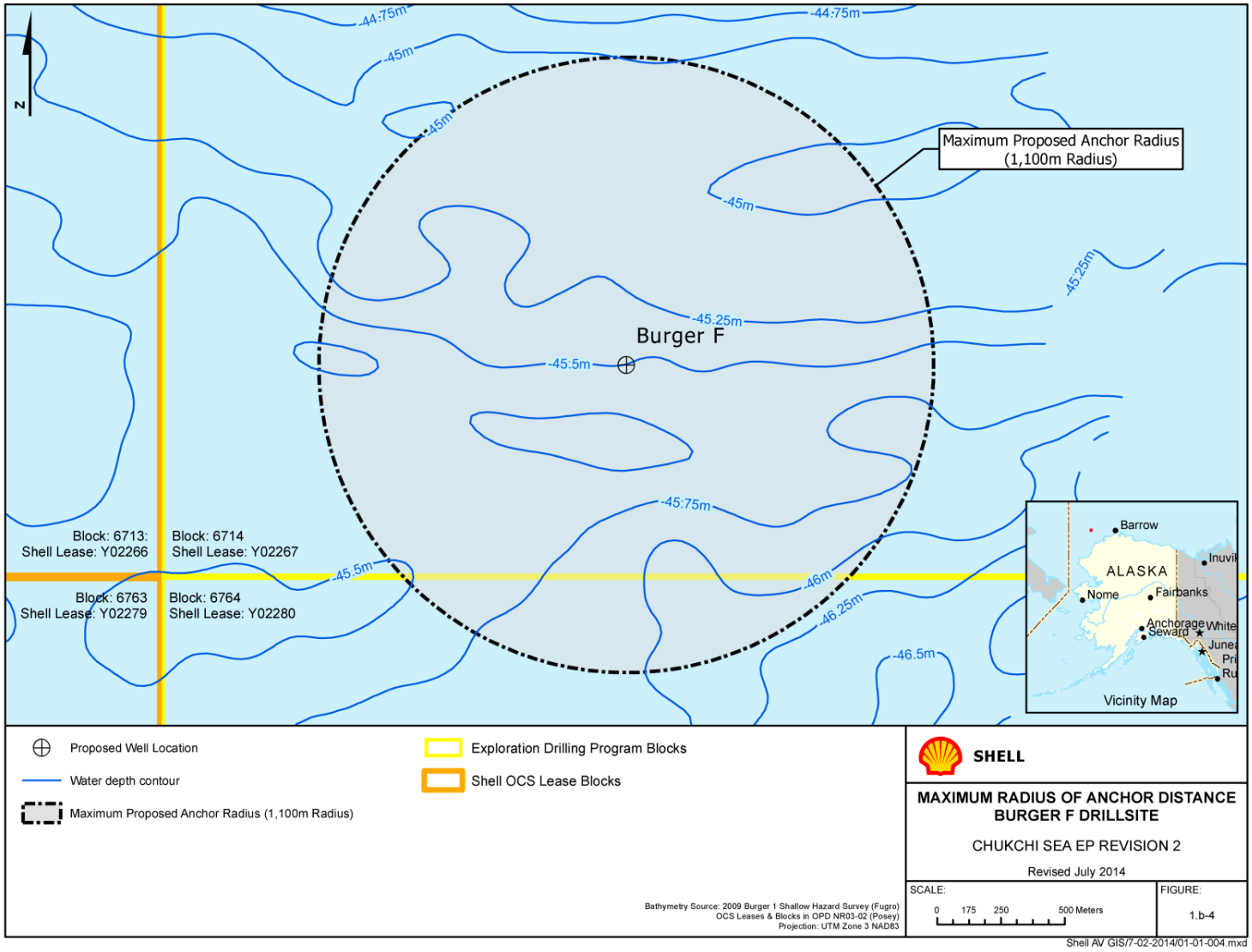


Figure 1.b-5 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger J

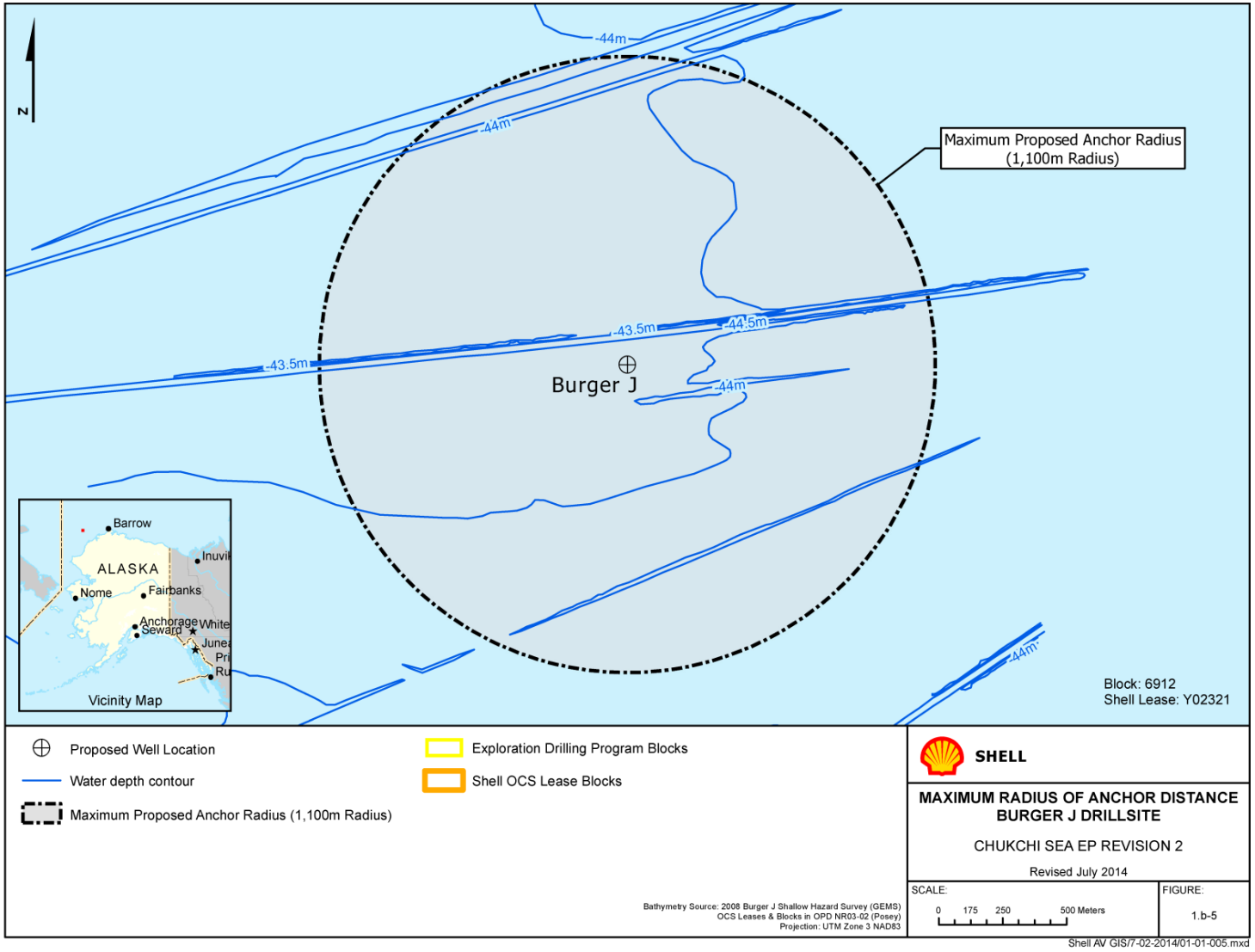


Figure 1.b-6 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger R

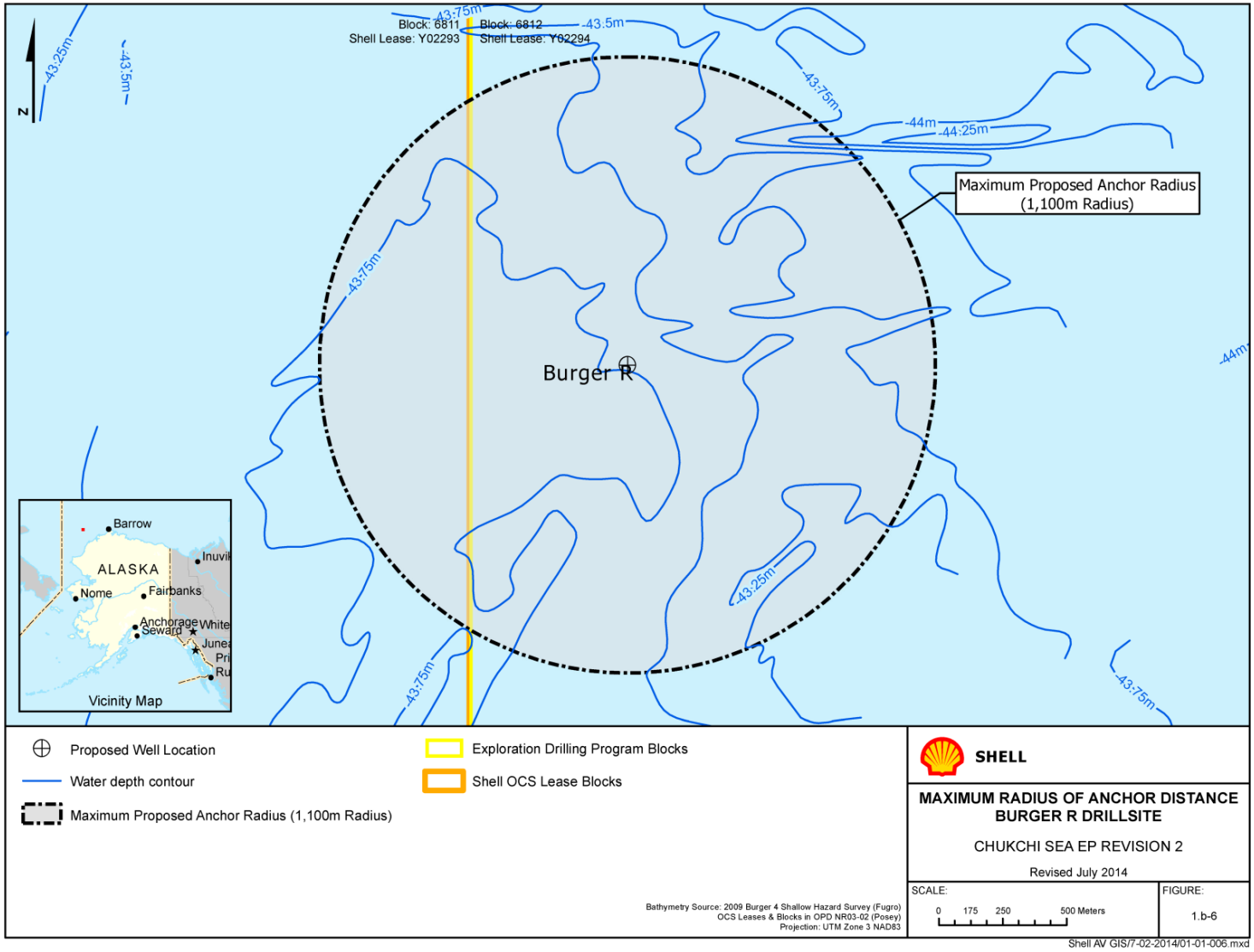


Figure 1.b-7 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger S

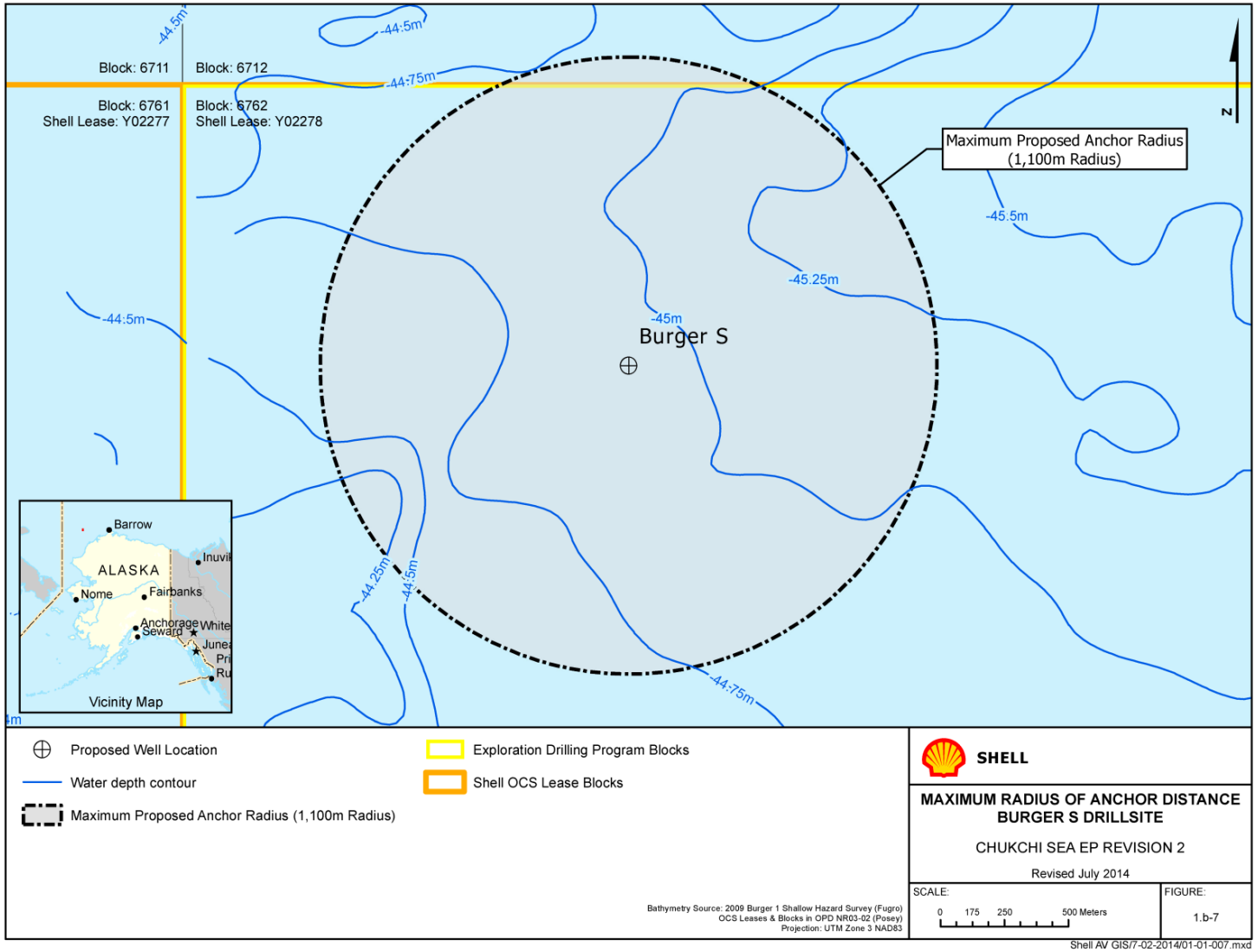
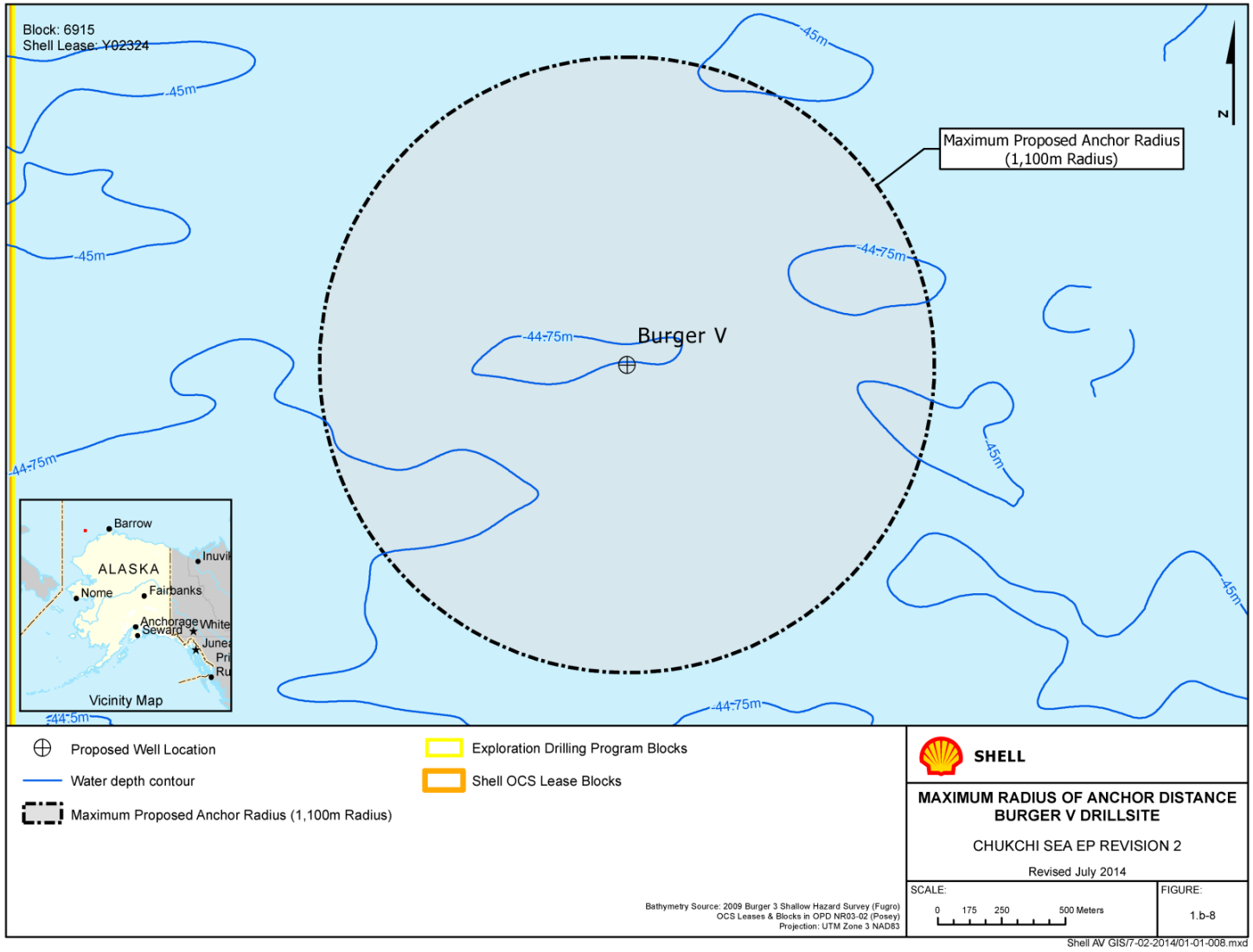


Figure 1.b-8 Bathymetry and Planned Drilling Unit Maximum Anchor Radius - Burger V



c) Drilling Units

All planned exploration drilling in the identified lease blocks will be conducted with the *Discoverer* and the *Polar Pioneer*.

The *Discoverer* is a turret moored self-propelled drillship. Station keeping is accomplished using a turret-moored, 8-point anchor system. The underwater fairleads prevent ice fouling of the anchor lines. Turret mooring allows orientation of the vessel's bow into the prevailing metocean conditions to present minimum hull exposure to drifting ice. The vessel is rotated around the turret by hydraulic jacks. Rotation can be augmented by the use of the fitted bow and stern thrusters. Ice-strengthened sponsons have been retrofitted to the drillship's hull.

The *Discoverer* is classed by Det Norske Veritas (DNV) as a MODU for worldwide service. It is a "1A1 Ship-Shaped Drilling Unit l" and is capable of performing drilling operations offshore of Alaska. The *Discoverer* has been issued with a DNV Appendix to Class stating:

"*The structural strength and material quality of the 'Ice Belt' formed by the sponsons below the 8,950 mm A/B level, have been reviewed against the requirements for the DNV ICE-05 Additional Class Notation and found to meet those requirements (as contained in DNV Rules for Classification of Ships, Pt 5 Ch. 1, July 2006) for a design temperature of -15 degrees C.*"

The *Polar Pioneer* is classed by DNV as a MODU for worldwide service. It is a non-self-propelled, "SPM thruster assisted" semisubmersible offshore drilling unit of twin-hull configuration. The rig is a "+ A1 Column Stabilized Unit" and is capable of performing drilling operations offshore of Alaska. Positioning is accomplished with a combination of an eight-point all chain catenary mooring system and thruster assisted mooring system.

The *Polar Pioneer* was built in 1985, with unlimited operation area, in accordance with the Norwegian Maritime Directorate and to DNV regulations, current at that time. While operating in Norwegian waters, the installation, with its inventory, equipment, crew and machinery was required to comply with current rules and regulations for operation on the Continental Shelf of Norway. The *Polar Pioneer* is generally used in waters that are at least 230 ft. (70 m) in depth. However, the *Polar Pioneer* is able to operate in waters shallower than 230 ft. (70 m), such as those at the Burger Prospect, with a completed riser analysis and mooring analysis. These analyses are proprietary documents and are submitted to BSEE as part of the Application for Permit to Drill.

Both drilling units will comply with all of the regulations of DNV, the International Maritime Organization (IMO), and the U.S. Coast Guard (USCG). All exploration drilling operations will be conducted under the provisions of 30 CFR Part 250 Subpart D, and other applicable regulations and notices including those regarding the avoidance of potential drilling hazards, safety and pollution control. The drilling units will undergo inspections by BSEE, DNV and USCG before entering the theater.

Procedures for monitoring and reacting to ice in the prospect areas are provided in the COCP and the DIMP which are attached as Appendices F and G, respectively.

Discoverer

Polar Pioneer

Table 1.c-1 Specifications of the *Discoverer* and the *Polar Pioneer*

Specification	*Discoverer*	*Polar Pioneer*
Dimensions		
Hull Length	514 ft. (156.7 [m])	279 ft. (85 m)
Hull Width	85 ft. (26.0 m)	233 ft. (71 m)
Height	274 ft. (83.2 m)	319 ft. (97.3 m)
Derrick Height	175 ft. (53.3 m)	170 ft. (51.8 m)
Draft		
Transit Draft	26.9 ft. (8.2 m)	30 ft. (9.15 m)
Operating Draft at Load line	26.9 ft. (8.2 m)	75.4 ft. (23 m)
Berths	124 berths	114 berths
Storage Capacity		
Potable Water	1,670 barrels (bbl) (266 cubic meters [m^3])	4,843 bbl (770 m^3)
Drill Water	5,798 bbl (922 m^3)	11,140 bbl (1,770 m^3)
Liquid Mud	2,400 bbl (382 m^3)	6,180 bbl (982 m^3)
Bulk Cement	6,400 cubic feet (ft^3) (180 m^3)	12,678 ft^3 (359 m^3)
Fuel	6,497 bbl (1,033 m^3)	11,290 bbl (1,794 m^3)
Propulsion Engines	(1) MAN Diesel B&W l 6,480 horsepower (hp)	Not Applicable
Power Plant	(6) Caterpillar 3512 1,476 hp	(5) Bergen KVG-18 3,890 hp
Mooring		
Anchors	9 – 15 metric ton (mt) Stevshark, 8 each	9 – 15 mt Stevshark, 8 each
Anchor Lines	2.75-inch (in.) (7-centimeters [cm]) wire rope 2.5- in. (6-cm) chain	3.3 in (88 mm) K-4 chain
Anchor Line Length	(8 each) 2,750 ft. (838 m) wire + 1,150 ft. (351 m) chain (useable) per anchor	(8 each) 6,458 to 6,675 ft. (1,969 to 2,035 m) chain per anchor
Transit Speed	8.0 knots	N/A (non-self-propelled)
Marine Sanitation Device	OMNIPURE Series 55	Piranha WRS-40

d) Service Fee

The required permit fee of $20,652 (six drill sites at $3,442 each) has been paid in full.

SECTION 2.0 GENERAL INFORMATION

a) Application and Permits

Table 2.a-1 lists permit and authorization applications or plans that have or will be submitted that will support this EP Revision 2, for the wells to be drilled in the Burger Prospect under EP Revision 2. Some permits have already been obtained, and some existing permits need renewal or extension.

Table 2.a-1 Permit Applications Pending or Approved

Permits & Authorizations	Agency	Submittal Date	Authorization Date	Document Location
Chukchi Sea Exploration Plan Revision 2	BOEM	March 2015	EP Revision 1 approved 15 December 2011	This document
APD	BSEE	Six (6) Burger APD applications submitted – Jan-Sep 2012 Dates to seek amendments to APDs to be determined (TBD)	Burger A – 30 August 2012[1] Burger J – 27 September 2012[1] Burger V – 18 October 2012[1] Amendment authorizations TBD	Separate cover
OSRP	BSEE	Biennial review updates submitted on 18 December 2013 Administrative updates to be filed following submittal of EP Revision 2	17 February 2012; Biennial review updates approved June 2014	Separate cover
NPDES GP AKG-28-8100 – Notice of Intent (NOI)	EPA	23 January 2015	To be determined	Separate cover
Marine Mammal Protection Act (MMPA) Authorization – Whales and Seals	NMFS	18 September 2014	To be determined	Separate cover
MMPA Authorization – Incidental Take of Polar Bear and Pacific Walrus	USFWS	17 September 2014	To be determined	Separate cover
MMPA Authorization – Intentional Take of Polar Bear and Pacific Walrus	USFWS	17 September 2014	To be determined	Separate cover
Section 10/404 Nationwide Permit (NWP) #8	United States Army Corps of Engineers (USACE)	30 September 2014	13 February 2015	Separate cover
Section 10 Letter of Permission[2]	USACE	30 March 2015	To be determined	Separate cover
Land Use Permit – Dutch Harbor area[2]	Alaska Department of Natural Resources (ADNR)	24 December 2014	1 March 2015	Separate cover
Land Use Permit – Kotzebue Sound area[2]	ADNR	12 February 2015	To be determined	Separate cover

[1] BSEE approved APDs for three wells Burger A, J, and V; all only to the bottom of the 20-in casing in each well. These three APDs, plus the APD applications for the remaining three Burger wells (Burger F, R and S) will be amended with applications to seek drilling to TD. Dates to seek amendment are TBD.
[2] Permission and permits are for activities outside the Lease Sale 193 Planning Area. These approvals are not required to conduct exploration drilling activities.

b) Drilling Fluids

Projected drilling fluid volumes and discharge rates for each drill site are listed in Tables 2.b-1 and 2.b-2.

Further details regarding waste stream volumes, discharge rates, mud additives and other information can be found in Section 6.0. Drilling fluid constituents are listed in Tables 6.c-1 and 6.c-2.

Table 2.b-1 Drilling Fluid Type, Quantity and Discharge Rates for MLC (using bit), Conductor and Surface-Cased Sections

Drill Site	Drilling Fluid Type	Projected Drilling Fluid Quantity	Projected Drilling Fluid Discharge Rate[1]
Burger A		already complete	already complete
Burger F	Sea Water and Gel Sweeps	3,124 bbl	29.5 bbl/hour (hr.)
Burger J		3,207 bbl	30.3 bbl/hr.
Burger R		3,121 bbl	29.4 bbl/hr.
Burger S		3,123 bbl	29.5 bbl/hr.
Burger V		3,207 bbl	30.3 bbl/hr.

[1] discharge occurs only during drilling; assume 106 drilling hours (does not include non-drilling time); the MLC ROV system if used in lieu of drilling units and as specified will not use drilling fluids

Table 2.b-2 Drilling Fluid Type, Quantity and Discharge Rates for Well Sections below the Surface Casing, after the Riser is Established

Drill Site	Drilling Fluid Type[1]	Projected Drilling Fluid Quantity[2]	Projected Drilling Fluid Discharge Rate[3,4]
Burger A	WBM	6,231 bbl	69.2 bbl/hr.
Burger F	WBM	6,184 bbl	68.7 bbl/hr.
Burger J	WBM	5,546 bbl	61.6 bbl/hr.
Burger R	WBM	6,352 bbl	70.6 bbl/hr.
Burger S	WBM	6,340 bbl	70.4 bbl/hr.
Burger V	WBM	6,736 bbl	74.8 bbl/hr.

[1] WBM – water based mud; see Section 6 for list of components
[2] Cutting not included in this total
[3] Discharge occurs only during drilling; assume 90 drilling hours (does not include non-drilling time)
[4] Does not include reserve pit volumes (*Discoverer* – 1,500 bbl and *Polar Pioneer* – 2,427 bbl) discharged at the end of the well at a rate not exceeding 1000 bbl/hr.

In addition to the WBM constituents listed in Section 6, potassium chloride (shale inhibitor) may be used but not discharged to the ocean. This product may be part of the drilling fluid that will be pumped in the hole prior to cementing. This fluid will remain in the hole behind the casing.

c) Chemical Products

Ethylene glycol and caustic soda (sodium hydroxide) quantities are likely to exceed the reportable quantity (RQ) as defined under 40 CFR 302. However, in order for these chemicals to be discharged to the sea, they will meet the toxicity requirements specified in the NPDES permit.

Ethylene glycol (RQ is 5,000 pounds (lb.) or 2,273 kilograms [kg]) is an antifreeze agent that will be used in the BOP fluid and will be discharged to the seafloor in compliance with NPDES exploration facilities

GP AKG-28-8100. Caustic soda (RQ is 1,000 lb. or 455 kg) may be used in the drilling fluid as pH control and will also be discharged to the seafloor in compliance with NPDES exploration facilities GP AKG-28-8100. Chemical products on the drilling vessels will be stored in United Nations (UN) Specification Packaging. Materials Safety Data Sheets, or Safety Data Sheets for drilling fluid chemical will be available on the drilling units and they will be available on the support vessels used to transport the chemicals.

d) New or Unusual Technology

Shell is proposing to potentially use a MLC ROV system when able, under applicable permits or authorizations, and available in addition to the current MLC bit system, to excavate new MLCs.

The subsea (SS) MLC ROV system will be deployed by a dedicated OSV and will sit on the sea floor and may use a number of different implements to mobilize the seafloor sediments. These sediments will then be pumped away via use of a pump mounted on the MLC ROV system and discharged on the seafloor away from the excavation site. The implements used could include an excavator bucket, a rotating cutter, auger, drill, and/or rock hammer. The MLC ROV system will require a slope, currently estimated at 15^{o}, to maintain its stability while excavating the MLC.

Examples of MLC ROV Systems

The MLC ROV system vehicle would be deployed from a vessel rather than a drilling unit. The MLC ROV system would not require any pumping from the surface into the sea, which greatly decreases the discharge of foreign fluids into the water column. Because the geometry of the MLC excavated using the MLC ROV system would be different than a MLC excavated using a MLC bit system deployed from a drilling unit, any well using this new technology would correspondingly yield a larger volume of cuttings deposited on the seafloor (Table 6.b-1). The increased volume of the MLC afforded by the MLC ROV system would eliminate the need for a remote SS control panel for well control and allow for SS pumps to be used to clear sediment from the MLC without the utilization of cutting tools.

This specific technology has not been put to use for construction of MLCs, but similar technology has been used for very similar work elsewhere. The technology being proposed is commonly used for the trenching of SS pipelines and cable runs.

e) Bonds, Oil Spill Financial Responsibility, and Well Control Statements

BOEM has determined that Shell has the financial capacity to allow BOEM to waive supplemental bond requirements of Shell (Operator No. YK02117). Shell also has an area wide exploration bond for $1,000,000 with Federal Insurance Company, Bond #8216-14-86.

Shell is of sound financial strength and reliability and has demonstrated oil spill financial responsibility (OSFR) according to 30 CFR 553 for the facilities planned in the EP Revision 2. In accordance with 30 CFR 553.30(d), Shell is indemnified for $150,000,000. This financial reliability ensures that Shell has the capability to deal with all emergency situations such as blowout control including relief well drilling and kill operations, if such an unlikely event should occur. This OSFR is current and valid and is renewed yearly when Shell submits audited financial information to BOEM.

This is a planned exploration drilling program with temporary seasonal operations. Drilling unit anchoring systems employed during operations will be removed upon permanent abandonment of each well. Permanent facilities will be limited to the casing, wellhead housings and the permanent guide base remaining after well abandonment. MLC excavations to protect the wellhead, casing and BOPs from potential ice gouge events will remain. Any well on which exploration drilling is suspended is secured in compliance with BSEE regulations and with the approval of the RS/FO, whether it is permanently abandoned (30 CFR 250.1710 through 1717) or TA (30 CFR 250.1721-1723).

f) Suspension of Operations

Shell has plans and mitigation measures in place that accommodate the forced or voluntary suspension of operations during implementation of the proposed exploration drilling program detailed in EP Revision 2. These plans and mitigation measures are in reference to suspension of operations as cited under 30 CFR 550.213(f) and not to be confused with suspension of operations as cited under BSEE regulations at 30 CFR 250.168 through 177. Forced suspension of operations could result from weather, ice conditions, drilling unit mechanical conditions, or downhole conditions, among others. In order to facilitate a possible suspension of operations, Shell has drafted several operational plans containing suspension procedures and protocols in accordance with 30 CFR 550.220, including a COCP, which is discussed in Section 9.0 and attached as Appendix F.

g) Blowout Scenario

A blowout scenario was developed for Shell's approved Chukchi Sea Regional OSRP based on 30 CFR 254.47(b). The blowout scenario is described in Section 8.0(d) and (e) of this EP Revision 2 as required by 30 CFR 550.219. This blowout scenario is the same scenario as described in EP Revision 1. The approved OSRP has been prepared to accommodate this same blowout scenario, the change of a second drilling unit (the *Kulluk* will not be drilling in the Beaufort Sea but the *Polar Pioneer* will be drilling near the *Discoverer* on the Burger Prospect), the change in name of an OSR contractor, and other administrative changes. Calculation of a WCD is also required by 30 CFR 550.213(g) and NTL 2015-N01, and is discussed below and in Section 8.

WCD – Maximum Flow Rate, Duration and Total Volume

Shell calculated WCD flow rates and volumes for a well at each of the drill sites identified in the EP Revision 1 using a combination of nodal analysis and numerical simulation techniques. Burger J was found to have the calculated maximum flow rate (Table 2.g-1). As stated previously, the WCD calculations remain the same in EP Revision 2. The total volume from a WCD from Burger J was calculated for both 34 days (603,564 bbl) and 38 days (669,479 bbl). These volumes were calculated from an initial flow rate of 23,100 bbl/day which diminishes over time.

Table 2.g-1 Calculated Maximum Daily Oil Flow Rates for Wells at Drill Sites

Drill Site	Lease	Estimated WCD Maximum Daily Oil Flow rate (bbl/day)
Burger J	OCS-Y-2321	23,100
Burger S	OCS-Y-2278	19,127
Burger A	OCS-Y-2280	19,031
Burger V	OCS-Y-2324	13,812
Burger F	OCS-Y-2267	11,763
Burger R	OCS-Y-2294	8,689

The assumptions and basis for calculation of the WCD are provided in Section 3.0 of the Proprietary version of EP Revision 2. The OSRP blowout planning scenario used for OSR planning (25,000 bbl/day for 30 days – 750,000 bbl) exceeds the WCD calculated for Burger J, as further discussed in Section 8.0.

Potential for Well Bridging

For calculation of the WCD, Shell has assumed uncontrolled flow to the mudline with no drill pipe in the hole, and no formation bridging. There has been only one penetration of the reservoir and it produced insufficient petrophysical data to be considered sufficient for determining bridging tendency at other sites.

Surface Intervention

Well control is discussed in Section 9.0 of this document and a WCP is provided in Appendix H. Shell will have a capping stack and a separate containment system tugs and barge available for the exploration drilling program. Surface intervention and capping and containment are discussed specifically in Section 9.0. The capping stack system will be carried as equipment on an ice management vessel so will remain in the vicinity of the drilling units, and the containment system tugs and barge will be located in Kotzebue Sound where it can respond if required.

Relief Well Drilling Unit – Availability, Constraints, and Days to Drill and Kill Flow

Shell's WCP is attached as Appendix H. Well control is the process of maintaining positive hydrostatic pressure in the drilled wellbore greater than that in any drilled formation, a process called positive pressure drilling, that prevents gas or fluids from underground reservoirs escaping from the wellbore in an uncontrolled manner.

In the unlikely event of a well blowout, the primary drilling unit will serve as its own relief well drilling unit. If the primary drilling unit is undamaged and capable of drilling its own relief well, drilling operations could begin in as little as three days, with the relief well drilled and flow from the blowout being killed in about 31 days (the estimated total duration after mooring of the relief well drilling unit to well kill would be approximately 28 days for a blowout at a Burger site). If the primary drilling unit cannot be used to drill the relief well, the secondary drilling unit would be brought in for that purpose. The *Polar Pioneer* will serve as the secondary relief well drilling unit for the *Discoverer*, and the *Discoverer* will serve as the secondary relief well drilling unit for the *Polar Pioneer*. EP Revision 2 assumes that both drilling units will be drilling at the Burger Prospect, in which case the estimated duration of flow prior to drilling a relief well to intersection with the original wellbore and killing the flow is approximately 34 days (six days to mobilize and moor and 28 days to kill the well). Should one drilling unit be as far away as Dutch Harbor, an additional four days will be required for the relief well, bringing total duration of uncontrolled flow to 38 days (10 days to mobilize and moor and 28 days to kill the well).

h) Contact Information

Contact Susan Childs, Alaska Venture Support Integrator, Manager at telephone number (907) 646-7112 or via e-mail at Susan.Childs@Shell.com.

SECTION 3.0 GEOLOGICAL AND GEOPHYSICAL INFORMATION (PROPRIETARY AND CONFIDENTIAL)

SECTION 4.0 HYDROGEN SULFIDE INFORMATION

a) Concentration

During the historic 1989–1991 Chukchi exploration drilling program, no hydrogen sulfide (H_2S) was recorded while drilling in open-hole conditions in any of the five wells: OCS-Y 1482 Klondike #1, OCS-Y 1275 #1 (Popcorn), OCS-Y 1413 #1 (legacy Burger #1 well), OCS-Y 1320 #1 (Crackerjack) and Chevron OCS-Y 0996 #1 (Diamond). However, two occurrences of minor amounts of H_2S, related to the bacterial digestion of the XC (*Xanthomonas campestris*, also known as xanthan gum) polymer in the mud that was left inside the casing during an extended period of operational suspension, were recorded and are described below. In early October 1989, a string of 13 ⅜-in. (340 mm) casing was set and cemented at 5,516 ft. (1,681 m) in the legacy Burger #1 well. The cement was displaced by the same XC polymer-based drilling mud as that used to drill the 17 ½-in. (445 mm) hole below 20-in. (508 mm) casing set at 1,440 ft. (439 m). The cement was displaced to the float collar some 43 ft. (13 m) above the casing shoe leaving a cement plug in the bottom of the casing along with two check valves (i.e., floats). The cement plugs and floats, along with the hydrostatic pressure from the mud column within the 20-in. (508 mm) casing, prevented formation fluids from entering the casing. The well was TA with a corrosion cap set on top of the wellhead after pressure testing the wellhead hanger. The well remained in this configuration until it was re-entered.

In August 1990, the MLC was cleaned out on the legacy Burger #1 well and the corrosion cap was removed. Then a 12¼-in. (311 mm) bit was run through the old mud to the top of the cement plug inside the casing. The old mud was then displaced out of the 20-in. (508 mm) casing with newly mixed drilling mud. When the bottom portion of the old mud reached the surface, a maximum H_2S concentration of 30 parts per million (ppm) was detected at the shale shaker. As the new mud circulated to surface, the H_2S concentration returned to zero. Once the H_2S concentration returned to zero the 12¼-in. (311 mm) bit then drilled through the cement plug and both check valves. It then proceeded to drill new formation on its way to the main objective target.

It is concluded that the H_2S was the byproduct of bacterial digestion of the polymer in the old mud contained within the 20-in. (508 mm) casing. There had been no H_2S detected while drilling the 17 ½-in. (445 mm) hole and the casing was sealed during the 10-month time between depositing the mud inside the casing and circulating it out. No other H_2S was recorded while drilling the remaining hole segments to the well's final TD of 8,202 ft. (2,500 m).

In October 1990, the 13 ⅜-in. (340 mm) surface casing was set and cemented in the OCS-Y 1320 #1 (Crackerjack) well at 5,448 ft. (1,661 m) in a 17 ½-in. (445 mm) hole below the 20-in. (508 mm) casing set at 1,326 ft. (404 m). On this casing string, two joints of casing separated the float collar at 5,363 ft. (1,635 m) from the float shoe at 5,448 ft. (1,661 m), leaving at least 85 ft. (26 m) of cement inside the base of the pipe. Again, the cement was displaced with the same XC polymer mud used to drill the 17 ½-in. (445 mm) hole. The combination of the cement plug and the floats along with the hydrostatic pressure from the mud column within the 13⅜-in. (340 mm) casing, prevented formation fluids from entering the casing. In addition, an H_2S scavenger, Sulf-X ES at a concentration of 1.0 parts per billion (ppb) was added to the mud to prevent bacterial degradation of the mud (as seen at the legacy Burger #1 well). The Crackerjack well was TA, without drilling out cement inside the surface casing, using a corrosion cap.

In late July 1991, the rig returned to the OCS-Y 1320 #1 (Crackerjack) well and re-entered the TA well. A 12¼-in. (311 mm) bit was run to the top of cement inside the 13⅜-in. (340 mm) casing and the old mud was circulated out of the hole. The returned mud was monitored for H_2S by a safety specialist and by mud loggers. When mud from approximately 4,000 ft. (1,219 m) in the well reached the surface, H_2S in trace concentrations was released at the shakers. As the old mud was displaced with new mud, the H_2S concentration fell to zero prior to drilling out the cement plug and floats, and into new formation. No

other H_2S was recorded while drilling the remaining hole segments to the well's final TD of 9,573 ft. (2,918 m).

Again, it is concluded that the H_2S in this well was the product of bacterial digestion of the XC polymer in the old mud. There was no H_2S encountered while drilling the 17 ½-in. (445 mm) hole and none was released into the mud during subsequent drilling. Apparently, the H_2S scavenger was not completely successful in preventing the H_2S, but the concentration was reduced from that seen in the Burger well after about the same on-bottom time.

No H_2S was detected or released while drilling any of the other wells in the Chukchi Sea during the 1989-1991 campaign. This reinforces the conclusion that the source of H_2S detected in these two wells was indeed the result of bacterial degradation of the polymer mud left in each hole for approximately 10 months each and not from any geologic formation penetrated by either well.

In 2012, H_2S scavenger and corrosive inhibitor were not used in the drilling fluid. In the event of re-entering a well that was started in 2012, that was TA the following procedure will be used. Once the drilling unit is moored, the drill pipe will be run into the surface plug and drill it out. Once the surface plug is drilled out, continue to trip in the hole to the surface casing shoe track and tag the top of cement. The drilling unit will pick up off bottom and circulate the well to the sea floor. This will ensure that if there is any H_2S build up it is circulated to the seafloor rather than the drilling unit topsides. Once the well has been circulated, the drilling unit will pull the drill pipe out of the hole and commence running the BOPs and riser.

b) Classification

H_2S is not expected in any hole segment in any exploration well planned in Shell's EP Revision 2. This is based on the absence of H_2S in any previously drilled exploration well in the Chukchi Sea, the Beaufort Sea or the Canadian Beaufort Sea, and the fact that no H_2S was encountered while drilling the legacy Burger #1 well. The legacy Burger #1 well was drilled through the targeted Cretaceous objective at a TD in the Jurassic Kingak Formation at 8,202 ft. (2,500 m). All of the planned exploration wells described in this EP Revision 2 will be targeting the same Cretaceous objective interval, as encountered in the legacy Burger #1 well, and would reach TD above the Kingak Formation.

All of the Burger Prospect drill sites covered by Shell's EP Revision 2 are requested to be classified as "H_2S absent" from the BSEE Regional Supervisor because none of the wells is projected to be drilled below the equivalent stratigraphic interval penetrated by the depth of the legacy Burger #1 well, 8,202 ft. (2,500 m).

c) Contingency Plan

Shell is requesting "H_2S Absent" classification from the BSEE Regional Supervisor in this EP Revision 2; therefore a contingency plan is no longer included.

d) Modeling Report

All of the Burger Prospect drill sites covered by Shell's EP Revision 2 are requested to be classified as "H_2S absent"; therefore a modeling report has not been developed.

SECTION 5.0 BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

a) Biological Environment Reports

Results of the shallow hazards surveys indicate that the seafloor at all six drill sites is relatively level and smooth with the exception of ice gouges. Seafloor sediments consist largely of silts and clays. No evidence was observed of hard bottom or other special habitats.

Shell partially funded other types of baseline studies since 2008 as part of a multi-faceted study to gather data regarding resources in the project area, and plans to continue these studies. The studies' focus includes a 30 x 30 nautical mile (nmi) study area (56 x 56 km) encompassing Shell's Burger Prospect. The data collected during the course of these programs were used in the EIA (Appendix C). Final reports are currently available for the following studies:

- Benthic ecology of the Burger and Klondike survey areas: 2008 environmental studies program in the northeastern Chukchi Sea (Blanchard et al. 2010a).
- Benthic ecology of the Burger and Klondike survey areas: 2009 environmental studies program in the northeastern Chukchi Sea (Blanchard et al. 2010b).
- Oceanographic assessment of the planktonic communities in the Klondike and Burger survey areas of the Chukchi Sea: report for survey year 2008 (Hopcroft et al. 2009).
- Oceanographic assessment of the planktonic communities in the Klondike and Burger survey areas of the Chukchi Sea: report for survey year 2009 (Hopcroft et al. 2010).
- Oceanographic assessment of the planktonic communities in the northeastern Chukchi Sea: report for survey year 2010 (Hopcroft et al. 2011).
- Oceanographic assessment of the planktonic communities in northeastern Chukchi Sea: report for survey year 2011 (Hopcroft et al. 2012).
- Oceanographic assessment of the planktonic communities in northeastern Chukchi Sea: report for survey year 2012. (Hopcroft et al. 2013)
- Oceanographic assessment of the planktonic communities in northeastern Chukchi Sea: report for survey year 2013. (Hopcroft et al. 2014)
- Distribution and abundance of seabirds in the northeastern Chukchi Sea, 2008 (Gall and Day 2009).
- Distribution and abundance of seabirds in the northeastern Chukchi Sea, 2008 and 2009 (Gall and Day 2010).
- Marine mammal surveys at the Klondike and Burger survey areas in the Chukchi Sea during the 2008 open water season (Brueggeman 2009).
- Marine mammal surveys at the Klondike and Burger survey areas in the Chukchi Sea during the 2009 open water season (Brueggeman 2010).
- Passive acoustic monitoring of marine mammals in the Chukchi Sea 9 September – 14 October 2008 (The Cornell Lab of Ornithology 2010).
- Marine mammal distribution and abundance in the northeastern Chukchi Sea during summer and early fall, 2008-2012 (Aerts et al. 2013).

- Distribution and Abundance of Seabirds in the Northeastern Chukchi Sea, 2008-2012 (Gall and Morgan, 2013).
- Distribution and abundance of seabirds in the northeastern Chukchi Sea, 2008 – 2013 (Gall et al. 2014).
- Oceanographic assessment of the planktonic communities in the northeastern Chukchi Sea (Hopcroft et al. 2013).
- Acoustic Survey of Fishes in the Chukchi Sea Environmental Studies Program in 2012 (Goodman et al. 2013).
- Chukchi Sea Environmental Studies Program 2008-2012: Benthic Ecology of the Northeastern Chukchi Sea (Blanchard and Knowlton, 2013).
- Northeastern Chukchi Sea Joint Acoustic Monitoring Program 2011–2012 (Delarue et al. 2013).
- Continental Shelf Research. Seasonal and inter-annual dynamics of the northeastern Chukchi Sea Ecosystem (Hopcroft and Day, 2013).
- Seasonal observations of carbonate chemistry and ocean acidification in 2013 (Mathis and Monacci 2014)
- Marine mammal distribution and abundance in the northeastern Chukchi Sea from shipboard surveys during summer and early fall 2008-2013 (Aerts et al. 2014).
- Deep Sea Research Part II: Topical Studies in Oceanography. The Northern Chukchi Sea Benthic Ecosystem: Characterization, Biogeochemistry and Trophic Linkages (Dunton et al. 2014).
- Physical oceanographic measurements in the northeastern Chukchi Sea: 2013 (Weingartner et al. 2014).

In addition to the baseline surveys described above, Shell has partially funded U.S. Geological Survey (USGS) walrus tagging studies in the Chukchi Sea and ringed seal tagging studies in Kotzebue Sound with the Native Village of Kotzebue.

Shell has also collected a large amount of information regarding marine mammals in the northeastern Chukchi Sea, including the area of Shell's Burger Prospect, through its marine mammal monitoring program associated with open water activities. Data collected are summarized in the following reports:

- Funk, D. W., R. Rodrigues, D. S. Ireland, and W. R. Koski (eds.). 2007. Joint Monitoring Program in the Chukchi and Beaufort Seas, July-November 2006. LGL Alaska Report P891-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., Bioacoustics Research Program, Cornell University, and Bio-Wave Inc. for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., and GX Technology, and National Marine Fisheries Service , U.S. Fish and Wildlife Service. 316 p. plus Appendices.
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- Funk, D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2010. Joint Monitoring Program in the Chukchi and Beaufort seas, open-water seasons, 2006–2008. LGL Alaska Report P1050-3, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 499 p. plus Appendices.
- Funk, D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2011. Joint Monitoring Program in the Chukchi and Beaufort seas, open-water seasons, 2006–2009. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Applied Sciences, for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service.
- Funk, D.W., C.M. Reiser, D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2013. Joint Monitoring Program in the Chukchi and Beaufort seas, 2006–2010. LGL Alaska Final Report P1213-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 592 p. plus Appendices.
- Funk, D., D Hannay, D. Ireland, R. Rodrigues, W. Koski. (eds.) 2008. Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–November 2007: 90-day report. LGL Rep. P969-1. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 218 pp plus appendices.
- Ireland, D.S., D.W. Funk., R. Rodrigues, and W.R. Koski (eds.), 2009. Joint Monitoring Program in the Chukchi and Beaufort seas, open water seasons, 2006–2007. LGL Alaska Report P971–2, Report from LGL Alaska Research Associates, Inc., Anchorage, AK, LGL Ltd., environmental research associates, King City, Ont., JASCO Research, Ltd., Victoria, BC, and Greeneridge Sciences, Inc., Santa Barbara, CA, for Shell Offshore, Inc., Anchorage, AK, ConocoPhillips Alaska, Inc., Anchorage, AK, and the National Marine Fisheries Service, Silver Springs, MD, and the U.S. Fish and Wildlife Service, Anchorage, AK. 485 p. plus Appendices.
- Ireland, D.S., R. Rodrigues, D. Funk, W. Koski, D. Hannay. (eds.) 2009. Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October 2008: 90-day report. LGL Rep. P1049-1. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 277 pp, plus appendices.
- LGL Alaska Research Associates, Inc., JASCO Applied Sciences, Inc., and Greeneridge Sciences, Inc. 2013. Joint Monitoring Program in the Chukchi and Beaufort Seas, 2012. LGL Alaska Report P1272-2 for Shell Offshore, Inc. ION Geophysical, Inc., and Other Industry Contributors, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 320 p. plus Appendices.
- LGL Draft Rep. P891-1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Goleta, CA, for Shell Offshore Inc., Houston, TX, and National Marine Fisheries Service, Silver Spring, MD. 199 p.
- Patterson, H., S.B. Blackwell, B. Haley, A. Hunter, M. Jankowski, R. Rodrigues, D. Ireland and D. W. Funk. 2007. Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–September 2006: 90-day report.

- Reiser, C. M, D. W. Funk, R. Rodrigues, and D. Hannay. (eds.) 2010. Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore, Inc. in the Alaskan Chukchi Sea, July–October 2009: 90-day report. LGL Rep. P1112-1. Rep. from LGL Alaska Research Associates Inc. and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 104 pp, plus appendices.
- Reiser, C.M, D.W. Funk, R. Rodrigues, and D. Hannay. (eds.) 2011. Marine mammal monitoring and mitigation during marine geophysical surveys by Shell Offshore, Inc. in the Alaskan Chukchi and Beaufort seas, July–October 2010: 90-day report. LGL Rep. P1171E–1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, and JASCO Applied Sciences, Victoria, BC for Shell Offshore Inc., Houston, TX, National Marine Fisheries Service, Silver Spring, MD, and U.S. Fish and Wildlife Service, Anchorage, AK. 240 pp, plus appendices.
- Bisson, L.N., H.J. Reider, H.M. Patterson, M. Austin, J.R. Brandon, T. Thomas, and M.L. Bourdon. 2013. Marine mammal monitoring and mitigation during exploratory drilling by Shell in the Alaskan Chukchi and Beaufort Seas, July–November 2012: Draft 90-Day Report. D.W. Funk, C.M. Reiser, and W.R. Koski, editors. LGL Rep. P1272D–1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, USA, and JASCO Applied Sciences, Victoria, BC, Canada, for Shell Offshore Inc., Houston, TX, USA, National Marine Fisheries Service, Silver Spring, MD, USA, U.S. Fish and Wildlife Service, Anchorage, AK, USA. 266 pp, plus appendices.
- Reider, H.J., L.N. Bisson, M. Austin, A. McCrodan. J. Wladichuk, C.M. Reiser, K.B. Matthews, J.R. Brandon, K. Leonard, and H.M. Patterson. 2013. Marine mammal monitoring and mitigation during Shell's activities in the Chukchi Sea, July–September 2013: 90-Day Report. LGL Report P1272D–2. Report from LGL Alaska Research Associates Inc., Anchorage, AK, USA, and JASCO Applied Sciences, Victoria, BC, Canada, for Shell Gulf of Mexico, Houston, TX, USA, National Marine Fisheries Service, Silver Spring, MD, USA, and U.S. Fish and Wildlife Service, Anchorage, AK, USA. 198 pp, plus appendices.

b) Physical Environment Reports

Archaeological Assessments

Shell has conducted shallow hazards surveys at the six drill sites. Archaeological resource assessments were conducted for each drill site based on geophysical data collected during the surveys. The shallow hazards survey reports and archaeological assessments have been submitted to BOEM under separate cover as listed below.

- Fugro GeoConsulting, Inc. 2010a. Shallow Hazards and Archaeological Assessment Burger Site Survey 1 OCS Lease Sale 193 area Chukchi Sea, Alaska. Report No. 27.2009-2327 V. 1 & 2, prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2010b. Drill Site Clearance Letter Proposed Burger A Drill Site Block 6764 OCS-Y-2280 Posey Area, Chukchi Sea, Alaska. Report No. 27.2010-2375-1 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2010c. Drill Site Clearance Letter Proposed Burger F Drill Site Block 6714 OCS-Y-2267 Posey Area, Chukchi Sea, Alaska. Report No. 27.2010-2375-3 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2010d. Drill Site Clearance Letter Proposed Burger S Drill Site Block 6762 OCS-Y-2278 Posey Area, Chukchi Sea, Alaska. Report No. 27.2010-2375-4 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.

- Fugro GeoConsulting, Inc. 2010e. Shallow Hazards and Archaeological Assessment Burger Site Survey 3 OCS Lease Sale 193 area Chukchi Sea, Alaska. Report No. 27.2010-2342 V. 1 & 2, prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2010f. Drill Site Clearance Letter Proposed Burger V Drill Site Block 6915 OCS-Y-2324 Posey Area, Chukchi Sea, Alaska. Report No. 27.2010-2375-6 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2011a. Shallow Hazards and Archaeological Assessment Burger Site Survey 4 OCS Lease Sale 193 area Chukchi Sea, Alaska. Report No. 27.2010-2343 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Fugro GeoConsulting, Inc. 2011b. Drill Site Clearance Letter Proposed Burger R Drill Site Block 6812 OCS-Y-2294 Posey Area, Chukchi Sea, Alaska. Report No. 27.2010-2375-7 prepared by Fugro GeoConsulting, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.
- Geoscience Earth & Marine Services (GEMS), Inc. 2009. Shallow Hazards and Archeological Assessment, Burger J Drill Site Posey Block NR03-02 6912, Chukchi Sea, Alaska. Prepared by Geoscience Earth & Marine Services, Inc., Houston, TX for Shell Gulf of Mexico Inc., Houston, TX.

Results of the shallow hazards surveys are summarized in Section 3.0 of the Proprietary version of EP Revision 2. The results of the archaeological assessments are discussed below and in more detail in Section 3.0 of the EIA (Appendix C) and in the shallow hazards and archaeological assessment reports for Burger J Site Survey (GEMS 2009), Site Survey 1 (Fugro GeoConsulting, Inc. 2010a), Site Survey 3 (Fugro GeoConsulting, Inc. 2010e), and Site Survey 4 (Fugro GeoConsulting, Inc. 2011a).

None of the EP blocks for this EP Revision 2 or drill sites are located in areas that BOEM has identified as having high potential for occurrence of historic archaeological resources. No potential archaeological resources were identified at or near the Burger A, F, J, R, S, or V drill sites. No facilities, shipwrecks, significant debris, or other man-made seafloor obstructions were detected during the shallow hazards surveys. The only man-made object around the proposed sites is the legacy Burger #1 well and wet stored anchors at Burger A set in 2012. The legacy Burger #1 well was drilled in 1989-1990 in Posey Area Block 6814 (Figure 3.0-2 of the Proprietary version of EP Revision 2). The historic well was plugged and abandoned in 1990, with all surface wellhead equipment contained well below the seafloor at the bottom of the MLC. None of the observed unidentified side-scan sonar contacts and unidentified magnetic anomalies is believed to be of archaeological significance. Fugro GeoConsulting Inc. (2011a) recognized a cluster of seven unidentified magnetic anomalies in the southern portion of Burger Site Survey 4 and thought that they could represent debris of unknown origin and recommended they be avoided. The seven magnetic anomalies are outside the planned drill site area (Burger R drill site) and thus will be avoided. All of the side-scan sonar contacts and magnetic anomalies will be avoided during the exploration drilling operations.

All the EP blocks and drill sites are located in water depths of less than 200 ft. (60 m), which is generally considered to be the low stand of sea level approximately 13,000 years before present (YBP). Recent research in the Bering Sea suggests that the sea level was about 164 ft. (50 m) lower than present approximately 11,000 years ago. Between 9,000 YBP and 7,500 YBP the sea level rose from approximately 144 ft. (44 m) to 59 ft. (18 m) lower than present (GEMS 2009). These rising marine waters would have inundated all of the planned drill site locations on the Burger Prospect. Early humans could have traversed presently inundated areas within the planned drill sites up until about 9,000 YBP; therefore, these areas, which were sub-aerially exposed prior to 9,000 YBP, could hold prehistoric archaeological resources. Such resources are most likely to occur along relict terrestrial landforms such as preserved levees or terraces associated with paleo-river channels or shorelines.

Pleistocene buried channels have been identified in the area of the Burger A, F, and S drill sites. In all three of these cases, the possible levees that might have been constructed on the sides of these subsurface

channel features have likely been eroded during the last sea-level rise, and covered in turn by Holocene aged materials, thus the possibility of preserved archaeologically significant sites has been decreased and the potential for disturbance of any such sites by exploration drilling operations is very low. No Pleistocene channels were identified near the Burger J, R, and V drill sites. Both Fugro and GEMS concluded that the potential for the occurrence and preservation of both prehistoric and historic cultural resources at the identified Burger A, F, J, R, S, and V drill sites is very low.

Other Studies of the Physical Environment

Shell participated in the funding of a number of other types of baseline studies in 2008 through 2013 as part of a multi-faceted study to gather data regarding resources in the project area, and Shell is continuing these studies. The study focused on a 30 x 30 nmi study area (56 x 56 km) encompassing Shell's Burger Prospect. The data collected during the course of these programs were used in the EIA. Final reports are currently available for the following:

- Physical oceanographic measurements in the Klondike and Burger survey area of the Chukchi Sea: 2008 and 2009 (Weingartner and Danielson 2010)
- Environmental studies in the Chukchi Sea 2008: chemical characterization (Neff et al. 2010)
- Chukchi Sea environmental studies baseline program: 2009 fish sampling chemistry results (Exponent 2010)
- Physical Oceanographic Measurements in the Northeastern Chukchi Sea: 2012 (Weingartner et al. 2013)
- Seasonal Observations of carbonate chemistry and ocean acidification in 2012 (Mathis 2013)

Shell also collected oceanographic information as part of the multi-faceted baseline study conducted at Burger in 2008-2013 as described above. Shell:

- Deployed meteorological buoys (including wave and current sensors) in the Chukchi Sea near the Burger Prospect from 2008 through 2012 (a buoy was not placed at the Burger Prospect in 2013 due to ice but a buoy was placed at the Popcorn and Crackerjack Prospects) and plans to continue to deploy these buoys yearly.
- Deployed an acoustical wave and current meter in the Chukchi Sea near the Burger Prospect in 2008-2010; no current plans to continue this deployment of this particular instrument. However, Shell continues to deploy a seafloor mooring capable of measuring waves and currents at the site.

Shell intends to reestablish a meteorological and air quality monitoring station at Wainwright. Data have been collected and reported for November 2008 through December 2013 in the following reports, which indicate that measured concentrations of air pollutants are well below National Ambient Air Quality Standards (NAAQS).

- AECOM, Inc. 2009a. Wainwright near-term ambient air quality monitoring program first quarter data report November 2008 through January 2009 final. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2009b. Wainwright near-term ambient air quality monitoring program second quarter data report February through April 2009 final. Document No. 01865-104-3220 prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2009c. Wainwright near-term ambient air quality monitoring program third quarter data report May through July 2009 final. Document No. 01865-104-3230 prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.

- AECOM, Inc. 2009d. Wainwright near-term ambient air quality monitoring program fourth quarter data report August through October 2009 final. Document No. 60136620-3240 prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2010a. Wainwright near-term ambient air quality monitoring program annual data report November 2008 through November 2009 final. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2010b. Wainwright permanent ambient air quality monitoring program first quarter data report January through March 2010 final. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2010c. Wainwright permanent ambient air quality monitoring program second quarter data report April through June 2010 draft. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2010d. Wainwright permanent ambient air quality monitoring program third quarter data report July through September 2010 draft. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2011a. Wainwright permanent ambient air quality monitoring program fourth quarter data report October through December 2010 draft. Unpublished report prepared by AECOM, Inc., for ConocoPhillips Alaska, Inc., Anchorage, AK.
- AECOM, Inc. 2011b. Wainwright permanent ambient air quality monitoring program annual data report January 2010 through December 2010 final. Unpublished report prepared by AECOM, Inc. for ConocoPhillips Alaska, Inc. Anchorage, AK.
- SLR International Corp. 2013a. Wainwright permanent ambient air quality monitoring program annual data report January 2012 through December 2012 final. Unpublished report prepared by SLR International Corp. for ConocoPhillips Alaska, Inc. Anchorage, Alaska.
- SLR International Corp. 2013b. Wainwright permanent ambient air quality monitoring program quarterly data report January 2013 through March 2013 final. Unpublished report prepared by SLR International Corp. for ConocoPhillips Alaska, Inc. Anchorage, Alaska.
- SLR International Corp. 2013c. Wainwright permanent ambient air quality monitoring program quarterly data report April 2013 through June 2013 final. Unpublished report prepared by SLR International Corp. for ConocoPhillips Alaska, Inc. Anchorage, Alaska.
- SLR International Corp. 2013d. Wainwright permanent ambient air quality monitoring program quarterly data report July 2013 through September 2013 final. Unpublished report prepared by SLR International Corp. for ConocoPhillips Alaska, Inc. Anchorage, Alaska.

Meteorological and air quality data were also collected at Point Lay as detailed in the following reports:

- Point Lay Comprehensive Ambient Air and Meteorological Monitoring Program, Annual Data Summary for June 1, 2010 – May 31, 2011. Unpublished report by SLR Consulting, Inc. for Shell Offshore Inc., Anchorage, Alaska, Sep. 2011 (SLR 2011).
- 2012 Annual Data Report, Point Lay Comprehensive Ambient Air and Meteorological Monitoring Program, Jan. 1 – Dec. 31, 2012. Unpublished report by SLR Consulting, Inc. for Shell Gulf of Mexico Inc., Anchorage, Alaska, Feb. 2013 (SLR 2013b).
- 2013 Annual Data Report, Point Lay Comprehensive Ambient Air and Meteorological Monitoring Program, Jan. 1 – Dec. 31, 2013. Unpublished report by SLR Consulting, Inc. for Shell Gulf of Mexico Inc., Anchorage, Alaska, Feb. 2014 (SLR 2014).

c) Socioeconomic Study Reports

Shell continues with its Plan of Cooperation (POC) meetings, as required by the National Marine Fisheries Service (NMFS), USFWS and BOEM in order to gather comments and questions and to address the concerns of the communities that are potentially affected by the planned exploration drilling program.

In addition, Shell offers several programs that involve the training and subsequent hiring of local residents. Programs include the following:

- Protected Species Observer (PSO) Program: The PSO program involves intensive training for marine mammal identification and documentation, computer use, and health and safety. Some PSOs are recruited locally from North Slope communities to work during exploration drilling activities, including the planned exploration drilling program.
- Subsistence Advisor (SA) Program: In the SA program, potentially affected villages are represented by one of its residents to relay subsistence information and issues to Shell. The SA speaks with other village members and documents subsistence information. This information may then be integrated into Shell's exploration drilling program.
- Community Liaison Officer (CLO) Program: The CLO program plans to include community liaisons in Wainwright, Point Hope, Point Lay, Barrow, Kaktovik, Nuiqsut, Kotzebue, Nome, and Dutch Harbor that serve as Shell's point of contact for questions regarding Shell activities and programs in the area.
- Cultural Awareness Program: Shell and contractor personnel involved in field operations (i.e., deployed north of Fairbanks, either onshore or offshore) during the planned exploration drilling program will attend an initial and annual refresher orientation, which addresses environmental, social, and cultural concerns related to the project area. The program is designed to increase sensitivity and understanding by Shell and its contractors regarding community values, customs, and lifestyles in the area they will be working, and how to avoid conflicts with Native Alaskans and their subsistence activities. The program stresses the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provides guidance on how to avoid disturbance. The program is discussed in more detail in Section 11.

Shell collected information on the use of coastal areas along the Chukchi Sea for subsistence through its SA Program. Data were collected through a number of person-to-person interviews. Subsistence users from Barrow, Wainwright, Point Lay, and Point Hope were interviewed. Reports were prepared summarizing and mapping the results of these interviews.

The following Arctic Slope Regional Corporation (ASRC) Energy Services (2009, 2010) and UMIAQ (2011, 2012, 2013 and 2014) SA reports were previously submitted to BOEM.

- ASRC Energy Services. 2009. Subsistence advisor program summary, North Slope, Alaska. Report prepared for Shell Exploration and Production Company, Houston, TX by ASRC Energy Services, Anchorage, AK.
- ASRC Energy Services. 2010. 2009 Subsistence Advisor Program Annual Summary North Slope, Alaska. Prepared for Shell Exploration and Production Company. Anchorage, AK by ASRC Energy Services, Anchorage, AK. December 2009.
- UMIAQ. 2011. 2010 Subsistence advisor program North Slope, Alaska. Report prepared by UMIAQ, Anchorage, AK for Shell Exploration & Production Company, Anchorage, AK.
- UMIAQ. 2012. 2011 Subsistence advisor program North Slope, Alaska. Report prepared by UMIAQ, Anchorage, AK for Shell Exploration & Production Company, Anchorage, AK.

- UMIAQ. 2013. 2012 Subsistence advisor program North Slope, Alaska. Report prepared by UMIAQ, Anchorage, AK for Shell Exploration & Production Company, Anchorage, AK.
- UMIAQ. 2014. 2013 Subsistence advisor program North Slope, Alaska. Report prepared by UMIAQ, Anchorage, AK for Shell Exploration & Production Company, Anchorage, AK.

Shell conducted interviews with residents of Barrow, Wainwright, Point Lay, and Point Hope to supplement existing formal environmental and resource data for the Chukchi Sea coastline. Data collected pertained to hunting, fishing, land use, and coastal processes such as erosion, ice movement and melting, and coastal dynamics. A report was prepared summarizing and mapping the results of these interviews. The report (Sound Enterprises and Associates, LLC 2008) has been submitted to the BOEM. Results of these interviews were used in the preparation of the EIA (Appendix C).

- Sound Enterprises and Associates, LLC. 2008. Shell Exploration & Production Company (SEPCO) Chukchi Village interview program. Report prepared for Shell Exploration and Production Company Houston, TX by Sound Enterprises, LLC, Bainbridge, WA.

Shell also conducted an economic analysis of future oil and gas exploration and development in the Beaufort Sea, Chukchi Sea, and North Aleutian Basin. The results (Northern Economics 2009, Northern Economics, Inc. and Institute of Social and Economic Research 2011) of the analyses have been presented to BOEM and were used in preparation of the EIA, where summaries can be found.

- Northern Economics Inc. 2009. Economic analysis of future offshore oil and gas development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Report prepared by Northern Economics, Anchorage Alaska for Shell Exploration and Production, Houston, TX.
- Northern Economics, Inc. and Institute of Social and Economic Research. 2011. Potential National-Level Benefits of Alaska OCS Development. Report prepared by Northern Economics, Inc. and Institute of Social and Economic Research, Anchorage, AK for Shell Exploration & Production, Anchorage, AK.

SECTION 6.0 SOLID AND LIQUID WASTE AND DISCHARGE INFORMATION

a) Projected Generated Wastes

The type, composition, and amount of solid and liquid waste projected to be generated on the drilling units during the planned exploration drilling program at the planned drill sites are listed below. Waste and discharge volumes were calculated based on empirical information and past experience; therefore, the actual generated amounts and ocean discharge volumes may differ from these projections.

b) Ocean Discharges and Disposal Methods

The type, composition, and amount of solid and liquid waste projected to be generated on the drilling units during the planned exploration drilling program and discharged to the ocean are listed below in Tables 6.b-1 and 6.b-2. Regarding Table 6.b-1, drilling fluids and cuttings can be further divided into the following six drilling intervals, as noted in the EIA (Appendix C), based on the section of the well being drilled:

- Interval 1 – MLC (and ramp if the MLC ROV System is used) (discharged at the seafloor)
- Interval 2 – conductor casing (discharged at the seafloor)
- Interval 3 – surface casing (discharged at the seafloor)
- Interval 4 – intermediate casing (discharged near the surface)
- Interval 5 – drilling liner (discharged near the surface)
- Interval 6 – open hole (discharged near the surface)

NPDES exploration facilities GP AKG-28-8100 discharge 013 (D013) includes the discharges from intervals 1 through 3, and discharge 001(D001) includes the discharges from intervals 4 through 6.

The ocean discharge information has been submitted to the EPA to support NOIs for authorization to conduct these discharges under NPDES exploration facilities GP AKG-28-8100. The projected wastes and discharges listed in these tables are applicable only to the drilling units. Discharges from support vessels will be made pursuant to the International Convention for the Prevention of Pollution from Ships (Marine Pollution or International Convention for the Prevention of Pollution from Ships [MARPOL]) standards and requirements as well as the NPDES Vessel GP.

Additional details regarding the transportation and final disposal location for wastes that will not be discharged to the ocean (Table 6.b-3) are provided in Section 13.

Table 6.b-1 NPDES Exploration Facilities GP Waste Streams Generated During Drilling

NPDES GP Discharge No. and Composition	Discharge Location	Projected Discharge Rate	Projected Season Volume	Disposal
D001[1] Water-based drilling fluids and drill cuttings (Intervals 4 - 6)	Burger A	81 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings - 1,052 bbl Fluids – 6,231 bbl **Total while drilling – 7,283 bbl** Reserve pit fluid volume –2,427 bbl **Total with reserve – 9,710 bbl**	Discharged to the ocean through a disposal caisson
	Burger F	80 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings - 1,043 bbl Fluids – 6,184 bbl **Total while drilling – 7,227 bbl** Reserve pit fluid volume – 2,427 bbl **Total with reserve – 9,654 bbl**	Discharged to the ocean through a disposal caisson
	Burger J	72 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings – 915 bbl Fluids – 5,546 bbl **Total while drilling – 6,461 bbl** Reserve pit fluid volume –2,427 bbl **Total with reserve – 8,888 bbl**	Discharged to the ocean through a disposal caisson
	Burger R	83 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings - 1,077 bbl Fluids – 6,352 bbl **Total while drilling – 7,429 bbl** Reserve pit fluid volume –2,427 bbl **Total with reserve – 9,856 bbl**	Discharged to the ocean through a disposal caisson
	Burger S	82 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings - 1,074 bbl Fluids – 6,340 bbl **Total while drilling – 7,414 bbl** Reserve pit fluid volume – 2,427 bbl **Total with reserve – 9,841 bbl**	Discharged to the ocean through a disposal caisson
	Burger V	88 bbl/hr. while drilling; 1000 bbl/hr. for reserve pit volume	Cuttings - 1,153 bbl Fluids – 6,736 bbl **Total while drilling – 7,889 bbl** Reserve pit fluid volume – 2,427 bbl **Total with reserve – 10,316 bbl**	Discharged to the ocean through a disposal caisson
D012 Excess cement slurry (rinsate from cement tank)	Each drill site	5 bbl/casing string and when setting plugs	*Discoverer* - 45 bbl	Discharged to the ocean through a disposal caisson
		5 bbl/casing string and when setting plugs	*Polar Pioneer* – 45 bbl	
D013[2,3] Muds, cuttings, cement at the seafloor (Intervals 1 - 3)	Burger A	47.4 bbl/hr. while drilling	Estimated at 5,007 bbl (this section completed in 2012)	Discharged at the ocean floor
	Burger F	77 bbl/hr. while drilling	MLC Cuttings – 3,703 bbl; Conductor and Surface Casing Cuttings – 1,303 bbl; Fluids – 3,124 bbl; Cement - 45 bbl; **Total while drilling using MLC bit – 8,175 bbl**	Discharged at the ocean floor
		162 bbl/hr.	MLC cuttings only if using the MLC ROV system[4] – 27,197 bbl	Discharged at the ocean floor

Table 6.b-1 NPDES Exploration Facilities GP Waste Streams Generated During Drilling

NPDES GP Discharge No. and Composition	Discharge Location	Projected Discharge Rate	Projected Season Volume	Disposal
D013[2,3] Muds, cuttings, cement at the seafloor (Intervals 1- 3)	Burger J	79 bbl/hr. while drilling	MLC Cuttings – 3,703 bbl Conductor and Surface Casing Cuttings – 1,386 bbl; Fluids – 3,207 bbl; Cement - 45 bbl; **Total while drilling using MLC bit – 8,341 bbl**	Discharged at the ocean floor
		162 bbl/hr.	MLC cuttings only if using the MLC ROV system[4]– 27,197 bbl	Discharged at the ocean floor
	Burger R	77 bbl/hr. while drilling	MLC Cuttings – 3,703; Conductor and Surface Casing Cuttings – 1,300 bbl; Fluids – 3,121 bbl; Cement - 45 bbl; **Total while drilling using MLC bit – 8,169 bbl**	Discharged at the ocean floor
		162 bbl/hr.	MLC cuttings only if using the MLC ROV system[4]– 27,197 bbl	Discharged at the ocean floor
	Burger S	77 bbl/hr. while drilling	MLC Cuttings – 3,703; Conductor and Surface Casing Cuttings – 1,302 bbl; Fluids – 3,123 bbl; Cement - 45 bbl; **Total while drilling using MLC bit – 8,173 bbl**	Discharged at the ocean floor
		162 bbl/hr.	MLC cuttings only if using the MLC ROV system[4]– 27,197bbl	Discharged at the ocean floor
	Burger V	79 bbl/hr. while drilling	MLC Cuttings – 3,703; Conductor and Surface Casing Cuttings – 1,386 bbl; Fluids – 3,207 bbl; Cement - 45 bbl; **Total while drilling using MLC bit – 8,341 bbl**	Discharged at the ocean floor
		162 bbl/hr.	MLC cuttings only if using the MLC ROV system[4]– 27,197 bbl	Discharged at the ocean floor

[1] Estimated time to drill these bottomhole sections is 90 hr. drilling time (does not include non-drilling time)
[2] Estimated time to drill these tophole sections is 106 hr. drilling time (does not include non-drilling time). Reserve pit volume (2,427 bbl) is for the *Polar Pioneer*; the *Discoverer* has a reserve pit volume of 1,500 bbl. This table assumes the greatest possible pit volume will be discharged. The EIA (Appendix C) also assumes the larger pit volume in its analyses.
[3] MLC construction time using the MLC ROV system is estimated at 168 hr.
[4] MLC ROV system cuttings volumes and rates are only for the potential construction of the MLC using this technology; MLC ROV system is not capable of drilling the conductor and surface casing sections

Table 6.b-2 NPDES Exploration Facilities GP Waste Streams Generated Daily

Type of Waste NPDES GP Discharge	Composition	Projected Discharge Rate	Projected Season Volume[1]	Treatment, Storage, and Disposal
D002 Deck Drainage	Uncontaminated fresh or seawater	*Discoverer* – 33 bbl/day	3,960 bbl	Uncontaminated water discharged overboard; contaminated water is treated in an oil-water separator (OWS); oily water stored aboard, transported by boat to approved treatment/disposal/storage (TDS) site
		Polar Pioneer - 70 bbl/day	8,400 bbl	Uncontaminated water discharged overboard; contaminated water is treated in an OWS; oily water stored aboard, transported by boat to approved TDS site
D003 Sanitary Wastes	Black water	*Discoverer* – 29.5 bbl/day discharge (based on 124 persons; 10 gallons [gal]/person/day)	3,540 bbl	Discharged through disposal caisson after treatment in a marine sanitation device
		Polar Pioneer – 14.3 bbl/day (based on 114 persons; 5.3 gal/person/day)	1,716 bbl	
D004 Domestic Wastes	Gray water (laundry, galley, lavatory)	*Discoverer* - 295 bbl/day discharge (based on 124 persons)	35,400 bbl	Discharged through disposal caisson
		Polar Pioneer - 271 bbl/day (based on 114 persons)	32,520 bbl	
D005 Desalination Unit Wastes	Rejected water from watermaker unit	*Discoverer* - 1,742 bbl/day	209,040 bbl	Discharged through disposal caisson
		Polar Pioneer - 377 bbl/day	45,286 bbl	
D006 BOP Fluid	Freshwater, concentrate and monoethylene glycol	*Discoverer* - 16.6 bbl/test	150 bbl (based on 3 function tests, 3 pressure test and 3 retests)	Discharged to the ocean
		Polar Pioneer - 20 bbl/test	180 bbl (based on 3 function tests, 3 pressure test and 3 retests)	
D007 Boiler Blowdown	Water and minerals drained from boiler drums	*Discoverer* - 1.3 bbl/day	151 bbl	Discharged through disposal caisson
		Polar Pioneer - 6 bbl/day	754 bbl	Discharged directly overboard
D008 Fire Control System Test Water	Uncontaminated seawater	*Discoverer* - 36 bbl/test (tested weekly)	607 bbl	Discharged directly overboard
		Polar Pioneer - 36 bbl/test (tested monthly)	607 bbl	

Table 6.b-2 NPDES Exploration Facilities GP Waste Streams Generated Daily

Type of Waste NPDES GP Discharge	Composition	Projected Discharge Rate	Projected Season Volume[1]	Treatment, Storage, and Disposal
D009 Non-contact cooling water	Uncontaminated seawater	*Discoverer* – 107,314 bbl/day discharge while drilling; 55,200 bbl/day discharge while not drilling	Range of 6,624,000 – 12,877,680 bbl	Discharged overboard to ocean waters at several sites around the hull
		Polar Pioneer – 21,385 bbl/day	2,566,240 bbl	Discharged to ocean through a number of outlets
D010 Uncontaminated ballast water	Uncontaminated seawater	*Discoverer* – variable	37,915 bbl	Discharged through disposal caisson
		Polar Pioneer – 719 bbl/day plus 85,655 bbl when the drilling unit is moved	171,935 bbl	
D011 Bilge water	Seawater that collects in internal parts of the drilling vessel hull	*Discoverer* - 754 bbl/day	90,514 bbl	Treated in OWS, uncontaminated water discharged through disposal caisson, oily water stored aboard, transported by boat to approved TDS site
		Polar Pioneer - 714 bbl/day	85,714 bbl	

[1] Based on an assumed drilling season of approximately 120 days

Table 6.b-3 Wastes Generated on the Drilling Units that are not Discharged*

Type of Waste	Composition	Projected Generated Amount	Treatment / Storage/ Disposal
Household Trash	Refuse generated through domestic living activities (includes food wastes).	8,500 lb./month/drilling unit stored and transported for disposal; 6,000 lb./month/drilling unit incinerated onboard - resulting ash weight of 200 lb. included in non-hazardous waste monthly total	Not discharged to ocean waters; burned in on-board incinerator or stored aboard in approved waste containers until removed at port and transferred to an approved TDS site
Non-Hazardous Waste (solid and liquid)	Non-hazardous waste liquids and solids such as used oils, oily rags, vessel slops; incinerator ash; steel (to be recycled); generated through vessel cleaning, maintenance and drilling operations.	62,500 lb./month/drilling unit	Not discharged to ocean waters; stored aboard in approved waste containers until removed at port and transferred to an approved TDS site
Hazardous Waste (Conditionally Exempt Small Quantity Generator [CESQG])	Expired or spent chemicals left over from cleaning, maintenance and drilling operations.	50 lb./month/drilling unit (CESQG status is anticipated)	Not discharged to ocean waters; stored aboard in approved UN rated waste containers until removed at port and transferred to an approved TDS site

*Solid and hazardous wastes are portrayed differently in this Table 6.b-3 than they were in EP Revision 1. EP Revision 1 reported the non-discharged wastes on a per well basis, measured in barrels. EP Revision 2 reports the non-discharged wastes on a monthly basis, measured in pounds.

c) NPDES Permits

All discharges from the drilling units while anchored at a drill site during the exploration drilling program (as itemized above in Tables 6.b-1 and 6.b-2) will be made in accordance with the EPA NPDES exploration facilities GP AKG-28-8100.

Drilling support vessels in excess of 300 gross registered tons or having a ballast capacity of 2,133 gallons (gal) (8 m^3) or greater, must acquire authorization to discharge under the Vessel GP for Discharges Incidental to the Normal Operation of Commercial Vessels and Large Recreational Vessels. Authorizations to discharge under this Vessel GP for discharges incidental to normal operations will be undertaken by the vessel owner and/or operator and is not a part of Shell's required permit and authorization application submittals.

Drilling Fluid Products

Products that may be part of the drilling fluid are provided in Tables 6.c-1 and 6.c-2, on a per well basis. This component list and the respective volumes have been designed for drilling depth from the MLC to PTD.

Table 6.c-1 Drilling Fluid Components for the Upper Portions of the Well (MLC, Conductor and Surface-Cased Sections)

Generic Description	Product Name	Maximum Concentration
BASE FLUID		
Biopolymer	DUOVIS	5 lb./bbl
Bentonite	M-I GEL	35 lb./bbl
Bentonite extender	GELEX	0.05 lb./bbl
Polyanionic cellulose	Polypac Supreme UL	5 lb./bbl
ADDITIVES		
Crushed nut hulls	NUT PLUG	20 lb./bbl
CONTINGENCY PRODUCTS		
Barite	M-I WATE	160 lb./bbl
Defoamer	DEFOAM-X	0.3 lb./bbl
Dye	Sodium Fluoresceine Green Dye	0.5 gal/bbl in seawater
Caustic soda	stock product	8 lb./bbl
Citric acid	stock product	5 lb./bbl
Sodium acid pyrophosphate (SAPP)	stock product	TBD
Soda ash	stock product	13 lb./bbl
Biocide	Busan 1060	0.4 lb./bbl
NaCl brine	Sodium chloride brine	100 lb./bbl
Hydrogen sulfide scavenger	SAFE-SCAV HS	0.1 lb./bbl
Surfactant	SCREENKLEEN	2% v/v
Lubricant	DRILLZONE	7% v/v

Table 6.c-2 Drilling Fluid Components for the lower portions of the well after the riser and BOP are established

Generic Description	Product Name	Maximum Concentration
BASE FLUID		
Soda ash	stock product	12 lb./bbl
Acrylic polymer	IDCAP D	5 lb./bbl
Shale/clay inhibitor	EMI-2009	20 lb./bbl
Shale/clay inhibitor	KLA-STOP	20 lb./bbl
Biopolymer	DUOVIS	2 lb./bbl
Biopolymer	Flowzan	2 lb./bbl
Polyanionic cellulose	POLYPAC SUPREME UL	5 lb./bbl
Sodium hydroxide	Caustic Soda	8 lb./bbl
Barite	M-I WATE	160 lb./bbl
Sodium chloride in brine	Salt/NaCl	100 lb./bbl
ADDITIVES		
Copolymeric shale stabilizer	POROSEAL	19 lb./bbl
Deflocculant	CF Desco®II	4 lb./bbl
Sodium bicarbonate	stock product	10 lb./bbl
Citric acid	stock product	4 lb./bbl
Liquid defoamer	DEFOAM-X	0.3 lb./bbl
Liquid defoamer	DF-9065	0.3 lb./bbl
Crushed nut hulls	NUT PLUG MED	40 lb./bbl
Crushed nut hulls	NUT PLUG FINE	40 lb./bbl
Vegetable, polymer fiber blend	MI SEAL	40 lb./bbl
Cellulose fiber	MIX II Fine	25 lb./bbl
Cellulose fiber	MIX II MED	25 lb./bbl
Graphite	G-SEAL	20 lb./bbl
Calcium carbonate	SAFECARB-20	200 lb./bbl
Calcium carbonate	SAFECARB-40	200 lb./bbl
Calcium carbonate	SAFECARB-250	200 lb./bbl
Sodium chloride	stock product	100 lb./bbl
Resinated lignite	RESINEX	10 lb./bbl
Sulfonated asphalt	ASPHASOL SUPREME	8 lb./bbl
CONTINGENCY PRODUCTS		
Mixture	FORM-A-BLOK	40 lb./bbl
Cellulose	FORM-A-SET AK	Formulation pill
H_2S Scavenger	Sulf-X	2.5 lb./bbl
Biocide	Busan 1060	0.4 lb./bbl
Mixture	Pipelax ENV WH	4% v/v
Mixture	LUBE 945	3% v/v
Mixture	CLEAN SPOT	4% v/v
Surfactant	SCREENKLEEN	2% v/v
Lubricant	DRILLZONE	7% v/v
Mixture	SAFE-SCAV HS	0.1 lb./bbl

Cement Composition

Two types of cement discharges are expected. One of these discharges involves bulk cement plus additives, which are circulated around the conductor and surface casing, and collect in the base of the MLC. The cement cures to a hardened mass surrounding the conductor. The second type of cement discharge involves small volumes of cement washed from the cement pump and lines on the drilling unit at the surface after cementing operations. The cement slurry to be discharged to the ocean (Table 6.b-1, D012) consists of the following primary components and additives, or their equivalents:

- Type C Permafrost cement
- API Class G "Premium" cement
- Econolite L (fly ash, calcium oxide) in small amounts
- Halad-344EXP (fluid loss additive) in very small amounts
- Calcium sulfate hemihydrate (accelerator) very small amounts
- Sodium chloride (accelerator) in very small amounts
- Calcium chloride (accelerator) in very small amounts
- SCR-100 (sodium citrate retarder) in very small amounts
- Dual Spacer (surfactant blend) in trace amounts
- Fresh water (mixing fluid)
- Seawater (wash water)

Blowout Preventer Fluid Composition

BOP fluid is a pressured fresh water-based fluid used to operate various components of the SS BOP including rams, locking mechanisms, annular preventers, choke and kill line valves and the hydraulic connectors to the wellhead and to the lower marine riser package (LMRP). The fluid is discharged at the device after use rather than bringing it back to the surface in a closed loop system. This reduces back-pressure and increases the potential that the devices will function quickly. Only small volumes of BOP fluid are discharged within and just above the MLC (or directly to the ocean if a test is done on the drilling unit deck prior to installation) which dilute and diffuse quickly in the seawater column. It is estimated that nine BOP tests will occur during the drilling of each well for a total of 113 bbl (*Discoverer*) and 180 bbl (*Polar Pioneer*) of BOP fluid per well (Table 6.b-2, D006). The BOP fluid will be a mixture of fresh water (~ 45%), concentrate (~5%) and monoethylene glycol (~50%). The concentrates may contain, but not limited to, Stack Magic, Erifon HD603, and/or Pelagic.

d) Modeling Report

All requested exploration facility NPDES permitted discharges will be carried out in federal waters of the OCS. No expanded mixing zones or zones of deposit are being requested and no modeling was conducted in support of such requests. Shell has carried out modeling of the expected discharges of drill cuttings and drilling fluids and of the projected discharges of cooling water for impact assessment purposes. The results of these modeling efforts are discussed in Section 4 of the EIA (Appendix C).

e) Cooling Water Intake

Discoverer

A saltwater service system supplies the *Discoverer's* requirement for saltwater, including that for the exploration drilling operations. The system is primarily used to supply cooling water to equipment heat exchangers. The amount of seawater that will be used for non-contact cooling water while drilling is estimated at 107,314 bbl/day and 55,200 bbl/day discharge while not drilling. This volume includes cooling water for hydraulic coolers, air-conditioning coolers and all other cooling water service lines. This does not include the seawater volume that would be supplied by the fire water pumps to provide firefighting capability in an emergency situation.

The saltwater service system consists of saltwater pumps, four sea-suctions (each with strainer having holes 5 mm in diameter), and associated distribution piping. Screen mesh sizes on the water intakes are provided below in Table 6.e-1.

Table 6.e-1 Screen Mesh Size on Water Intakes on the *Discoverer*

Sea-suction	Screen Mesh Size
Pump room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Lower Engine Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Upper Engine Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Generator Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate

The calculated velocity of intake water across the screens is approximately 40 ft. per minute (ft./min) (12.2 m/min).

Polar Pioneer

Non-contact cooling water is supplied to the *Polar Pioneer* via a general services seawater loop. Seawater is pumped from four screened sea chests; located on the inboard side of the *Polar Pioneer's* four pontoons (Table 6.e-2). The amount of seawater that will be used for non-contact cooling water is estimated at 21,385 bbl per day.

Table 6.e-2 Screen Mesh Size on Water Intakes on the *Polar Pioneer*

Sea-suction	Screen Mesh Size
Aft Starboard	0.75 in. (19 mm) Height; 25.75 in. (654 mm) width
Forward Starboard	0.75 in. (19 mm) Height; 25.75 in. (654 mm) width
Aft Port	0.75 in. (19 mm) Height; 25.75 in. (654 mm) width
Forward Port	0.75 in. (19 mm) Height; 25.75 in. (654 mm) width

The calculated velocity of intake water across the screen mesh is calculated to be 0.8 ft./min (0.25 m/min).

SECTION 7.0 AIR EMISSIONS INFORMATION

This section identifies the sources of air emissions and projected emissions from Shell's EP Revision 2. The information presented in this section is supported by detailed emission information in Appendix K, *AQRP and NEPA Emission Inventories*. In accordance with BOEM's Air Quality Regulatory Program (AQRP) (30 CFR Part 550, Subpart C), facility-wide maximum projected emissions generated from the proposed exploration activities are calculated and compared to the BOEM exemption formulas established in 30 CFR 550.303(d). Shell includes in this assessment emissions from the *Discoverer* and *Polar Pioneer* drilling units and all support vessels operating within 25 mi (40 km) of the *Discoverer* and *Polar Pioneer* while each are anchored at a drill site. The following is a list of the vessel types that are included for the air emissions evaluation under 30 CFR 550.303(d):

- Drilling Unit – *Discoverer* (x1)
- Drilling Unit – *Polar Pioneer* (x1)
- Ice Management Vessels (x2)
- Anchor handlers (x3)
- OSVs (x2)
- Science Vessels (x2)
- OSRV (x1)
- OSR tug (x1) and barge (x1)
- Support tugs (x2)
- Supply tug (x1; used for support purposes)
- OST (x1)
- MLC ROV system vessel (x1)

As required under 30 CFR 550.224, information on support vessels and aircraft that may be used in the exploration drilling program is described in Section 13. Information on the onshore support facilities as required under 30 CFR 550.225 is included in Section 14.

a) Projected Emissions

For the BOEM AQRP, an AQRP emissions inventory is provided in Appendix K that includes detailed documentation of projected emissions including the basis for all calculations (30 CFR 550.218(a)(2)) attributable to operation of the *Discoverer, Polar Pioneer* and support vessels operating within 25 mi (40 km) of the drilling units while each are anchored at a drill site. For purposes of evaluating air emissions under the AQRP, it is estimated that up to two wells may be drilled per season to complete the six wells in a total of three years. Appendix K (Table A-1 of Attachment A) includes peak hourly emissions for the AQRP as required under 30 CFR 550.218(a)(1)(i). The peak hourly emissions presented in Table A-1 of Attachment A in Appendix K are representative of peak emissions in each of the three years.

Appendix K provides the annual emissions as required by 30 CFR 550.218(a)(1)(ii). Annual emissions are based on a maximum 120-day drilling season per year. The information in these tables provides a summary of emissions from each source category type for each drilling unit and support vessel. Details on the components that contribute to emissions (e.g., propulsion engines, generation engines, boilers, and incinerators) as well as the operational assumptions applied in the emission estimates are provided in Appendix K. A summary of annual emissions for the AQRP emissions inventory from Appendix K is presented in Tables 7.e-1 through 7.e-4 of EP Revision 2.

30 CFR 550.218(a)(1)(iii) requires that "emissions over the duration of the proposed exploration activities" be included under the EP. As previously mentioned, Shell estimates it will require three years

to complete the six wells described and the annual/seasonal emissions are provided in Tables 7.e-1 through 7.e-4. Table 7.a-1 provides the emissions over the duration of the proposed exploration activities that are scaled appropriately (three times increase) to reflect the anticipated project duration total emissions. The AQRP emissions inventory detailed in Appendix K and summarized in Tables 7.e-1 through 7.e-4 represents a conservative assessment of *Discoverer*, *Polar Pioneer* and support vessels emissions in any year.

At this time, Shell cannot distinguish between activities (and air emissions) in one year versus those in other years. Consequently, Shell has estimated "Project Duration Total" emissions by assuming the same conservative representation of emissions for each of the three seasons.

Table 7.a-1 3-Year Project Duration Emissions (tons) [1]

Parameter	*Discoverer*	*Discoverer* and Support Vessels	*Polar Pioneer*	*Polar Pioneer* and Support Vessels
Carbon Monoxide (CO)	300	1,109	227	1,166
Total Suspended Particulate (TSP) (particulate matter less than 2.5 microns [$PM_{2.5}$] & particulate matter less than 10 microns [PM_{10}])	47	222	74	238
sulfur dioxide (SO_2)	8	33	8	31
nitrogen oxide (NOx)	1,183	4,460	1,444	4,838
volatile organic compound (VOC)	67	258	71	274

[1] Aggregate emissions are based on rounded annual emissions.

Shell presents a conservative depiction of emissions for the purpose of demonstrating its exemption from the AQRP (i.e., the emissions presented overstate what is expected to occur during normal operations). This conservative approach is required by 30 CFR 550.218(a)(3), which requires Shell to base the projected emissions on the maximum rated capacity of the equipment on the proposed drilling units under its physical and operational designs. For example, the AQRP analysis assumes all emission units are operating at the same time every hour of the season, which will not occur during normal operation. Further, this analysis, includes the *Discoverer* propulsion engine even though actual operation of the propulsion engine will be minimal (if it operates at all) while the drilling unit is completely anchored. Section 2.3 of Appendix K provides additional background on the conservative assumptions applied in the AQRP emissions summary.

Appendix K discusses the activity of various emissions units as required by 30 CFR 550.218(a)(1)(iv). As further discussed in Appendix K, diesel-fueled engines are the primary source of emissions associated with the exploration drilling activity. Analogous to how automobiles are driven, diesel engines are not expected to continuously operate at maximum rated power during the proposed exploration activity. In calculating emissions for this exemption analysis, Shell conservatively assumed the engines on the *Discoverer* and *Polar Pioneer* were operating at maximum load, 100 percent of the season. In these calculations, maximum load is based on engine nameplate rating, modified by operational limitations established from a combination of safety policies and good engine care policies. Such "good engine care policies" are implemented by vessel owners and operators to extend equipment life. In practice, maximum continuous power ratings of marine engines are typically 10 to 20 percent below "name-plate" power ratings .Thus, in calculating emissions for this exemption analysis, the maximum operating rate for each engine is limited to 80 percent of the name-plate rating.

When calculating emissions from engines of the support vessels in order to determine cumulative emissions, Shell included fuel restrictions on most of the propulsion and generator engines. For those support vessel engines not subject to a fuel restriction, emissions were based on continuous operation all season. As discussed in Appendix K, emissions from the smaller engines are based on the same 80 percent power operating assumption applied to the drilling rig engines.

Maximum projected uncontrolled emissions are compared to AQRP exemption formula criteria under Tables 7.e-1 through 7.e-4.

b) Emission Reduction Measures

Shell employs emission reduction measures on the *Discoverer*, *Polar Pioneer*, and on some of the support vessels that are candidates for use with the drilling units in the Chukchi Sea. These emission reduction measures include the following:

- Procuring ultra-low sulfur diesel (ULSD) fuel or a fuel with equal or lower sulfur content to reduce SO_2 emissions for each of the drilling units and all vessels operating as part of the exploration drilling program; and
- Establishing fuel restrictions on most of the propulsion and generators engines for the support vessels.

Appendix K provides a summary of the emission reduction measures and resulting emissions reductions, as applied in the AQRP analysis. Shell will monitor compliance by obtaining certification documentation of fuel sulfur content from fuel terminals and suppliers upon each fueling and by measuring annual fuel consumption of the support vessels with fuel restrictions.

Shell has elected to present maximum projected emissions in the AQRP emissions inventory for the 30 CFR 550.303(d) exemption formula analyses without consideration of existing emission controls on the *Discoverer*'s primary generation units or any of the support vessels as emission reduction measures. These emission controls include the following:

- Use of selective catalytic reduction (SCR) emission controls to reduce NO_X emissions on *Discoverer*'s primary generation units and certain units on support vessels;
- Use of catalytic diesel particulate filters (CDPF) emission controls to reduce CO, particulate matter (PM), and VOC emissions on the *Discoverer*'s primary generation units and certain units on support vessels; and
- Use of oxidation catalysts (OxyCat) emission controls to reduce CO, PM, and VOC emissions on certain units on support vessels.

The 30 CFR 550.303(d) exemption analyses in Section 7(e) conservatively assume the emission controls are not employed as emission reduction measures. As a result, Shell is not required to operate these controls, but is voluntarily committing to do so. Therefore, emissions reductions resulting from the voluntary commitment to operate the controls are not quantified in the AQRP emission inventories presented in Appendix K and thus no corresponding monitoring is proposed for these emission controls.

c) Processes, Equipment, Fuels, and Combustibles

The *Discoverer* and *Polar Pioneer* engines generate electrical, compressed air, and hydraulic energy for drilling operations. All other processes are secondary and related to general purpose heating (using boilers), transfer of materials about the deck (using cranes), pumping of cement, and incineration (primarily domestic waste). All engines on the *Discoverer, Polar Pioneer* and support vessels will be powered by a fuel purchased with sulfur content at or below 15 ppm. Additional descriptions of these processes and emissions units are provided in Appendix K.

d) Distance to Shore

The minimum distance from a drill site to the shoreline is 64.7 mi (104 km).

e) Impact from Non-Exempt Drilling Units

As required by 30 CFR 550.218(e), Table 7.e-1 compares projected annual emissions from the *Discoverer* with the exemption criteria at 30 CFR 550.303(d). The comparison confirms the exploration program is exempt from further air quality review, pursuant to 30 CFR 550.303(d).

Table 7.e-1 Application of BOEM Exemption Formula to the *Discoverer*

Parameter	BOEM formula at 30 CFR 250.303(d)[1]	BOEM Exemption Threshold (Emissions in tons/year)	Total Projected Drilling Unit Emissions *Discoverer* (tons/year)[2]	Exempt?
CO	$E=3400D^{2/3}$	54,796	100	Yes
TSP ($PM_{2.5}$ & PM_{10})	E=33.3D	2,155	16	Yes
SO_2	E=33.3D	2,155	3	Yes
NOx	E=33.3D	2,155	394	Yes
VOC	E=33.3D	2,155	22	Yes

[1] D=distance from the closest of the six candidate drill sites to the nearest point of land (Icy Cape) in statute miles (64.7 mi [104 km])
[2] As provided in Appendix K.

Table 7.e-2 compares projected annual emissions from the *Discoverer* and its support vessels with the exemption criteria at 30 CFR 550.303(d). The comparison confirms the exploration program even with projected support vessel emissions included, is exempt from further air quality review, pursuant to 30 CFR 550.303(d).

Table 7.e-2 Application of BOEM Exemption Formula to the *Discoverer* and Support Vessels

Parameter	BOEM formula at 30 CFR 250.303(d)[1]	BOEM Exemption Threshold (Emissions in tons/year)	Total Projected Emissions *Discoverer* and Support Vessels (tons/year)[2]	Exempt?
CO	$E=3400D^{2/3}$	54,796	370	Yes
TSP ($PM_{2.5}$ & PM_{10})	E=33.3D	2,155	74	Yes
SO_2	E=33.3D	2,155	11	Yes
NOx	E=33.3D	2,155	1,487	Yes
VOC	E=33.3D	2,155	86	Yes

[1] D=distance from the closest of the six candidate drill sites to the nearest point of land (Icy Cape) in statute miles (64.7 mi [104 km])
[2] As provided in Appendix K.

Table 7.e-3 compares projected annual emissions from the *Polar Pioneer* with the exemption criteria at 30 CFR 550.303(d). The comparison confirms the exploration program is exempt from further air quality review, pursuant to 30 CFR 550.303(d).

Table 7.e-3 Application of BOEM Exemption Formula to the *Polar Pioneer*

Parameter	BOEM formula at 30 CFR 250.303(d) [1]	BOEM Exemption Threshold (Emissions in tons/year)	Total Projected Drilling Unit Emissions *Polar Pioneer* (tons/year) [2]	Exempt?
CO	$E=3400D^{2/3}$	54,796	76	Yes
TSP ($PM_{2.5}$ & PM_{10})	E=33.3D	2,155	25	Yes
SO_2	E=33.3D	2,155	3	Yes
NOx	E=33.3D	2,155	481	Yes
VOC	E=33.3D	2,155	24	Yes

[1] D=distance from the closest of the six candidate drill sites to the nearest point of land (Icy Cape) in statute miles (64.7 mi [104 km])
[2] As provided in Appendix K.

Table 7.e-4 compares projected annual emissions from the *Polar Pioneer* and its support vessels with the exemption criteria at 30 CFR 550.303(d). The comparison confirms the exploration program even with projected support vessel emissions included, is exempt from further air quality review, pursuant to 30 CFR 550.303(d).

Table 7.e-4 Application of BOEM Exemption Formula to the *Polar Pioneer* and Support Vessels

Parameter	BOEM formula at 30 CFR 250.303(d) [1]	BOEM Exemption Threshold (Emissions in tons/year)	Total Projected Emissions *Polar Pioneer* and Support Vessels (tons/year) [2]	Exempt?
CO	$E=3400D^{2/3}$	54,796	389	Yes
TSP ($PM_{2.5}$ & PM_{10})	E=33.3D	2,155	79	Yes
SO_2	E=33.3D	2,155	10	Yes
NOx	E=33.3D	2,155	1,613	Yes
VOC	E=33.3D	2,155	91	Yes

[1] D=distance from the closest of the six candidate drill sites to the nearest point of land (Icy Cape) in statute miles (64.7 mi [104 km]) Cape) in statute miles (64.7 mi [103 km])
[2] As provided in Appendix K.

f) Modeling Report

According to 30 CFR 550.218(f), results of the modeling and impact analysis are required to be included only if 30 CFR 550.303 requires the use of an approved air quality model to model projected air emissions in developing EP Revision 2. As discussed in the previous section, the exploration drilling program is exempt from further air quality review using the exemption formula found at 30 CFR 550.303(d); therefore, an impact analysis and use of an approved air quality model is not required under the AQRP.

SECTION 8.0 OIL AND HAZARDOUS SUBSTANCES SPILL INFORMATION

a) Oil Spill Response Planning

Shell prepared a Chukchi Sea Regional Exploration Program OSRP as a fundamental component of the planned exploration drilling program when it submitted EP Revision 1. BSEE approved that Chukchi Sea OSRP 17 February 2012. As per 30 CFR 254.30(a) Shell conducted a biennial review of the Chukchi Sea OSRP and submitted to BSEE administrative changes to the Chukchi Sea OSRP on 18 December 2013. In June 2014, BSEE confirmed that the OSRP is in compliance with 30 CFR 250.30(a). Shell will submit to BSEE additional administrative changes to the approved OSRP to reflect additional operational changes consistent with EP Revision 2. These additional administrative changes will reflect the change of a second drilling unit (the *Kulluk* will not be drilling in the Beaufort Sea but the *Polar Pioneer* will be drilling near the *Discoverer* on the Burger Prospect), change in name of an OSR contractor, and other administrative changes.

Despite the very low likelihood of a large oil spill event, Shell has designed a response program based upon a regional capability of responding to a range of spill volumes, from small operational spills up to and including an OSRP WCD for planning purposes from an exploration well blowout. Shell's program is developed to fully satisfy federal oil spill planning requirements. The OSRP presents specific information on the response program that includes a description of personnel and equipment mobilization, the incident management team organization, and the strategies and tactics used to implement effective and sustained spill containment and recovery operations.

Shell is committed to conducting safe and environmentally responsible operations in the Chukchi Sea. To achieve this goal, oil spill prevention is a priority in all operations. Prevention practices include personnel training programs and strict adherence to procedures and management practices. All project personnel, including employees and contractors, involved in oil spill contingency response would receive discharge prevention and response training as described in the OSRP. Training drills also would be conducted periodically to familiarize personnel with on-site equipment, proper deployment techniques, and maintenance procedures.

b) Location of Primary Oil Spill Equipment Base and Staging Area

One dedicated OSR barge and on-site oil spill response vessel (OSRV) will be staged in the vicinity of the drilling unit(s) when drilling into potential liquid hydrocarbon bearing zones. The OSRV will be positioned within 10 nmi (19 km, approximately 1 hour transit time) of the drilling unit(s) and an OSR tug and barge will be positioned approximately 25 nmi (46 km) from the drilling unit(s) (approximately 3 hours transit time). The OSR barge, associated tug, and OSRV possess, in total, greater than 25,000 bbl capacity; therefore providing containment, recovery and storage for the initial 24 hours until an OST arrives.

An OST will be staged such that it will arrive at the recovery site on the Burger Prospect within 24 hours of departure from its staging location. Response personnel will conduct maintenance, training and other activities to ensure continued readiness in the event they are needed. The OST will possess enough storage capacity to store all recovered liquids (oil and emulsified oil/water) for the initial response or until the second relief OST arrives to supplement the response for the full 30 days. The total storage capacity between the two tankers available for the 30 day response is > 750,000 bbl. By hour 42, two additional dedicated Vessels of Opportunity Skimming Systems would arrive at the spill site to support skimming capacity at the site. The OSR tug and barge, OSRV, and vessels would work in conjunction to sustain containment and skimming operations and transfer recovered fluids to the OSTs for the duration of the response.

An additional ice-strengthened OSR tug and barge with skimming capability, and an associated tug, will be mobilized from its staging location near Kotzebue Sound and re-located to the nearshore zone of the Chukchi Sea within 96 hours for shoreline protection and cleanup support, if necessary. It will be mobilized to arrive prior to the earliest projected time oil could arrive in the Chukchi nearshore zone. The OSR tug and barge would possess storage capacity of 17,000 bbl for recovered liquids. It will also carry response equipment, including one 47 ft. (14 m) skimming vessel, 34 ft. (10 m) workboats, mini-barges, boom and duplex skimming units for nearshore recovery and possibly support nearshore protection. The OSR tug and barge, will carry designated response personnel and will mobilize to recovery areas, deploy equipment and begin operations.

c) Name(s) of Spill Removal Organization(s) for Both Equipment and Personnel

Shell's OSRP is supported by three Oil Spill Removal Organizations (OSROs). AES-Response Operations, UIC-Arctic Response Services and Alaska Clean Seas (ACS) are Shell's primary response action contractors supporting the program. The OSROs would lead the spill response efforts in the offshore, nearshore, and shoreline environments. The OSROs response personnel and OSR equipment would be maintained on standby while critical exploration drilling operations into liquid hydrocarbon bearing zones are underway and provide offshore, nearshore, and shoreline response operations in the unlikely event of an actual oil spill incident. Additionally, each OSRO provides program oversight for their particular scope, overall spill management team support, response training, and additional responders through the Auxiliary Contract Response Teams, North Slope Spill Response Team, and Village Response Teams.

Shell provides dedicated response vessels, skimmers, and equipment for the nearshore and offshore operations. Response activities will be conducted using the Shell or ACS tactics as defined in the Shell's *Beaufort and Chukchi Seas Regional Tactics Manual* and/or *ACS' Technical Manual*, or otherwise as defined in the OSRP.

d) Calculated Volume of Worst Case Discharge Scenario

The planning volume (25,000 bbl/day) of a WCD scenario for the Chukchi OSRP is provided in Table 8.d-1. The WCD planning volume for EP Revision 2 has not changed from the WCD planning volume used for EP Revision 1.

Table 8.d-1 Oil Volume of the Worst Case Discharge Planning Scenario* for the Chukchi Sea OSRP

Element	Capacity (bbl)	Reference
Possible Daily Volume of Highest Capacity Well	25,000	30 CFR 254.47(b)
Total Worst Case Discharge (Daily Volume X 30-day Duration of Blowout)	750,000	30 CFR 254.47(b)
Total Storage Capacity Requirements	750,000	30 CFR 254.47(b)

* WCD scenario planning volume, which exceeds the calculated WCD volume established under BOEM NTL No. 2015-N01. The calculated daily WCD is established for Burger J at 23,100 bbl/day initially but diminishes over the 30 days.

The WCD planning scenario provided above in Table 8.d-1 exceeds the WCD calculated for EP Revision 2 as indicated in Table 8.d-2.

Table 8.d-2 Comparison of the WCD Planning Scenario Developed for the Chukchi Sea Regional OSRP with the WCD Calculated for EP Revision 2 for Two Relief Well Scenarios

	OSRP WCD Planning Scenario	EP Revision 2 Calculated WCD – Two Drilling Units in the Chukchi Sea	EP Revision 2 Calculated WCD – One Drilling Unit as far away as Dutch Harbor
Maximum Flow Rate	25,000 bbl	23,100 bbl[1]	23,100 bbl[1]
Total Duration	30 days	34 days	38 days
Total Oil Volume	750,000 bbl	603,564 bbl	669,479 bbl

[1] Calculated WCD for Burger J; flow rate diminishes over time

e) Description of Worst Case Discharge Scenario

For exploration drilling operations, the WCD scenario is equal to the daily volume possible from an uncontrolled blowout for period of 30 days. In order to address BOEM NTL 2015-N01 and 30 CFR 254.47, the total WCD planning volume was based upon BSEE's planning requirement for a 30-day blowout, and the Chukchi Sea OSRP assumes as a planning standard a maximum flow rate of 25,000 bbl/day resulting in a WCD scenario volume of 750,000 bbl (119,237 m^3) of oil during 30 days. This is the same conservative planning standard volume as assumed in EP Revision 1.

f) Modeling Report

The WCD scenario is based upon a spill simulation model of a 25,000 bpd well blowout at the seafloor (or mudline) in the Burger Prospect at Latitude 71° 16' 37.2", Longitude 163° 19' 48.0", the site of the legacy Burger #1 well, in approximately 138-144 ft. (42-44 m) of water. Modeling of the oil plume trajectory was conducted by Applied Science Associates, Inc. (ASA), using historical wind data and the BOEM hydrodynamic ocean-ice current model. The ASA trajectory model includes algorithms for spreading, evaporation, emulsification, and entrainment, all of which are input parameters based on the properties of an Alaska North Slope crude oil with an American Petroleum Institute (API) gravity of 30.6°.

The ASA's OILMAP software was used to run the trajectory model based on environmental conditions including predominate winds and currents. Oil on the ocean's surface is assumed to move as the sum of vectors: surface currents plus 3.5 percent of the wind speed in the downwind direction. Oil plume migration is driven by ocean currents and prevailing winds for the 30-day duration of this scenario. Wind data used for the trajectory modeling were collected by Shell from 22 locations in the Chukchi Sea during June through November for the years 1980, 1982, and 1983. Data from these three years were used for stochastic modeling. Wind data for the period of 7 August to 6 September was used in the trajectory modeling.

Based upon the collected data, the offshore winds originated from the northeast to southeast 54 percent of the time and the northwest to southwest 23 percent of the time during the June through November period. Three predominant wind directions had a measured frequency of occurrence greater than 10 percent of the time originating from the northeast (NE), east-northeast (ENE) and east (E) based upon the 16 cardinal compass directions. These three wind directions on average occurred at the following frequencies for the June through November period:

- ENE wind = 14.6 percent frequency
- NE wind = 13.8 percent frequency
- E wind = 13.0 percent frequency

The trajectory simulation uses a SS blowout rising through the water column and surfacing above the well location. The trajectory simulation moves and spreads the oil under the influence of local winds measured at the closest station for the 7 August to 6 September time period and the BOEM ocean-current information.

The trajectory shows the oil plume moving into open ocean away from shorelines in a southwesterly direction. From Day 1 through Day 3, the oil movement is directed by winds predominantly from the NE and the predicted current. Through Day 12, the oil movement is away from land into the open ocean. If not intercepted by containment and recovery operations, oil is predicted to begin drifting to the north-northeast (NNE) and toward shorelines by Day 14. The earliest oil is predicted to possibly contact shorelines is Day 25 in the area between Peard Bay and Kasegaluk Lagoon. Following Day 25, unrecovered oil would continue drifting to the NE, offshore and north of land.

In the very unlikely event that strong, sustained winds develop out of the west-northwest (WNW), the trajectory modeling estimates that Day 6 is the earliest possible time oil could reach shore. For planning response mobilization, the WCD scenario assumes oil could intercept the shoreline in no less than six days in the event sustained northwesterly winds develop, potentially affecting the shorelines from Peard Bay to Kasegaluk Lagoon, SW of Wainwright. The WNW wind is used for planning purposes and does not correspond to the actual prevailing E, NE, and ENE winds typical in the area. As a precaution, Shell response would include nearshore and shoreline protection strategy and tactics, and OSROs would be mobilized to implement predesigned protection strategies at priority resource sites.

SECTION 9.0 ALASKA OUTER CONTINENTAL SHELF PLANNING INFORMATION

a) Emergency Plan

Shell has drafted various plans to respond to emergency situations such as a blowout (well control event), the loss or disablement of a drilling unit, and the loss or damage to a support vessel.

Shell's WCP describes how Shell would respond to a well control event. (Appendix H). The WCP is focused on the prevention of a blowout using pressure control equipment and operational monitoring. Well control is the process of maintaining barriers in the drilled wellbore that prevent gas or fluids from underground reservoirs escaping from the wellbore in an uncontrolled flow.

The WCP describes measures to control the flow of a blowout including if the primary drilling unit is lost or disabled. A capping stack will be available and can be used to cap the well and stop the flow (a process called 'cap and contain'). If the capping stack is not able to stop the flow, then a separate containment system, will be available to capture the flow and divert the recovered liquid for storage and processing (a process called 'cap and flow'). Additional detail on the capping stack and the containment system is available in Section 9c. Also, a relief well drilling unit will be available and can be mobilized to the blowout site to drill a relief well.

Note that the WCP attached to EP Revision 2 is worded differently from that attached to EP Revision 1. It was changed to incorporate language more familiar to Shell's well engineers and responders to a well control event; however, there have been no changes to reduce the substance of Shell's well control procedures.

Shell's proposed COCP (Appendix F) describes precautionary measures to minimize the likelihood and consequence of an oil spill while drilling exploration wells in the Chukchi Sea and to protect personnel, equipment and the environment. The COCP defines planned and unplanned critical operations. In the event that a support vessel, such as an ice management vessel, is unavailable, drilling operations may be curtailed depending on circumstances.

b) Critical Operations and Curtailment Plan and Drilling Ice Management Plan

A copy of Shell's proposed COCP for the Chukchi Sea is attached in Appendix F and a copy of Shell's DIMP is provided in Appendix G. These plans are complementary documents that address the methods by which Shell will cease, limit, or not initiate specific critical operations due to operational status and environmental conditions that may be encountered at the exploration drill sites. However, the scope of the DIMP is limited to approaching hazardous ice and its potential effects on exploration drilling operations and the drilling unit's safety.

The text of the COCP has been updated to include the *Polar Pioneer*, key personnel titles have changed, and the curtailment decision protocol has been updated to include the new key personnel.

The DIMP contains minor changes and updates from the version submitted with EP Revision 1. Ice management objectives and principles are clearly defined and the drilling units and attending ice management vessels have been updated.

c) Additional Information

Fuel Transfer Plan

Shell has prepared a Fuel Transfer Plan (FTP) that covers activities with its planned exploration drilling program in the Chukchi Sea. A copy of the FTP is provided in Appendix I. Shell has revised the attached FTP that was submitted to BOEM with EP Revision 1 to include a variety of booming scenarios depending on whether the fuel transfer is from vessel-to-vessel, vessel-to-drilling unit or dock-to-vessel.

Partial Wells

Two scenarios exist that could result in partial wells being drilled in a multi-year exploration plan:

- Exploration drilling and/or evaluation of the deepest primary objective has not been concluded on a well by the end of the drilling season; or
- A hazardous condition (e.g., ice) forces suspension of the exploration drilling operations, temporary abandonment of a wellbore in a safe and secure manner, and drilling unit demobilization from the Chukchi Sea with no opportunity to return before the end of the drilling season

These scenarios are discussed in more detail below.

Initial Drilling Season

If exploration drilling and/or evaluation of the initial or a subsequent well has not been concluded (i.e., the deepest primary objective has not been penetrated and/or evaluated), before the end of a drilling season, Shell plans to stop the exploration drilling operations, TA the well in compliance with BSEE regulations and leave the drill site for the winter.

Operations may begin on additional wells during the drilling season if there is sufficient time prior to the onset of the end of the drilling season. This work could include MLC construction (using either a drilling unit with a MLC bit or the MLC ROV system), or drilling additional hole sections and cementing casing strings during the time remaining in the drilling season.

The best way to suspend a well is to run casing, cement it in the hole, then set a mechanical plug near the top of the well and cap the well. This provides multiple barriers to prevent unexpected flows and leave the well suitable for safe re-entry. The proposed suspension procedure on any unfinished, or partial well, will be provided via submission of an Application for Permit to Modify (APM) for BSEE approval. The MLC for each well is constructed such that the ram-type BOP stack (i.e., the bottom section of the stack) can remain installed on the high-pressure wellhead housing as part of the TA procedure with the upper most portion below the LMRP remaining below the maximum ice keel scour depth. Efforts will be made to preferentially provide a sufficient number of independent verified barriers in the wellbore (a minimum of two) to ensure that the well cannot leak or flow while TA without the lower stack remaining on the well. These barriers can include cement not drilled out from the bottom joints of casing after cementing it in place, double float valves inside the casing, wellhead seal assembly between casing strings, cement plugs, mechanical plugs and sealed hang-off tools. These techniques and barriers are also described in the COCP in Appendix F. If there are a sufficient number of quality barriers left in the well when it is TA, the entire BOP stack will be recovered for repair and testing during the winter season in preparation for the next drilling season.

If a hazardous condition requires curtailment of critical operations (or prevents initiation of them, depending on time available) per the provisions of the COCP (Appendix F), the well will be suspended and secured using a BSEE approved procedure, moorings will be recovered if possible and the drilling unit will move to a safe area. Once the hazardous condition has passed, the drilling unit will return to the drill site and conclude exploration drilling operations, evaluation, permanent plugging and abandonment operations.

If, however, the hazardous condition (e.g., ice) does not permit moving back over the well, re-mooring, re-entering and continuing drilling/evaluation operations before the end of any drilling season, the well will remain TA until the next drilling season. The drilling unit may return to the suspended well and finish exploration drilling/evaluation operations during a subsequent drilling season prior to permanently abandoning the well.

Subsequent Drilling Seasons

In a subsequent season, Shell may choose to return to an unfinished drill site where a well has been left TA from a previous season, or Shell may choose to go to a new drill site covered by this EP Revision 2 and start a new well that will meet the exploration program objectives. Once all objectives have been satisfied, all wells will be successfully plugged and permanently abandoned according to BSEE regulations, as were the legacy wells drilled from 1989 through 1992.

All wells are planned to be temporarily or permanently abandoned in accordance with BSEE regulations during the season they are drilled. An exception to this plan involves the inability to return to the drill site following an emergency evacuation, such as, but not limited to, an approaching ice hazard. If a well cannot be abandoned due to ice, it will be properly suspended per BSEE approval before the drilling unit evacuates. At the beginning of a subsequent drilling season, the drilling unit may return to the drill site to permanently abandon the unfinished well or continue exploration drilling/evaluation of the well. All wells will be permanently abandoned prior to the end of the exploration program.

Surface Intervention – Capping and Containment System

In the unlikely event of a blowout in the Chukchi Sea, Shell's capping and containment capabilities are provided by a combination of a 1) SS capping stack and 2) surface separation equipment, i.e. a containment system. The capping stack equipment will be stored aboard one of the ice management vessels and will be available for deployment within 24 hours, depending on ice, weather and location, in the unlikely event of a blowout. The containment system, located on the *Arctic Challenger* barge and accompanied by a tug (*Corbin Foss* or similar) is planned to be stationed in Kotzebue Sound and could arrive at the scene of a blowout and be capable of receiving liquid hydrocarbons in eight days, depending on weather and the characteristics of the blowout.

The capping stack will be lowered onto the BOP to shut off oil leaks in the event that the BOP fails to shut off the flow. The capping stack is meant to seal a leaking wellhead provided that the well's integrity has not been compromised. It is part of the efforts to control the outflow of liquid hydrocarbons from the well in an uncontrolled blowout but it is separate from the containment system. The containment system is another oil spill collection system that will be available. The containment system will provide the means to collect uncontrolled well flows from SS blowout situations as close to the source as possible, thereby minimizing surface oil slicks. The containment system is housed on the *Arctic Challenger* barge and includes the containment dome, topside processing facilities, flare boom, an ROV, two workboats, and living quarters (Figure 9.c-1).

Surface intervention involves work done on the wellhead of a SS well. Surface intervention in the OCS involves SS devices used on the top of the well or some device connected thereto (e.g., the BOP stack or wellhead).

A set of SS devices has been assembled for the drilling seasons to provide direct surface intervention capability with the following priorities:

- Attaching a device or series of devices to the well to affect a seal capable of withstanding the maximum anticipated wellhead pressure (MAWP) and closing the assembly to completely seal the well against further flows (this intervention process is commonly called "Cap and Contain")
- Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (this intervention process is commonly called "Cap and Flow")

These devices form what is generally known as a capping stack. The devices on the capping stack include ram-type BOP bodies equipped with blind rams, spacer spools, flow crosses (or mud crosses) for pumping kill weight fluid into the well or for flowing the well in a controlled manner through piping to the surface and connectors to attach to the upper H4 connector mandrel, the high-pressure wellhead housing if the entire BOP stack has been removed.

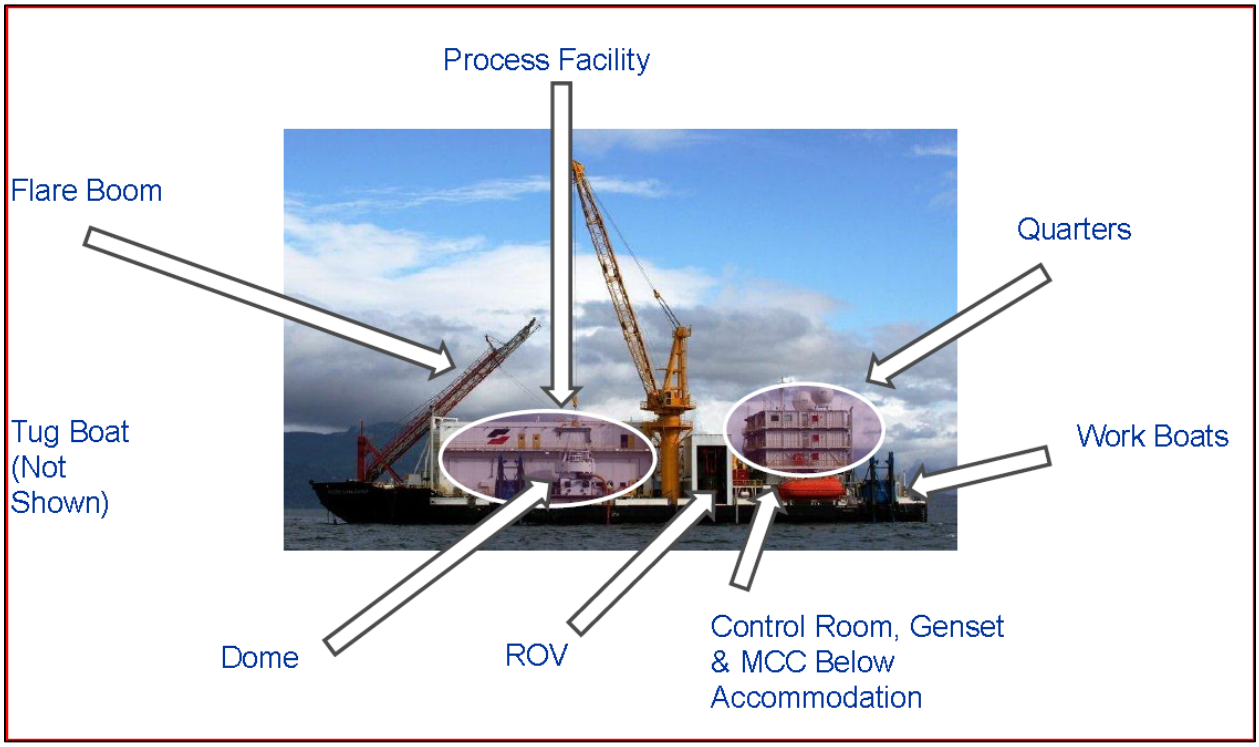
This equipment will be stored aboard a designated vessel in Alaska with a marine crew aboard, warm-stored and ready for use. It is anticipated that surface intervention efforts will successfully stop the flow from a blowout.

Various crossovers, spools, ram sets, and other equipment (including demolition tools for clearing debris away from the well) are included on the designated vessel. Extra studs, nuts, gaskets, hydraulic wrenches and other tools are available to allow the capping stack to be modified aboard the vessel as necessary to provide flexibility to deal with a wide variety of capping situations.

The equipment on the containment system tugs and barge is designed for reliability, ease of operation, flexibility and robustness so it could be used for a variety of blowout situations.

Efforts to contain the blowout will begin when the equipment arrives to clear debris from the well and a capping stack will be attached as necessary. If these efforts fail to capture all the oil, Shell's OSR support vessels will still be available at the blowout well site to collect and recover fugitive oil emissions from the surface. This equipment will be positioned downwind and down current from the blowout well and will not interfere with either containment efforts or relief well drilling. Containment efforts will continue during relief well drilling operations unless it is unsafe or futile to do so. The surface OSR vessels would remain and oil spill cleanup would continue, as necessary, until the blowout is under control.

Figure 9.c-1 Containment System and Components



SECTION 10.0 ENVIRONMENTAL MONITORING

a) Monitoring Systems

The drilling units will be equipped with the following equipment (or similar, but of equal or superior specifications) used to monitor conditions at the location of either drilling unit:

Table 10.a-1 Monitoring Equipment on the *Polar Pioneer* and the *Discoverer*

Equipment	*Polar Pioneer*	*Discoverer*
Navigation Radar	Furuno FAR-2127BB	Furuno ARPA FAR - 28 X 7 SERIES; Furuno FAR - 21 X 7 (-BB) SERIES
Communications	very high frequency – amplitude modulation (VHF-AM) aeronautical radio Aeronautical non-directional beacon Sailor, Compact-GMDSS station V-SAT, phone/fax/data Iridium Scanset-7701 satellite phone	GMDSS EQUIPMENT Sailor HC 4500 MF / HF control units System 4000 GMDSS Sailor HF SSB 250W PEP Thrane & Thrane TT - 3020C / TT - 3022D Capsat Transceiver JMC Dual Frequency Navtex Receiver Model NT – 1800 Satellite Phone Sailor TT3622B
Positioning	Kongsberg K-Pos DPM 11 – Positioning mooring system Kongsberg Simrad HPR 309 Furuno GPS/WAAS Navigator GP32	Furuno GPS Navigator GP – 150 AIS L3 Communications Simrad GL 80 / 85 Furuno FE 700 echo sounder Cassen & Plath GmbH Type 12 Reflector compass Standard clinometer model MOELLER 5 / 15 degs
Anchor Tensions	APM 3000 (SIMRAD/ Kongsberg Albatross) computer system for indications of tensions and alarm at specified levels	Plimsoll Anchor tension monitoring system
Meteorological	Meteorology instruments installed in compliance with all relevant requirements (Environmental Management System); measuring wind, barometric pressure, water temperature	Young Marine Wind Tracker model 06206 Sato Sigma - II Barograph model NS II – BR Barometer Hanseatic Instruments Laser mounted flute to measure seawater inlet temperature

Environmental Monitoring at Drill Sites While Drilling

As part of the requirements under the NPDES exploration facilities GP, Shell will conduct an Environmental Monitoring Program (EMP) that meets the objectives in the permit AKG-28-8100. The specific details around this monitoring program have been submitted with the NPDES NOI; however, the EMP will generally consist of a 4 phase monitoring program.

- Phase I establishes the baseline conditions of the drill site prior to exploration drilling activities and will either be supported with historical data or supplemental data collected prior to exploration drilling activities. The baseline data generally consist of benthic samples, receiving water chemistry, sediment characteristics, and a visual assessment of the sea floor.
- Phase II requires monitoring to be conducted while exploration drilling activities are occurring and consists of discharge plume monitoring, metals analysis of the drilling fluid, and Phases III and IV are similar in nature and are conducted once exploration drilling activities are completed. Phase III monitoring will occur shortly after exploration drilling operations cease at a drill site. Phase IV is conducted no later than 15 months after exploration drilling operations cease. Benthic samples, sediment characteristics, and a sea bottom survey will be completed during these phases.

The results from this monitoring program will be submitted to EPA as required in permit AKG-28-8100.

Bird and mammal observations will be made from all transiting surface operation vessels throughout exploration drilling activities in accordance with the Marine Mammal Monitoring and Mitigation Plan (4MP) located in Appendix B and the Bird Strike Avoidance and Lighting Plan located in Appendix E.

b) Incidental Takes

Applications have been submitted for the following MMPA authorizations:

- NMFS – Non-lethal, Incidental Take of Whales and Seals
- USFWS – Non-lethal, Incidental Take of Polar Bears and Pacific Walrus
- USFWS – Non-lethal, Intentional Take of Polar Bears and Pacific Walrus

During the planned exploration drilling program, the two drilling units and transiting support vessels will each have PSOs onboard to observe for marine mammals and record all observations. The PSO program is described in the 4MP (Appendix B) submitted in support of the NMFS and USFWS MMPA non-lethal, incidental take authorization applications.

Species for which a MMPA authorization is sought from NMFS are:

- Mysticetes: bowhead, fin, gray, humpback and minke whales
- Odontocetes: beluga, narwhal, killer whale, and harbor porpoise
- Pinnipeds: bearded, ribbon, ringed, and spotted seals

Table 12.b-2 lists these species and provides the current ESA designation.

Under current guidelines, NMFS assumes that marine mammals exposed to pulsed airgun sounds with received levels ≥160 decibels (dB) root mean square (rms) or continuous sounds from vessel activities with received levels ≥120 dB rms have the potential to be disturbed. As a result, these sound level thresholds are currently used by NMFS to define acoustic disturbance criteria, also known as the Level B thresholds. Shell plans to conduct a geophysical survey with airguns referred to as a zero-offset vertical seismic profile (ZVSP) survey at each drill site where a well is drilled to PTD. The numbers of marine mammals that may potentially be exposed to pulsed sound levels of ≥160 dB (rms) while conducting ZVSP surveys, and continuous sound levels ≥120 dB rms during exploration drilling, ice management,

anchor handling, MLC construction, and supply vessels using dynamic positioning in a drilling season are summarized in Table 10.b-1. Shell recognized that NMFS has recently issued draft acoustic guidance (NMFS, 2013) for all sound sources which are specific for the onset of Temporary Threshold Shift which is considered Level B harassment and Permanent Threshold Shift which is considered Level A harassment. The criteria for Level B behavioral disturbance have not been developed. Until such time as the acoustic criteria are finalized and released, Shell will utilize the current threshold criteria.

The estimates shown in Table 10.b-1 reflect the results of a multistep process for calculating the exposure of animals to Level B thresholds. The first of these steps estimates the number of marine mammals that may be present in areas exposed to Level B thresholds for a range of activity scenarios and sums them together. Estimates from this method do not account for animal avoidance, movements into or out of exposed areas, or new animals moving through (i.e., turnover) that might occur during the course of each season. The second step for estimating exposures produces conservative estimates and takes into account assumptions of turnover rates of animals in the project area and avoidance rates. For all species except bowhead whales, it is assumed that there is 100% replacement of individual marine mammals with zero avoidance every 24 hours. This is likely to overestimate exposure in most cases, resulting in over estimation of the number of individuals that would actually be exposed to Level B thresholds. For bowhead whales, we conservatively assumed that zero whales will avoid the area ensonified by drilling program sounds in excess of 120 dBand also assumed a 48 hour turnover rate.

The results are exposure estimates that are larger than prior years, but as stated are considered an overestimate. Though the aggregate activity level will increase from 2012, the resulting impacts to the affected marine mammal populations, as described in the EIA (Appendix C), would be temporary and result in only short-term disturbance or displacement. From a historical perspective, the temporary activity of offshore exploration drilling and associated support vessel activities, collectively and individually, have not resulted in impacts of biological significance to marine mammals of the Arctic, or interference with the subsistence harvest of those marine mammals by the residents of the communities along the Beaufort and Chukchi Seas.

Many animals exposed to continuous sound levels near 120 dB rms would not react, particularly pinnipeds, and exposure to this sound level should not be considered as “takes by harassment” in such cases. Even for species that may change their behavior or alter their migration route, those changes are likely to be within the normal range of activities for the animals and may not rise to the level of “taking” based on prior decisions by NMFS. *See* 77 Fed. Reg. 27283, 27290 May 9, 2012. In regard to the subsistence harvest of bowhead whale, as a consequence of Shell’s planned mitigation measures (see Section 12.0) any effects on the bowhead whale as a subsistence resource also will be negligible.

Species for which MMPA incidental and intentional take authorizations are sought from USFWS are:

- Carnivora – Polar bears
- Pinnipedia – Pacific walrus

Table 12.b-2 lists these species and provides the current ESA designation.

The MMPA applications provides an outline of the planned exploration drilling program and includes an updated, drilling program-specific bear and walrus plan titled: *Polar Bear, Pacific Walrus and Grizzly Bear Avoidance and Encounter/Interaction Plan, Chukchi Sea, Alaska, Exploration Drilling Program.*

Shell is currently in discussion with USFWS with respect to the approach to operations that may occur in and around the HSWUA during and related to drilling activities. The details of the monitoring and mitigation measures that are to be utilized in relation to the HSWUA will be fully documented in the MMPA authorization.

Table 10.b-1 Number of Potential Exposures of Marine Mammals to Received Sound Levels in the Water of >120 dB re 1 µPa rms Generated by Exploration Drilling and >160 dB re 1 µPa rms Generated by ZVSPs during 2015 Exploration Drilling

Species	Number of Individuals Potentially Exposed to Continuous Sounds ≥120 dB re 1 µPa (rms) or Pulsed Sounds ≥160 dB re 1 µPa (rms)	Percent of Estimated Population
Odontocetes		
Monodontidae		
Beluga	974	2.3
Narwhal	1	0.0
Delphinidae		
Killer whale	14	0.7
Phocoenidae		
Harbor porpoise	294	0.6
Mysticetes		
Bowhead whale	2,582	13.2
Fin whale	14	0.8
Gray whale	2,581	13.5
Humpback whale	14	0.1
Minke whale	41	5.1
Pinnipeds		
Bearded seal	1,722	1.1
Ribbon seal	96	0.2
Ringed seal	50,433	16.8
Spotted seal	1,007	0.7

SECTION 11.0 LEASE STIPULATIONS INFORMATION

The source for the italicized text below is the OCS Chukchi Sea Planning Area Oil and Gas Lease Sale 193.

Stipulation No. 1 - Protection of Biological Resources

If previously unidentified biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (RS/FO), the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:

1) *Relocate the site of operations;*
2) *Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;*
3) *Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or*
4) *Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.*

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such findings to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

Shell Proposed Actions:

The BOEM has not requested that Shell conduct any biological resource surveys in the area of the planned drill sites. No new areas of special biological significance have been identified within or near the blocks identified in this EP Revision 2.

In addition to the shallow hazards surveys, which provide detailed information on the seafloor sediments and relief, Shell conducted or participated in the funding or in the facilitation of several types of environmental studies in and near the prospects in 2008 through 2014 to gather baseline data regarding resources. These studies included coastline surveys to assess the relative environmental sensitivity of Chukchi Sea coastline segments, walrus tagging and monitoring studies, seal tagging and monitoring studies, bird and marine mammal surveys, assessments of the benthic invertebrate communities, oceanographic studies, and sediment quality assessments at the planned drill sites. The results of the marine mammal and bird surveys are summarized in the EIA in Appendix C.

These studies also indicated that there are no new areas of special biological significance in the vicinity of the drill sites. Video reconnaissance surveys were conducted at historical drill sites at Burger in 1989, and the results were submitted to BOEM at that time. These surveys also found a relatively flat and featureless

seafloor, with a silty substrate and a benthic fauna typical of the Lease Sale 193 Area (Finney 1989, Boudreau 1989).

Stipulation No. 2 - Orientation Program

The lessee shall include in any exploration plan (EP) or development and production plan (DPP) submitted under 30 CFR 550.211 and 550.241 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence activities and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

Shell Proposed Actions

Shell has developed and is currently implementing an approved orientation program for Shell and contractor personnel involved in Shell's Alaska Venture exploration drilling program that was first approved by the Alaska OCS Region of the BOEM RS/FO on 15 February 2007. An outline of the program was again submitted to BOEM with the initial Chukchi Sea EP, and found by the BOEM RS/FO on 7 December 2009 to satisfy the requirements of Stipulation No. 2. Shell revised the orientation program based on BOEM comments regarding the 2009 orientation program, and submitted the complete orientation program to BOEM for approval on 9 June 2011. The orientation program was approved on 13 June 2012. Shell will periodically make minor changes to the orientation program content to maintain its currency (e.g., updates in safety statistics, permitting requirements) and those changes will be rolled into EP revisions as required. Another update to the approved orientation program will be submitted to BOEM for approval prior to beginning the next drilling season. This update will be substantially the same as the current approved orientation program.

All Shell and contractor personnel involved in field exploration drilling activities will attend an initial training orientation for all personnel and an annual refresher for field deployed personnel. All Alaska office-based Shell and contractor personnel will attend the program at least once at the time they join the team. Field deployed personnel traveling to onshore or offshore locations north of Fairbanks, Alaska will attend annual refresher training. Visitors traveling to land locations (i.e., trips performing low-risk activities less than three days) will receive an abbreviated fit-for purpose orientation as related to their visit. Contractors hired by Shell who reside in an area north of Fairbanks (i.e., a village) may receive a slightly modified version of the cultural awareness orientation that is fit for purpose or allow comparable training (e.g., attendance at Alaska Federation of Natives convention).

Shell will retain and maintain a record, for at least 2 years, of all personnel who attend the program, including relevant attendee and program information. Shell has designed a specific program that addresses environmental, social, and cultural concerns related to the project area. The program is designed to increase sensitivity and understanding by Shell and its contractors of community values, customs, and lifestyles in the area they will be working, and how to avoid conflicts with subsistence activities. The program stresses the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provides guidance on how to avoid disturbance.

Shell's Cultural Awareness Program addresses the following:

- Alaska Native Ethnic Breakdown
- Brief history of land claims
- Formation of regional corporations, and region within which Shell is working
- History of the North Slope
- Cultural diversity
- Comparison of cultural values Patterns of language
- Communication skills and body language
- Guidelines on cultural artifacts
- Local community values and customs
- Whaling

Shell has developed a very robust Health, Safety, Security and Environment (HSSE) Awareness Program, of which the requirements listed in Lease Stipulation 2 are a component of this training. The following areas are highlighted to address the requirement in Lease Stipulation 2.

- Environmental Awareness
    - ESA – Major Provisions
    - Endangered and threatened species
    - MMPA of 1972
    - Marine mammal interactions
    - Sensitive Habitats on the North Slope
    - Wildlife interactions
    - Prohibited activities of hunting, trapping and fishing
    - Environmental requirements, for air, spills and waste
    - Environmental training

The awareness level orientations may be given as face-to-face training, video and computer slides, or via computer based training. Annual refreshers will include the general content noted above but adapted for those already familiar with basic information.

Stipulation No. 3 - Transportation of Hydrocarbons

Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any Federal, State, and local governments and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Shell Proposed Action

Not applicable to the activities described in this EP Revision 2.

Stipulation No. 4 - Industry Site-Specific Bowhead Whale Monitoring Program

A lessee proposing to conduct exploration operations, including ancillary seismic surveys, on a lease within the blocks identified below during the periods of subsistence use related to bowhead whales, beluga whales, ice seals, walrus, and polar bears will be required to conduct a site-specific monitoring program approved by the RS/FO; unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with appropriate agencies and co-management organizations, determines that a monitoring program is not necessary. Organizations currently recognized by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuuq Commission. The RS/FO will provide the appropriate agencies and co-management organizations a minimum of 30 calendar days, but no longer than 60 calendar days to review and comment on a proposed monitoring program prior to Minerals Management Service (MMS) approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead and beluga whales, ice seals, walrus, and polar bears are present in the vicinity of lease operations and the extent of behavioral effects on these marine mammals due to these operations. In designing the program, the lessee must consider the potential scope and extent of effects that the type of operation could have on these marine mammals. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

1) *Recording and reporting information on sighting of the marine mammals of concern and the extent of behavioral effects due to operations;*
2) *Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project (BWASP) and other mandated aerial monitoring programs;*
3) *Inviting a local representative to be determined by consensus of the appropriate co-management organizations to participate as an observer in the monitoring program;*
4) *Submitting daily monitoring results to the RS/FO;*

5) *Submitting a draft report on the results of the monitoring program to the RS/FO within 90 days following the completion of the operation. The RS/FO will distribute this draft report to the appropriate agencies and co-management organizations;*

6) *Allowing 30 days for independent peer review of the draft monitoring report; and*

7) *Submitting a final report on the results of the monitoring program to the RS/FO within 30 days after the completion of the independent peer review. The final report will include a discussion of the results of the peer review of the draft report. The RS/FO will distribute this report to the appropriate agencies and co-management organizations.*

The RS/FO may extend the report review and submittal timelines if the RS/FO determines such an extension is warranted to accommodate extenuating circumstances.

The lessee will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for bowhead whales. The lessee may be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for other co-managed marine mammal resources. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the appropriate agencies and co-management resource organizations. The results of these peer reviews will be provided to the RS/FO for consideration in final MMS approval of the monitoring program and the final report, with copies to the appropriate agencies and co-management organizations.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from NMFS and/or USFWS, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation. The lessee must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NMFS and/or USFWS and will advise the lessee if the LOA or IHA will meet these requirements.

The MMS, NMFS, and USFWS will establish procedures to coordinate results from site-specific surveys required by this stipulation and the LOA's or IHA's to determine if further modification to lease operations are necessary.

This stipulation applies to the following blocks:

NR02-06, Chukchi Sea

6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey

6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert

6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974,

7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island

6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317,

6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658,

6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West

6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317,

6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal

6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523,

6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868,

6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow

6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312,

6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright

6002-6006, 6052, 6053

NS04-08, (Unnamed)

6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

This stipulation applies during the time periods for subsistence-harvesting described below for each community.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow*: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area. Fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walrus. Seal hunting occurs mostly in winter, but some open water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.*

Wainwright*: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walrus can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.*

Point Lay*: Because Point Lay's location renders it unsuitable for bowhead whaling; beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walrus from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bear are hunted from September to April along the coast, rarely more than 2 miles offshore.*

***Point Hope**: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore.*

This stipulation will remain in effect until termination or modification by the Department of the Interior after consultation with appropriate agencies.

Shell Proposed Actions

Although none of the blocks listed in Stipulation No. 4 are included in those planned for exploration drilling in Shell's EP Revision 2, Shell voluntarily submitted to the BOEM a site-specific 4MP with EP Revision 1, and provided the 4MP to support its application for a MMPA authorization. The 4MP has been updated to reflect the revised drilling program in EP Revision 2, but remains substantially the same as the 4MP that is part of the approved EP Revision 1. The 4MP is located in Appendix B. Shell's POC, 4MP, and other mitigation measures are designed to address this change in areas of subsistence activities.

Shell intends to use contractors based in the NSB, Northwest Arctic Borough (NWAB) and potentially the Bering Straits region that will in turn provide job opportunities to local residents, including recruitment and training of SAs and PSOs. Summaries of key components of the program are presented below.

Protected Species Observers

Vessel-based monitoring for marine mammals will be done throughout the period of exploration drilling operations to comply with expected provisions in the MMPA authorizations that Shell receives. Those provisions will be implemented during the exploration drilling program by a team of trained PSOs. The presence of PSOs onboard drilling and transiting support vessels will be a core component of compliance with the 4MP. The PSOs will be responsible for collecting basic data on observations of marine mammals and for implementing mitigation measures including vessel avoidance measures and factored into decisions concerning operational shutdown. The observations made by PSOs serve as the primary basis for estimation of impacts to marine mammals. Because their ranks include representatives of the Alaska Native community, the PSOs also serve as an important means of providing local hire and local oversight of the monitoring program. PSOs will be stationed on both drilling units, ice management vessels, anchor handlers and other drilling support vessels engaged in transit to and between drill sites, and other operational and intermittent activities to monitor for marine mammals.

Aerial Survey Program

Offshore aerial wildlife monitoring photographic surveys (aka PSO flights) are proposed to start as soon as the ice management, anchor handler and drilling units are at or near the first drill site and would continue throughout the drilling period and until the drilling related vessels have left the exploration drilling area. In the event vessels enter the Chukchi Sea on or about 1 July, surveys would be initiated on or about 3 July. This start date differs from past practices of beginning five days prior to initiation of an activity and continuing until five days after cessation of the activity because the presence of vessels with helidecks in the area where overflights will occur is one of the main mitigations that will allow for supporting a safe operation of the overflight program this far offshore. A nearshore/coastal saw-tooth pattern also may be flown. The offshore aerial wildlife monitoring photographic surveys will be based out of Barrow and the same aircraft will conduct the offshore surveys around the drilling units and the nearshore/coastal saw-tooth pattern.

Photographic surveys are proposed to be flown daily, weather permitting, throughout the drilling program. The offshore survey transects over the drilling area would be the default priority each day, as opposed to the nearshore/coastal sawtooth pattern. The nearshore/coastal survey pattern would be flown only in instances when conditions offshore are not conducive for flying and coastal conditions would, however, support an overflight. There also may be isolated instances during the season when the nearshore/coastal survey would be identified as the priority due to a unique biological or operational scenario (e.g., walrus aggregations).

Acoustic Recorders

A combination of acoustic recorder technologies will be employed to document the distribution of marine mammals; the distribution of marine mammals in relation to activities; to add clarity to the characterization of exploration drilling sound levels, character, and propagation; and to document presence of marine mammals in subsistence hunting areas. This will be accomplished by deploying several acoustic recorder buoys in a wide area surrounding the planned locations. Acoustic monitoring instruments have been deployed in the Chukchi Sea in past years in late July. With drilling proposed to commence in early July, the deployment date would be pushed forward to occur after ice out and before exploration drilling. Over-wintering sonobuoys have also been located in the proposed exploration drilling area since 2007. In that early drilling related activities would be initiated upon arrival and while the arrays are being deployed, these over-wintered recorders would capture the sound associated with early activities.

Sound Modeling

Sound modeling will be conducted during the exploration drilling program in the Chukchi Sea.

Sound Source Verification

Field measurement of sound propagation profiles of vessels and the drilling units will be conducted during different operational modes, so as to determine those activities that produce the greatest opportunities for mitigation. Shell plans to conduct sound source verification (SSV) on the vessels which did not have a prior SSV in the Chukchi Sea. Since sound levels generated by drilling operations do not exceed sound levels where mitigation measures are required, the utility of SSVs, which are normally used to verify and adjust mitigation distances, is limited. Shell is also utilizing distributed arrays around the drilling location to measure cumulative sound impacts throughout the drilling process. These arrays are generating more useful information than individual SSVs.

Regarding the drilling units, as noted in the 4MP, exploration drilling sounds are expected to vary significantly with time due to variations in the level of operations and the different types of equipment used at different times onboard the drilling units. The goals of these measurements are to quantify the absolute sound levels produced by exploration drilling and to monitor its variations with time, distance and direction from the drilling unit; and to measure the sound levels produced by an end-of-hole ZVSP survey using a stationary sound source.

Additional Studies

Shell plans to participate in additional studies of marine resources in the Chukchi Sea to enable us to increase our understanding of: (1) baseline conditions and the distribution of critical resources; (2) interactions between industry activities and marine resources; and (3) resource status and conservation/management needs. The list of potential studies and monitoring projects includes:

- Baseline studies of the air quality, oceanography, sediment chemistry, benthic and planktonic communities, fish, marine birds, and marine mammals in the Burger Prospect area;

- Marine mammal distribution and response to industry activities in the northeastern Chukchi Sea;
- Participation in, and funding of, walrus and ringed seal tagging studies;
- Collection of subsistence use of coastal and offshore waters though a system of SAs; and
- Drilling waste discharge and benthic community monitoring.

With the exception of the discharge monitoring for the NPDES exploration facilities GP, Shell has been participating in these studies since 2006. Reports summarizing the methods and findings of the studies are listed in Section 5.0. Discharge monitoring studies Shell expects to conduct are described in Section 10.0.

Stipulation No. 5- Lease Sale 193 Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence Harvesting Activities

Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities. This stipulation applies to exploration, development, and production operations on a lease within the blocks identified below during periods of subsistence use related to bowhead whales, beluga whales, ice seals, walruses, and polar bears. The stipulation also applies to support activities, such as vessel and aircraft traffic, that traverse the blocks listed below or Federal waters landward of the sale during periods of subsistence use regardless of lease location. Transit for human safety emergency situations shall not require adherence to this stipulation. This stipulation applies to the following blocks:

NR02-06, Chukchi Sea

6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey

6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert

6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974,

7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island

6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317,

6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658,

6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West

6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317,

6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655,

6702, 6703

NR04-01, Hanna Shoal

6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523,

6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868,

6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow

6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312,

6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright

6002-6006, 6052, 6053

NS04-08, (Unnamed)

6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Prior to submitting an exploration plan or development and production plan (including associated oil-spill response plans) to the MMS for activities proposed during subsistence-use critical times and locations described below for bowhead whale and other marine mammals, the lessee shall consult with the North Slope Borough, and with directly affected subsistence communities (Barrow, Point Lay, Point Hope, or Wainwright) and co-management organizations to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures that could be implemented by the operator to prevent unreasonable conflicts. Organizations currently recognized by the NMFS and the USFWS for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuuq Commission. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other marine mammal subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The lessee shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative effects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill response plans) to the directly affected communities and the appropriate co-management organizations at the time the plans are submitted to the MMS to allow concurrent review and comment as part of the plan approval process. In the event no agreement is reached between the parties, the lessee, NMFS, USFWS, the appropriate co-management organizations, and any communities that could be directly affected by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the parties to specifically address the conflict and attempt to resolve the issues. The RS/FO will invite appropriate parties to a meeting if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests. The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Activities on a lease may be restricted if the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities. In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts. Subsistence-harvesting activities occur generally in the areas and time periods listed below.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow*: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from Ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area; fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walruses. Seal hunting occurs mostly in winter, but some open-water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.*

Wainwright*: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walruses can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.*

Point Lay*: Because Point Lay's location renders it unsuitable for bowhead whaling, beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walruses from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bears are hunted from September to April along the coast, rarely more than 2 miles offshore.*

Point Hope*: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore*

Shell Proposed Actions:

Shell has actively engaged the NSB, NWAB, and the subsistence communities of Kaktovik, Nuiqsut, Barrow, Wainwright, Point Lay, Point Hope, Kivalina, Kotzebue, Shishmaref, Kiana, Savoonga, and Gambell, and co-management organizations, including the Alaska Eskimo Whaling Commission (AEWC), Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Alaska Nanuuq Commission, to discuss potential conflicts between planned oil and gas activities and subsistence use activities. Shell's EP lease blocks do not lie within the stipulation area, but support activities associated with the exploration drilling program will transit the stipulation area.

Plan of Cooperation

Shell began consulting with potentially affected subsistence communities, stakeholders and federal, state, and local agencies in 2006 and prepared a POC for its Chukchi Sea open water activities (3D seismic activities and vessel transit) in November 2007. Shell has continued to consult through the date of submitting the final Revised EP 2. Shell will continue to engage with subsistence stakeholders to build on its past efforts to inform and engage the communities that could be potentially affected by exploration drilling activities in the Chukchi Sea. It is also noted that a POC is required for MMPA authorizations from NMFS and USFWS. Shell's POC, 4MP, and other mitigation measures are designed to minimize adverse impacts to subsistence use activities.

Shell met with public and community leaders beginning in January-April 2009 specifically to discuss the planned 2010 exploration drilling program in the Chukchi Sea, as detailed in the initial Chukchi Sea EP, and to hear their concerns. Shell prepared a written POC based on that effort, which described when and where the meetings were held, what was presented by Shell, the comments received, and Shell's responses to these comments. The POC also identified mitigation measures that Shell prepared in response to these concerns. A copy of the POC was attached as an appendix to the initial Chukchi Sea EP, and was forwarded to NMFS as part of the MMPA application. Shell's consultation efforts have continued since that time, and in February-April of 2011, Shell held a series of meetings specifically to discuss the exploration drilling activities outline in the EP Revision 1. The dates and locations of the meetings held since 2012 as part of consultation effort associated with exploration drilling in the Chukchi Sea, along with the persons Shell met with, are listed below in Table 11.0-1. Shell has prepared an addendum to the POC originally submitted. The POC addendum included with EP Revision 2 provides information on the meetings held specifically to address the EP Revision 2. The POC addendum is attached in Appendix D of this document.

Table 11.0-1 Dates and Locations of Meetings Held Regarding Shell's Chukchi Sea Exploration Drilling Program for the Development of the POC

2012	**Meeting Location**	**Meeting Attendees**
23 October	Point Lay	Plan of Cooperation Community Meeting
24 October	Wainwright	Plan of Cooperation Community Meeting
26 October	Kaktovik	Plan of Cooperation Community Meeting
29 October	Barrow	Plan of Cooperation Community Meeting
30 October	Nuiqsut	Plan of Cooperation Community Meeting
6 November	Barrow	NSB Assembly Workshop Meeting
2013	**Meeting Location**	**Meeting Attendees**
29 July	Kotzebue	NWAB, City of Kotzebue, KIC (Kikiktagruk Inupiat Corporation) & IRA(Indian Reorganization Act) representatives
5 November	Barrow	NSB Assembly
5 November	Wainwright	Plan of Cooperation Community Meeting
6 November	Point Lay	Plan of Cooperation Community Meeting
8 November	Barrow	Plan of Cooperation Community Meeting
12 November	Point Hope	Plan of Cooperation Community Meeting
2014	**Meeting Location**	**Meeting Attendees**
28 January	Kotzebue	Plan of Cooperation Community Meeting
16 June	Barrow	Stakeholder Meeting
16 June	Wainwright	Stakeholder Meeting
30 June	Barrow	Plan of Cooperation Community Meeting
1 July	Wainwright	Plan of Cooperation Community Meeting
7 July	Point Lay	Plan of Cooperation Community Meeting
8 July	Point Hope	Plan of Cooperation Community Meeting
9 July	Kotzebue	Plan of Cooperation Community Meeting
17 July	Deering	Plan of Cooperation Community Meeting
3 November	Barrow	Plan of Cooperation Community Meeting
6 November	Point Lay	Plan of Cooperation Community Meeting
2015	**Meeting Location**	**Meeting Attendees – Position**
12 January	Kotzebue	Plan of Cooperation Community Meeting
13 January	Wainwright	Plan of Cooperation Community Meeting
22 January	Buckland	Plan of Cooperation Community Meeting
22 January	Deering	Plan of Cooperation Community Meeting

Marine Mammal Co-Management Groups

Shell facilitated meetings with the co-management groups including the AEWC, Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Alaska Nanuuq Commission beginning in June 2006, and continues to meet with these groups. Shell continues to meet with representatives of these co-management groups to discuss our exploration drilling plans to inform them of Shell's planned activities and discuss potential conflicts that could arise with regards to the siting, timing, and method of the planned operations as well as mitigation measures designed to avoid or minimize any such effects.

Stipulation No. 6 - Pre-Booming Requirements for Fuel Transfers

Fuel transfers (excluding gasoline transfers) of 100 barrels or more will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. The lessee's oil-spill-response plans must include procedures for the pre-transfer booming of the fuel barge(s).

Shell Proposed Action:

Shell has prepared a FTP that covers activities with its planned exploration drilling program in the Chukchi Sea. A copy of the plan is provided in Appendix I. Shell has revised the attached FTP from that was submitted to BOEM with EP Revision 1 to include a variety of booming scenarios depending on whether the fuel transfer is from vessel-to-vessel, vessel-to-drilling unit and dock-to-vessel.

Stipulation No. 7 - Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's eider

This stipulation will minimize the likelihood that spectacled and Steller's eiders will strike drilling structures or vessels. The stipulation also provides additional protection to eiders within the blocks listed below and Federal waters landward of the sale area, including the Ledyard Bay Critical Habitat Area, during times when eiders are present.

(A) General conditions: *The following conditions apply to all exploration activities.*

(1) *An EP must include a plan for recording and reporting bird strikes. All bird collisions (with vessels, aircraft, or drilling structures) shall be documented and reported within 3 days to MMS. Minimum information will include species, date/time, location, weather, identification of the vessel, and aircraft or drilling structure involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Lessees are advised that the USFWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.*

(2) *The following conditions apply to operations conducted in support of exploratory and delineation drilling.*

(a) *Surface vessels (e.g., boats, barges) associated with exploration and delineation drilling operations should avoid operating within or traversing the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, to the maximum extent practicable. If surface vessels must traverse this area during this period, the surface vessel operator will have ready access to wildlife hazing equipment (including at least three Breco buoys or similar devices) and personnel trained in its use; hazing equipment may located onboard the vessel or on a nearby oil spill response vessel, or in Point Lay or Wainwright. Lessees are required to provide information regarding their operations within the area upon request of MMS. The MMS may request information regarding number of vessels and their dates of operation within the area.*

(b) *Except for emergencies or human/navigation safety, surface vessels associated with exploration and delineation drilling operations will avoid travel within the Ledyard Bay Critical Habitat Area between July 1 and November 15. Vessel travel within the Ledyard Bay Critical Habitat Area for emergencies or human/navigation safety shall be reported within 24 hours to MMS.*

(c) Aircraft supporting drilling operations will avoid operating below 1,500 feet above sea level over the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, or the Ledyard Bay Critical Habitat Area between July 1 and November 15, to the maximum extent practicable. If weather prevents attaining this altitude, aircraft will use pre-designated flight routes. Predesignated flight routes will be established by the lessee and MMS, in collaboration with the USFWS, during review of the EP. Route or altitude deviations for emergencies or human safety shall be reported within 24 hours to MMS.

(B) Lighting Protocols: *The following lighting requirements apply to activities conducted between April 15 and November 15 of each year.*

(1) Drilling Structures: *Lessees must adhere to lighting requirements for all exploration or delineation drilling structures so as to minimize the likelihood that migrating marine and coastal birds will strike these structures. Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration or delineation drilling structures to minimize the likelihood that birds will strike those structures. These requirements establish a coordinated process for a performance-based objective rather than pre-determined prescriptive requirements. The performance-based objective is to minimize the radiation of light outward from exploration/delineation structures while operating on a lease or if staged within nearshore Federal waters pending lease deployment.*

Measures to be considered include but need not be limited to the following:

- *Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;*
- *Types of lights;*
- *Adjustment of the number and intensity of lights as needed during specific activities;*
- *Dark paint colors for selected surfaces;*
- *Low-reflecting finishes or coverings for selected surfaces; and*
- *Facility or equipment configuration.*

Lessees are encouraged to consider other technical, operational, and management approaches that could be applied to their specific facilities and operations to reduce outward light radiation. Lessees must provide MMS with a written statement of measures that will be or have been taken to meet the lighting objective, and must submit this information with an EP when it is submitted for regulatory review and approval pursuant to 30 CFR 550.203.

(2) Support Vessels: *Surface support vessels will minimize the use of high-intensity work lights, especially when traversing the listed blocks and federal waters between the listed blocks and the coastline. Exterior lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they will be turned off. Interior lights and lights used during navigation could remain on for safety.*

For the purpose of this stipulation, the listed blocks are as follows:

NR02-06, Chukchi Sea
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Nothing in this stipulation is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard (USCG) or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

Shell Proposed Actions:

Stipulation No.7 has four parts. Part A(1) mandates that EPs for exploration drilling anywhere in the Chukchi include a plan for recording and reporting bird strikes, and therefore applies to Shell. Parts A(2) and B(2) place restrictions and lighting requirements on vessel and aircraft operations in certain listed blocks, in federal waters shoreward of those blocks, and in the Ledyard Bay Critical Habitat Unit (LBCHU), during specific dates. These restrictions would apply to any activities associated with Shell's EP Revision 2 that would take place in these areas during these dates. Part B(1) places lighting requirements on drilling structures and applies to the use of drilling structures anywhere in the Chukchi Sea, and therefore applies to Shell's EP Revision 2. Part B(2) also places restrictions on the use of lights on support vessels in the listed blocks and federal waters shoreward of these blocks, and these restrictions would apply to any vessel traffic associated with Shell's EP Revision 2 that would occur in these specific areas.

Shell has developed a Bird Strike Avoidance and Lighting Plan (Appendix E) that covers the planned exploration drilling program. In developing the plan, Shell considered all the measures identified for consideration in the stipulation, and selected the most proven and practical measures to minimize the likelihood that marine birds will strike the drilling units or support vessels.
Shell's plan includes:

- Bird strike monitoring will include recording and reporting bird strikes for the collection of information on bird strikes and lighting configuration. This information can be used to better understand methods to reduce bird strikes;
- Installing shading and directing some lights on drilling units inward and downward to living and work structures to minimize the amount of light radiating from the drilling units;
- Minimizing the use of high-intensity work lights on support vessels; and
- Restricting aircraft and vessel traffic such as restrictions on travel routes and flight altitudes, including: the avoidance of travel within the LBCHU between 1 July and 15 November by the drilling units and all support vessels.

The risk of Shell's exploration drilling program having an effect on marine birds, especially Steller's eiders and spectacled eiders, due to collisions, is minimal because exploration drilling would occur after the spring migration of most of these species, and more than 64 mi (103 km) offshore where the bird presence is relatively low.

SECTION 12.0 ENVIRONMENTAL MITIGATION MEASURE INFORMATION

a) Permits and Authorizations

The General Information section (Section 2.0) identifies the permits and authorizations required for the planned exploration drilling program. Shell will adhere to the mitigation measures required by these permits and authorizations. In addition to the permits and authorizations, Shell has met with marine mammal co-management groups, including the AEWC, Whaling Captains Associations, NSB and NWAB community members, to discuss their concerns regarding marine mammal subsistence resources including the bowhead whale, beluga whale, walrus, ice seal, and polar bear.

b) Protected Species

Species that occur within the northeastern Chukchi Sea and are listed under the ESA as either threatened or endangered are listed below in Table 12.b-1. The Kittlitz's murrelet, yellow-billed loon, and Pacific walrus are included in the table only as candidate species. NMFS published a final rule listing the Arctic, Okhotsk, and Baltic subspecies of ringed seals as threatened and the Ladoga subspecies as endangered under the ESA (77 FR 76706-76738 December 28, 2012). The only subspecies that occurs in the northeastern Chukchi Sea is the Arctic subspecies.

Potential effects on these species due to activities associated with the planned exploration drilling program in EP Revision 2, which includes the addition of simultaneous drilling by a second drilling unit, are analyzed in the EIA provided in Appendix C. The proposed mitigation measures, which have been designed to avoid or minimize any effects on these species, are described below in Section 12.0(c).

Table 12.b-1 Species Found in the Northeastern Chukchi Sea and Protected Under the ESA

Common Name	Scientific Name	ESA Status	Extralimital[3] (Yes/No)
spectacled eider	*Somateria fischeri*	threatened	No
Steller's eider	*Polysticta stelleri*	threatened	No
bearded seal [1,2]	*Erignathus barbatus* (Beringia distinct population segment)	candidate	No
ringed seal	*Phoca hispida*	threatened	No
Pacific walrus[2]	*Odobenus rosmarus divergens*	candidate	No
polar bear	*Ursus maritimus*	threatened	No
bowhead whale	*Balaena mysticetus*	endangered	No
fin whale	*Balaenoptera physalus*	endangered	Yes
humpback whale	*Megaptera novaeangliae*	endangered	Yes

[1] Treated as candidate – threatened status vacated.
[2] Pacific walrus and bearded seals are included in table only as a candidate species, which receive no protection under the ESA.
[3] Extralimital - not found within a given geographic area

No critical habitat has been designated for the fin whale, humpback whale, and bowhead whale. Critical habitat has been designated for the Steller's eider but none is located in the Chukchi Sea. Critical habitat has been designated for the spectacled eider, with the nearest critical habitat being located in Ledyard Bay more than 54 mi (87 km) from the Burger Prospect. NMFS proposed critical habitat for the Arctic ringed seal in the northern Bering, Chukchi, and Beaufort Seas off of Alaska in December 2014.

The USFWS issued a final rule on 7 December 2010 designating three types of critical habitat for the polar bear; sea ice habitat, barrier island habitat, and terrestrial denning habitat; this polar bear critical habitat designation has since been vacated. Potential effects on critical habitat due to activities associated with the planned exploration drilling program are analyzed in the EIA provided in Appendix C.

The planned exploration drilling program would have no effect on spectacled eider critical habitat.

Table 12.b-2 Marine Mammals[1] Found in the Northeastern Chukchi Sea and Protected Under the MMPA

Common Name	Scientific Name	ESA Status	MMPA Status	Extralimital (Yes/No)
beluga whale[1]	*Delphinapterus leucas*	not listed	--	No
narwhal	*Monodon monoceros*	not listed	--	Yes
killer whale	*Orcinus orca*	not listed	--	No
harbor porpoise	*Phocoena phocoena*	not listed	--	No
bowhead whale	*Balaena mysticetus*	endangered	depleted	No
gray whale	*Eschrichtius robustus*	not listed	--	Yes
fin whale	*Balaenoptera physalus*	endangered	depleted	Yes
minke whale	*Balaenoptera acutorostrata*	not listed	--	Yes
humpback whale	*Megaptera novaeangliae*	endangered	depleted	Yes
bearded seal	*Erignathus barbatus* (Beringia distinct population segment)	candidate	depleted	No
spotted seal[1]	*Phoca largha*	Arctic population segments not listed	--	No
ringed seal	*Phoca hispida*	threatened	depleted	No
ribbon seal	*Histriophoca fasciata*	not listed		No
Pacific walrus[2]	*Odobenus rosmarus divergens*	candidate	--	No
polar bear	*Ursus maritimus*	threatened	depleted	No

[1] Populations of some species identified as not listed, such as beluga & spotted seal, are listed but those populations are not found in the Chukchi Sea.

[2] Pacific walrus has been petitioned for listing under ESA, has undergone status review, and listing was found to be warranted but precluded by higher priorities – and is therefore considered a candidate species by USFWS.

In accordance with the MMPA, a walrus use area has been designated over Hanna Shoal (i.e. the HSWUA) located adjacent to Shell's Burger Prospect. The HSWUA is a large area (approximately 9,500 mi^2) to the northeast of the Burger Prospect that the USFWS designated as an area utilized by Pacific walrus during the summer months.

The planned exploration drilling program will likely involve the non-lethal incidental take of marine mammals. The projected incidental takes are provided in Section 10.0 of this document. Shell has submitted a MMPA application to the NMFS for the incidental take of whales and seals, and MMPA applications to the USFWS for the non-lethal incidental take of polar bears and Pacific walrus and intentional take of polar bears and Pacific walrus. The MMPA applications contain a 4MP, which is attached in Appendix B. The USFWS MMPA applications contain a bear and walrus avoidance and human encounter / interaction plan. Shell has also developed and will implement a Bird Strike Avoidance and Lighting Plan (Appendix E). All three of these documents describe mitigation measures that Shell will implement to minimize any effects on protected species. The authorizations may also contain added mitigation measures to help avoid or minimize incidental takes. A summary of mitigation measures that will be undertaken by Shell is provided below.

c) Mitigation Measures

The permits and authorizations table included in Section 2.0 lists the authorizations and necessary permits to conduct the planned exploration drilling program. Shell will adhere to the mitigation measures required by these authorizations.

In addition to meeting all regulatory requirements, Shell is committed to other mitigation measures including those that will decrease any potential conflicts between exploration drilling activities and subsistence harvests. The preface of the EIA (Appendix C) provides details on mitigation measures that have been deleted, those that have been changed and those that have been added. The following is the current list of mitigation measures for EP Revision 2.

Communications

- Shell has developed a Communication Plan and will implement this plan before initiating exploration drilling operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts. The Communication Plan includes procedures for coordination with Communications and Call Centers (Com Centers) to be located in coastal villages along the Chukchi Sea during Shell's proposed exploration drilling activities.
- Shell will employ local subsistence advisors (SAs) from the Chukchi Sea villages that may be potentially impacted by Shell's exploration drilling activities. The SAs will provide consultation and guidance regarding the whale migration and subsistence activities. There will be one SA per village, working approximately 8-hr per day and 40-hr weeks during the drilling seasons. The SA will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and provide advice on ways to minimize and mitigate potential negative impacts to subsistence resources during the drilling season. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information; coordinating with the Com and Call Center personnel; and, advising how to avoid subsistence conflicts.

Aircraft Travel

- Aircraft over land or sea shall not operate below 1,500 ft. (457 m) altitude unless engaged in marine mammal monitoring, approaching, landing or taking off, in poor weather (fog or low ceilings), or in an emergency situation.
- Aircraft engaged in marine mammal monitoring shall not operate below 1,500 ft. (457 m) in areas of active whaling; such areas to be identified through communications with the Com Centers and SAs.
- Except in an emergency, aircraft will not operate at an altitude lower than 1,500 ft. (457 m) within 0.5 mi. (0.8 km) of polar bears when observed on land or ice.
- Helicopters will not operate at an altitude lower than 3,000 ft. (914 m) within 1 mi. (1.6 km) of walrus groups observed on land, and fixed-wing aircraft will not, except in an emergency, operate at an altitude lower than 1,500 ft. (457 m) within 0.5 mi. (805 m) of walrus groups observed on ice, or within 1 mile (1,610 m) of walrus groups observed on land.
- If aircraft must be operated below 1,500 ft. (457 m) because of weather, the operator will avoid areas of known walrus and polar bear concentrations and will take precautions to avoid flying directly over or within flying within 0.5 mi. (805 m) of these areas..

Vessel Travel

- The drilling units and support vessels anticipate they will enter the Chukchi Sea through the Bering Strait on or about 1 July[4], minimizing effects on marine mammals and birds that frequent open leads and minimizing effects on spring and early summer bowhead whale hunting.
- The transit route for the drilling units and drilling support vessels will avoid known fragile ecosystems and the LBCHU, and will include coordination through Com Centers.

[4] *See supra* fn. 1.

- PSOs will be aboard the drilling units and all transiting support vessels.
- Except in an emergency, vessels will not approach within 0.5 mi. (0.8 km) of walruses or polar bears when observed on ice.
- Except in an emergency, vessels will not approach within 1.0 mi. (1.6 km) of groups of walruses or 0.5 mi. (0.8 km) of polar bears when observed on land.
- When within 900 ft. (274 m) of whales, vessels will reduce speed, avoid separating members from a group and avoid multiple changes of direction.
- Vessels should take all reasonable precautions (i.e., reduce speed, change course heading) to maintain a minimum operational exclusion zone of 0.5 mi (0.8 km) around groups of 12 or more walruses in the water.
- Vessel speed will be reduced during inclement weather conditions in order to avoid collisions with marine mammals.
- Shell will communicate and coordinate with the Com Centers regarding all vessel transits.
- Use of some lighting on the drilling units and support vessels will be minimized and shaded to reduce potential disorientation and attraction of birds and to reduce the possibility of a bird collision (Bird Strike Avoidance and Lighting Plan, Appendix E, EP Revision 2).

Exploration Drilling Operations

- Critical operations will not be started if potential hazards (ice floe, inclement weather, etc.) are in the vicinity and there is not sufficient time to finish the critical operation before the arrival of the hazard at the drill site (Appendix F).
- The blowout prevention program will be enhanced through the use of two sets of blind/shear rams.
- For drill sites at which a MLC is drilled by bit, a ROV control panel will be SS, linked to the BOP by an umbilical, with sufficient pressured water-based fluid to operate the BOP. In the event the MLC is drilled by the MLC ROV system, no additional SS control panel is required as an ROV will have direct access to the BOP panel located in the MLC.
- Provisions for a second relief well drilling unit will be in-place in the event that the primary drilling vessel is disabled and not capable of drilling its own relief well. Both the *Discoverer* and *Polar Pioneer* will serve as its own primary relief well drilling unit. If the *Discoverer* or the *Polar Pioneer* cannot be used to drill a relief well, the other drilling unit (secondary relief well drilling unit) would be used for that purpose. The drilling units will be in the Lease Sale 193 Area operating as primary drilling units, or one may be no further distant than Dutch Harbor when the other drilling unit is drilling in hydrocarbon bearing zones. In either case, the secondary relief well drilling unit could be mobilized to the location in the Burger Prospect, moored, and drill a relief well and kill the flow within 38 days.
- Airgun arrays will be ramped up slowly during ZVSP surveys to warn cetaceans and pinnipeds in the vicinity of the airguns and provide time for them to leave the area and avoid potential injury or impairment of their hearing abilities. Ramp ups from a cold start when no airguns have been firing will begin by firing a single airgun in the array. A ramp up to the required airgun array volume will not begin until there has been a minimum of 30 min of observation of the safety zone by PSOs to assure that no marine mammals are present. The safety zone is the extent of the 180 dB radius for cetaceans and 190 dB for pinnipeds. The entire safety zone must be visible during the 30 min lead-in to an array ramp up. If a marine mammal(s) is sighted within the safety zone during the 30 min watch prior to ramp up, ramp up will be delayed until the marine mammal(s) is sighted outside of the safety zone or the animal(s) is not sighted for at least 15 to 30 min: 15 min for small odontocetes and pinnipeds, or 30 min for baleen whales and large odontocetes.

Ice Management

- Real time ice and weather forecasting will be from the Shell Ice and Weather Advisory Center.
- Shell has developed and will implement an Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses (Appendix J).

Oil Spill Response

- The primary OSRV will be on standby at all times when drilling into zones capable of flowing liquid hydrocarbons in measurable quantities to ensure that OSR capability is available within one hour, if needed.
- Shell will deploy OSR support vessels capable of collecting oil on the water in excess of the calculated WCD flow rate of a blowout in the unlikely event that one should occur. The remaining OSR support vessels will be fully engaged within 72 hours.
- In addition to the OSR support vessels, oil spill containment equipment will be available for use in the unlikely event of a blowout. The containment system tugs and barge will be located in or near Goodhope Bay, Kotzebue Sound. This equipment is designed for maximum reliability, ease of operation, flexibility and robustness so it could be used for a variety of blowout situations. It is anticipated that the containment system could arrive at the scene of a blowout and be capable of receiving hydrocarbons in eight days, depending on weather and the characteristics of the blowout.
- Capping stack equipment will be stored aboard one of the ice management vessels and will be available for deployment within 24 hours, depending on ice, weather and location, in the unlikely event of a blowout. Capping stack equipment consist of SS devices assembled to provide direct surface intervention capability with the following priorities:
    - Attaching a device or series of devices (i.e. the capping stack) to the well to affect a seal capable of withstanding the MAWP and closing the assembly to completely seal the well against further flows (this intervention process is commonly called “Cap and Contain”), and
    - Attaching a device or series of devices (i.e. the capping stack) to the well and diverting flow to surface vessel(s) (i.e. the containment system on the *Arctic Challenger* barge) equipped for separation and disposal of hydrocarbons (this intervention process is commonly called “Cap and Flow”).
- A polar bear culvert trap has been constructed in anticipation of OSR needs and will be available prior to exploration drilling.
- Pre-booming will be conducted for all fuel transfers between vessels.

Air Emissions

- Procuring ULSD fuel or a fuel with equal or lower sulfur content to reduce SO_2 emissions for each of the drilling units and all vessels operating as part of the exploration drilling program; and
- Establishing fuel restrictions on most of the propulsion and generators engines for the support vessels.

Appendix K provides a summary of the emission reduction measures and the resulting emissions reductions, as applied in the AQRP analysis.

Shell has elected to present maximum projected emissions in the AQRP emissions inventory for the 30 CFR 550.303(d) exemption formula analyses without consideration of existing emission controls as reduction measures on the *Discoverer*'s primary generation units or any of the support vessels. These emission controls include the following:

- selective catalytic reduction (SCR) emission controls to reduce NO_X emissions on *Discoverer*'s primary generation units and certain units on support vessels;
- catalytic diesel particulate filters (CDPF) emission controls to reduce CO, particulate matter (PM), and VOC emissions on the *Discoverer*'s primary generation units and certain units on support vessels; and
- OxyCat emission controls to reduce CO, PM, and VOC emissions on certain units on support vessels.

The 30 CFR 550.303(d) exemption analyses in Section 7(e) conservatively assume the emission controls are not employed as emission reduction measures. As a result, Shell is not required to operate these controls, but is voluntarily committing to do so. Therefore, emissions reductions resulting from the voluntary commitment to operate the controls are not quantified in the AQRP emission inventories presented in Appendix K and thus no corresponding monitoring is proposed for these emission controls.

SECTION 13.0 SUPPORT VESSELS AND AIRCRAFT INFORMATION

a) Planned Vessel and Aircraft List

- Drilling units: *Discoverer and Polar Pioneer*
- Ice management vessels (x2)
- Anchor handlers (x3)
- OSVs (x3)
- Science vessels (x2)
- MLC ROV system vessel
- Support tugs (x2)
- Shallow water vessels (x2)
- Supply tugs (x2) and barges (x2) (one tug of which may have temporary duties accompanying the *Discoverer* during transiting to and from a drill site)
- OSRV (x1)
- OSR tugs (x2) and barges (x2)
- OSTs (x2)
- Containment system (tug [x2]and barge [x1]
- SAR helicopter
- Crew change/resupply helicopters (x3)
- Fixed wing aircraft for ice reconnaissance
- Fixed wing aircraft for PSO flights
- Fixed wing aircraft for crew change between Barrow and Wainwright

Drilling Units

The *Discoverer* and the *Polar Pioneer* will be the drilling units used to drill the wells on the Burger Prospect. The specifications for these drilling units are listed in Section 1c).

Support Vessels

The drilling units will be supported by the types of vessels listed in Table 13.a-1.

Oil Spill Response Vessels

The OSR support vessels will consist of those types of vessels listed in Table 13.a-2.

Table 13.a-1 Specifications of Support Vessel Types

Specification	Ice Management Vessels (x2)[1,2]	Anchor Handlers (x3)[1,3]	OSVs (x3)[1,4]	Science Vessels (x2)[1,5]	Shallow Water Vessels (x2)[1,6]	Support Tugs (x2)[1,7]	Supply Tug and Barges (x2)[1,8]		MLC ROV System Vessel [1,9]
							Tug (x2)	Barge (x2)	
Length	380 ft. (116 m)	361 ft. (110 m)	300 ft. (91.5 m)	300 ft. (91.5 m)	85 ft. (25.9 m)	146 ft. (44.5 m)	150 ft. (45.7 m)	400 ft. (122 m)	280 ft. (85.3 m)
Width	85 ft. (26 m)	80 ft. (24.4 m)	64 ft. (19.5 m)	64 ft. (19.5 m)	20 ft. (6.1 m)	46 ft. (14 m)	40 ft. (12.2 m)	99.5 ft. (30.3 m)	60 ft. (18.3 m)
Draft	27 ft. (8.4 m)	28 ft. (8.5 m)	19.6 ft. (5.9 m)	19.6 ft. (5.9 m)	4.5 ft. (1.4 m)	21 ft. (6.4 m)	19.5 ft. (5.9 m)	25 ft. (7.6 m)	16.5 ft. (5 m)
Accommodations	77	64	50	50	50	13	11	--	26
Maximum Speed	16 knots (30 km/hr.)	15 knots (28 km/hr.)	13 knots (24 km/hr.)	13 knots (24 km/hr.)	20 knots (37 km/hr.)	16 knots (30 km/hr.)	12 knots (22 km/hr.)	--	13 knots (24 km/hr.)
Available Fuel Storage	14,192 bbl (2,256 m^3)	11,318 bbl (1,799 m^3)	5,786 bbl (920 m^3)	5,786 bbl (920 m^3)	43 bbl (6.8 m^3)	5,030 bbl (799 m^3)	4,800 bbl (774 m^3)	--	6,233 bbl (991 m^3)

[1] Or similar vessel
[2] *Based on Nordica*
[3] Based on *Aiviq*
[4] Based on the *Harvey Champion*
[5] Based on the *Harvey Champion*
[6] Based on the *King C* (formerly the *Diana G*)
[7] Based on the tug *Ocean Wave*
[8] Based on the *Lauren Foss* (tug) and *Tuuq* (barge)
[9] Based on the *Harvey Spirit*

Table 13.a-2 Specifications of the Major Oil Spill Response Vessels

Specifications	OSRV [1,2] (x1)	Offshore OSR [1,3]		Nearshore OSR [1,4]		OST [1,5] (x1)	OST [1,6] (x1)	Containment System [1,7]	
		Tug (x1)	Barge (x1)	Tug (x1)	Barge (x1)			Tug (x2)	Barge (x1)
Length	301 ft. (91.9 m)	136 ft. (41.4 m)	333 ft. (101.5 m)	90 ft. (27.4 m)	205 ft. (62.5 m)	748 ft. (228 m)	813 ft. (248 m)	150 ft. (45.7 m)	316.5 ft. (96.5 m)
Width	60 ft. (18.3 m)	37 ft. (11.2 m)	76 ft. (23.1 m)	32 ft. (9.8 m)	90 ft. (27.4 m)	105 ft. (32 m)	141 ft. (48 m)	40 ft. (12.2 m)	105 ft. (32 m)
Draft	19 ft. (5.8 m)	20 ft. (6.0 m)	22 ft. (6.7 m)	10 ft. (3 m)	15 ft. (4.6 m)	66 ft. (20 m)	69 ft. (21 m)	19.5 ft. (5.9 m)	12.5 ft. (3.8 m)
Accommodations	41	10	--	8	--	25	25	11	72
Maximum Speed	16 knots (30 km/hr.)	12 knots (22 km/hr.)	--	12 knots (22 km/hr.)	--	15 knots (28 km/hr.)	15 knots (28 km/hr.)	10 knots (19 km/hr.)	--
Available Fuel Storage	7,692 bbl (1,223 m^3)	3,690 bbl (586 m^3)	3,857 bbl (616 m^3)	1,286 bbl (204.5 m^3)	--	16,121 bbl (2,563 m^3)	20,241 bbl (3,218 m^3)	4,800 bbl (763 m^3)	6,630 bbl (1,054 m^3)
Available Liquid Storage	12,245 bbl (1,947 m^3)	--	76,900 bbl (12,226 m^3)	--	17,000 bbl (5,183 m^3)	106,000 bbl[8] (16,852 m^3)	670,000 bbl (106,518 m^3)	--	--
Workboats	(3) 34 ft. work boats	--	--	--	(1) skim boat 47 ft. (14 m) (3) work boats 34 ft. (10 m) (4) mini-barges	--	--	--	--

[1] Or similar vessel
[2] Based on the *Nanuq*
[3] Based on the tug *Guardsman* (tug) and *Klamath* (barge)
[4] Based on the *Point Oliktok* (tug) and *Endeavor* (barge)
[5] Based on a Panamax type tanker
[6] Based on an Aframax type tanker
[7] Based on the *Corbin Foss* (tug), *Arctic Challenger* (barge)
[8] Total available storage is 350,000 bbl; however, 244,000 bbl of ULSD or a fuel with equal or lower sulfur content (used to refuel the drilling units and support vessels) will take up storage space, leaving 106,000 bbl for recovered liquid ds. Storage space for recovered liquids will increase as fuel is dispensed for refueling.

Photograph of an Ice Management Vessel

Two primary ice management vessels will support the drilling units (photograph of the M/V *Nordica*). These vessels will enter and exit the Chukchi Sea with the drilling units or before and will generally remain in the vicinity of the drilling units during the drilling season. Ice management and ice reconnaissance is expected to occur at distances of 20 mi (32 km) and 30 mi (48 km) respectively. However, these vessels may have to expand beyond these ranges depending on the ice conditions.

Photograph of an Anchor Handler

Three anchor handlers (photograph of the *Aiviq*) will support the drilling units and the containment system tugs and barge. These vessels will enter and exit the Chukchi Sea with the drilling units or before, and will generally remain in the vicinity of the drilling units during the drilling season. When not anchor handling, these vessels will be available to provide other general support if needed.

Photograph of an OSV

The planned exploration drilling operations will require three OSVs for resupply of the drilling units and support vessels. Drilling materials, food, fuel and other supplies will be picked up in Dutch Harbor (with possible minor resupply coming out of Kotzebue) and transported to the drilling units and support vessels.

Shell plans to use up to two science vessels to monitor discharges from the drilling units during drilling. The science vessel specifications are based on a large OSV (Harvey Champion [photograph] or similar) but may be a smaller vessel. This vessel will help sample drilling discharges that are defined in the EPA NPDES exploration facilities GP AKG-28-8100.

Photograph of a Shallow Water Vessel

Shell plans to use two shallow water vessels, based in Kotzebue Sound (photograph of the *Diana G*, now known as the *King C*). These vessels will be used to transport supplies and crew between Kotzebue and the vessels moored in Kotzebue Sound. These vessels will have a shallow draft and be capable of entering shallow water.

Photograph of a Support Tug

Two support tugs will tow the *Polar Pioneer* to the Burger Prospect (photograph of the *Ocean Wave*). After the *Polar Pioneer* is moored, the tugs will remain in the vicinity of the drilling units to help move them in the event that either drilling unit has to be moved off a drilling site due to ice or any other event.

Photograph of a Supply Tug

Shell plans to use two tugs and supply barges (photograph of the tug *Lauren Foss*) that may be based in Kotzebue Sound. The barges will house well material for the drilling vessels and for the containment system tugs and barge, provide contingency accommodations for personnel in Kotzebue Sound, and carry mooring equipment for the containment system barge.

Shell also plans to use an OSV type vessel to support an MLC ROV system that may be used to construct some of the MLCs. If used, this vessel will be located at a drill site on the Burger Prospect. When not in use, the vessel will be outside of the Chukchi Sea lease sale planning area.

Photographs of OSRV

An OSRV such as the Nanuq (or similar) will be staged in the vicinity of the drilling units when either is drilling in liquid hydrocarbon bearing zones. This will enable the OSRV to immediately respond to a spill and provide containment, recovery, and storage for the initial operational period following a spill event.

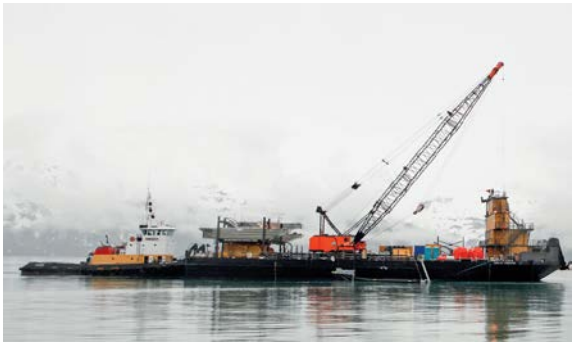
Photographs of Offshore OSR Tug and Barge

An OSR tug and barge, (photograph of the *Guardsman* tug and *Klamath* barge), will be staged in the Chukchi Sea. Together with the OSRV, it will have sufficient containment, recovery, and storage capacity for the initial operational period in the event of a spill.

Photograph of an OST

Shell plans to use up to two OSTs (photograph of a Panamax tanker). As planned, one OST with specifications of a Panamax tanker will be staged in the vicinity of the Burger Prospect. This tanker will hold fuel for Shell's drilling units and support vessels in addition to storage space to store collected recovered liquids if there is a well control event. A second OST, with specifications of an Aframax tanker, will be stationed in the Chukchi Sea lease sale planning area. The Aframax tanker will be sited such that it will be able to respond to a well control event before the Panamax tanker reaches its recovered liquid capacity.

Photograph of a nearshore Tug and Barge



A tug and barge (Photograph of the *Endeavor* barge) will be used for nearshore OSR. It will carry a 47 ft. (14 m) skimming vessel, three 34 ft. (10 m) workboats, four mini-barges, boom, and duplex skimming units for nearshore recovery. This tug and barge will be moored in or near Goodhope Bay in Kotzebue Sound.

Photograph of containment system barge

Shell's oil spill containment system, housed on the *Arctic Challenger* barge, will be accompanied by two tugs, likely the *Corbin Foss* and a similar tug. The containment system tugs and barge will be moored in or near Goodhope Bay in Kotzebue Sound.

Kotzebue Sound Mooring Location

There are four proposed mooring locations for vessels that will be stationed in Goodhope Bay, Kotzebue Sound. These locations are in the vicinity of the potential place of refuge (PPOR) in the Northwest Alaska Subarea Plan (e.g., approximately 66° 13' N 163° 28' W), which is in excess of 7 mi (11 km) from land, in a water depth of approximately 30 ft. (9 m). The proposed mooring locations are:

- Approximately longitude 66º 13.658' N and latitude 163º 28.138' W
- Approximately longitude 66º 12.986' N and latitude 163º 27.989' W
- Approximately longitude 66º 13.037' N and latitude 163º 26.305' W
- Approximately longitude 66º 13.704' N and latitude 163º 26.523' W

Setting of four mooring buoys is anticipated with each buoy having up to three anchors. The vessels expected to moor in this location include the containment system tugs and barge, nearshore OSR tug and barge, and two supply tugs and barges.

The mooring locations in Goodhope Bay in the western portion of Kotzebue Sound were selected based on detailed evaluations of environmental and traditional knowledge information regarding subsistence activities in this area of southwest Kotzebue Sound. The site of these four, closely spaced, temporary mooring locations were selected in large part because the area has been selected and approved by the State of Alaska as a potential place of refuge (PPOR) in addition to traditional knowledge. The review process for selecting PPORs considers the existence of sensitive resources such as historic properties. SS surveys have not been conducted at the location, but it is the conclusion of an archaeological review

requested by Shell that there is low potential for any effects to historic resources from the planned moorings and staging in Goodhope Bay. Shell visited the local communities in January 2014 (Kotzebue), July 2014 (Kotzebue and Deering) and in January 2015 (Kotzebue, Deering and Buckland) and informed local residents of Shell's proposed activities, including the mooring of vessels in Goodhope Bay, southwest Kotzebue Sound. During these community meetings (Appendix D) the residents did not raise concerns that the mooring of the vessels would cause disturbance to subsistence resources or subsistence use. Shell will employ SAs and CLOs in nearby communities to mitigate potential disturbances to subsistence issues that may arise. In addition, Shell will establish a Communication Center (Com Center) in Kotzebue. The SAs and CLOs will be hired, and the Com Center established prior to Shell vessels entering Kotzebue Sound.

Shell selected the area in large part because it has been selected and approved as a PPOR. The review process for selecting PPORs considers the existence of sensitive resources such as historic properties. Subsea surveys have not been conducted at the location, but it is the conclusion of an archaeological review requested by Shell that there is low potential for any effects to historic resources from the planned moorings and staging in Goodhope Bay.

Vessels will remain compliant with the existing waste management plan, MARPOL regulations, and NPDES Vessel GP for any discharge of gray water or effluent. Crew changes will occur throughout the season using shallow water vessels (yet to be contracted) transiting out from Kotzebue to the vessel locations in Kotzebue Sound. Vessels may also receive resupply of food stores via a shallow water vessel.

Shell plans to refuel the support vessels moored in or near Goodhope Bay, Kotzebue Sound at least once during the drilling season. It is anticipated that the support vessels will require approximately 250,000 gal (5,950 bbl) of ULSD (or other fuel with equivalent or lower sulfur content). Refueling will be done with an OSV or other support vessel capable of transferring fuel and will follow the procedures outlined in the FTP. The shallow water landing crafts may be fueled dockside at Kotzebue by a commercial entity.

Aircraft

Offshore operations will be serviced by up to three helicopters operated out of an onshore support base in Barrow. Sikorsky S-92s (or similar) will be used to transport crews between the onshore support base and the drilling units and support vessels with helidecks. The helicopters will also be used to haul small amounts of food, materials, equipment, samples between vessels and the shorebase. Approximately 40 Barrow-Burger Prospect round trip flights will occur each week (up from approximately 12/week in EP Revision 1) to support the additional crew change necessities for another drilling unit and support vessels and required sampling and analytical requirements under the NPDES exploration facilities GP.

Generalized flight corridors over the onshore and nearshore areas are indicated on Figure 13.e-2. The route chosen will depend on weather conditions and whether subsistence users are active on land or at sea. These routes may be modified depending on weather and subsistence uses.

Shell will also have a dedicated helicopter for Search and Rescue (SAR). The SAR helicopter is expected to be a Sikorsky S-92 (or similar). This aircraft will stay grounded at the Barrow shorebase location except during training drills, emergencies, and other non-routine events. The SAR helicopter and crews plan training flights for approximately 40 hr./month.

A fixed wing propeller or turboprop aircraft, such as Saab 340-B, Beechcraft 1900, or De Havilland Dash 8, will be used to transport crews, materials, and equipment between Wainwright and hub airports such as Barrow or Fairbanks. Additionally, rotary winged S-92s (or similar) in Barrow may provide crew transport between Barrow and Wainwright. It is anticipated that there will be one round trip flight every three weeks.

A fixed wing aircraft, Gulfstream Aero Commander (or similar), will be used for PSO flights (aka offshore aerial wildlife monitoring flights). PSO flights will take place daily depending on weather conditions. PSO flight paths are located in the 4MP (Appendix B).

An additional Gulfstream Aero Commander will be used to provide ice reconnaissance flights to monitor ice conditions around the Burger Prospect. Typically, the flights will focus on the ice conditions within 50 mi (80 km) of the drill sites, but more extensive ice reconnaissance may occur beyond 50 mi (80 km). These flights will occur at an altitude of approximately 3,000 ft. (915 m).

Fuel Storage Information and Frequency of Trips

The frequencies of trips the above-referenced marine vessels and aircraft would be expected to make during the planned exploration drilling program are listed below in Table 13.a-3.

Table 13.a-3 Fuel Storage Capacity and Trip Information for Support Vessels and Aircraft

Vessel Type	Maximum Fuel Tank Storage Capacity (each vessel)	Trip Frequency or Duration/Location
Marine Support Vessels (or similar)		
Ice management vessels (x2)	14,192 bbl (2,256 m^3)	Will remain in the vicinity of the drilling units until its mission is finished
Anchor handlers (x3)	11,318 bbl (1,799 m^3)	Will remain in the vicinity of the drilling units until its mission is finished; may occasionally assist in Kotzebue Sound
OSVs (x3)	5,786 bbl (920 m^3)	Up to 30 round trips (combined for all OSVs) for resupply between drilling unit and Dutch Harbor/Kotzebue during each exploration drilling season
Supply Tugs (x2) and barges (x2)	4,800 bbl (774 m^3)	Will generally remain in Kotzebue Sound for storage; one tug may accompany the *Discoverer* when transiting to/from a drill site
Support Tugs (x2)	5,585 bbl (888 m^3)	Support for the *Polar Pioneer*
Science Vessel (x2)	5,786 bbl (920 m^3)	Will remain in the vicinity of the drilling units until its mission is finished
MLC ROV system vessel	6,233 bbl (991 m^3)	Located on the prospect establishing MLCs ahead of the drilling units
Shallow water vessels (x2)	43 bbl (6.8 m^3)	Occasional trips as needed in vicinity of Kotzebue
OSR Support Vessels (or similar)		
OSRV	7,692 bbl (1,223 m^3)	Will remain in the vicinity of the drilling units until its mission is finished
OSR tug (x1) and barge (x1) (offshore)	1,786 bbl (284 m^3)	Will remain in the vicinity of the drilling units until its mission is finished
OSR tug (x1) and barge (x1) (nearshore)	1,286 bbl (204.5 m^3)	Staged in Kotzebue Sound
OST (Panamax)	16,121 bbl (2,563 m^3)	Will remain in the vicinity of the drilling units until its mission is finished
OST (Aframax)	20,241 bbl (3,218 m^3)	Stationed in the Chukchi Sea lease sale planning area
Containment system tugs (x2) and barge (x1)	6,630 bbl (1,054 m^3)	Staged in Kotzebue Sound
Aircraft (or similar)		
Saab 340 B, Beechcraft 1900, or Dash 8 fixed-wing or similar (x1) – transport from shorebase to regional jet service in Barrow	9 bbl (1.4 m^3)	1 trip every 3 weeks between Wainwright and Barrow or Anchorage
Gulfstream 690 Aero Commander (or similar) (x2)	9 bbl (1.4 m^3)	PSO flights and ice reconnaissance; both to occur daily when possible
Helicopter S-92 (or similar) (x3) for crew rotation & groceries/supply	18 bbl (2.9 m^3)	Approximately 40 trips/ week between Barrow and the Burger Prospect (approximately 3.0 hr./trip)
Helicopter S-92 (or similar) – Search-and-Rescue (x1)	18 bbl (2.9 m^3)	Stationed in Barrow – 40 hr./month for proficiency training & trips made in emergency

b) Air Emissions

Projected air emissions from support vessels are indicated below in Table 13.b-1 and are discussed in more detail in Section 7.0 and Appendix K of this document.

Table 13.b-1 Project Annual Air Pollutant Emissions (Tons Per Year) from Support Vessels Associated with the Drilling Units

Vessels	NO_x	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2
Ice Management Vessels (x2)	234	79	12	12	11	2
Anchor Handler Vessels (x3)	423	90	18	18	25	3
Science Vessels (x2)	111	45	5	5	10	1
Support Tugs (x2) & Supply Tug (x1)	172	22	6	6	13	1
OSVs (x2)	70	14	7	7	5	1
OSRV	117	44	8	8	6	1
OSR Workboats (x3)	18	5	0.4	0.4	5	0.2
OSR Tug (x1) and Barge (x1)	60	13	3	3	3	0.2
Oil Storage Tanker	156	35	12	12	8	2
MLC ROV system Vessel	145	44	3	3	6	1

Attachment A of Appendix K lists the source, composition, frequency and duration of air emissions associated with support vessels that will be within 25 mi (40 km) of the drilling units while each are anchored at a drilling location.

c) Drilling Fluids and Chemical Products Transportation

Each drilling unit will be preloaded with drilling fluids and other chemicals (Section 6.0) to be used for exploration drilling before being mobilized to the Burger Prospect at the start of each exploration drilling season. Any required additional drilling fluid components will be transported to the drilling unit via an OSV or tug and barge.

d) Solid and Liquid Wastes Transportation

An incinerator will be aboard each drilling unit and will be used to dispose of combustible municipal solid wastes. Authorized wastes will be discharged to the Chukchi Sea under the NPDES exploration facilities GP. The remaining wastes will be transported out of the Chukchi Sea by OSVs and disposed of at an approved disposal facility. Food wastes associated with the drilling vessels will be incinerated but, if conditions warrant, may be shipped out of the Arctic for disposal at a licensed facility. Descriptions of the transportation methods and a brief description of the composition, quantities, and destinations of the solid and liquid wastes to be transported by vessel from the drilling units are provided below in Table 13.d-1.

Table 13.d-1 Onshore Waste Disposal Facilities, Waste Type, Amount, Rate, and Disposal Method

Name/Location of Disposal Facilities	Type of Waste	Amount	Disposal Method
Waste Management Inc. Columbia Ridge Landfill, Arlington, OR (Subtitle D landfill)	Household trash (municipal solid waste [MSW]) only	Drilling Units: 17,000 lb. (8,500 lb./ month/drilling unit) Support Vessels: 23,454 lb./month	Landfill
Waste Management Inc. Chemical Waste Management, Arlington, OR (Subtitle C landfill)	Non-hazardous waste solids – including CESQG-exempt wastes (oily rags, unused chemicals, aerosols, batteries, lamps, cement, incinerator ash, etc.)	Drilling Units: 12,100 lb. (6,050 lb./ month/drilling unit - includes approximately 50 lb./month/ drilling unit of CESQG-exempt waste) Support Vessels: 4,765 lb./month	Landfill or Recycle
Marine Vacuum Service Inc. Seattle WA, - or Emerald Services, Inc., Seattle, WA or Thermo Fluids Portland, OR	Non-hazardous liquids in bulk shipments (bilge water, vessel slops, brine water)	Drilling Units: 100,000 lb. (50,000 lb./ month/drilling unit) Support Vessels: 123,975 lb. /month	Treat and Recycle
Seattle Iron & Metals Corp. Seattle WA, or Schnitzer Steel Industries, Anchorage, AK	Non Hazardous Waste Solids - Scrap Metal (uncontaminated scrap steel only)	Drilling Units: 13,000 lb. (6,500 lb./ month/drilling unit) Support Vessels: 1,220 lb./month	Recycle

e) Vicinity Map and Travel Routes

The locations of the planned exploration drilling activities relative to the shoreline and shorebase facilities and the primary route of the drilling units and routes of support vessels when entering and exiting the Chukchi Sea are indicated in Figure 13.e-1. Generalized flight corridors that helicopters would take between the shorebase and the Burger Prospect are indicated in Figure 13.e-2. The primary helicopter route between shorebase and the Burger Prospect is from the Barrow airport, directly offshore to the Burger Prospect. Helicopters would alternatively travel between Wainwright and the Burger Prospect under special circumstances. The planned use of Wainwright as a shorebase facility is only for the drilling seasons covered by EP Revision 2, and do not necessarily reflect Shell's planned shorebase operations in the extended term.

Figure 13.e-1 Marine Vessel Routes

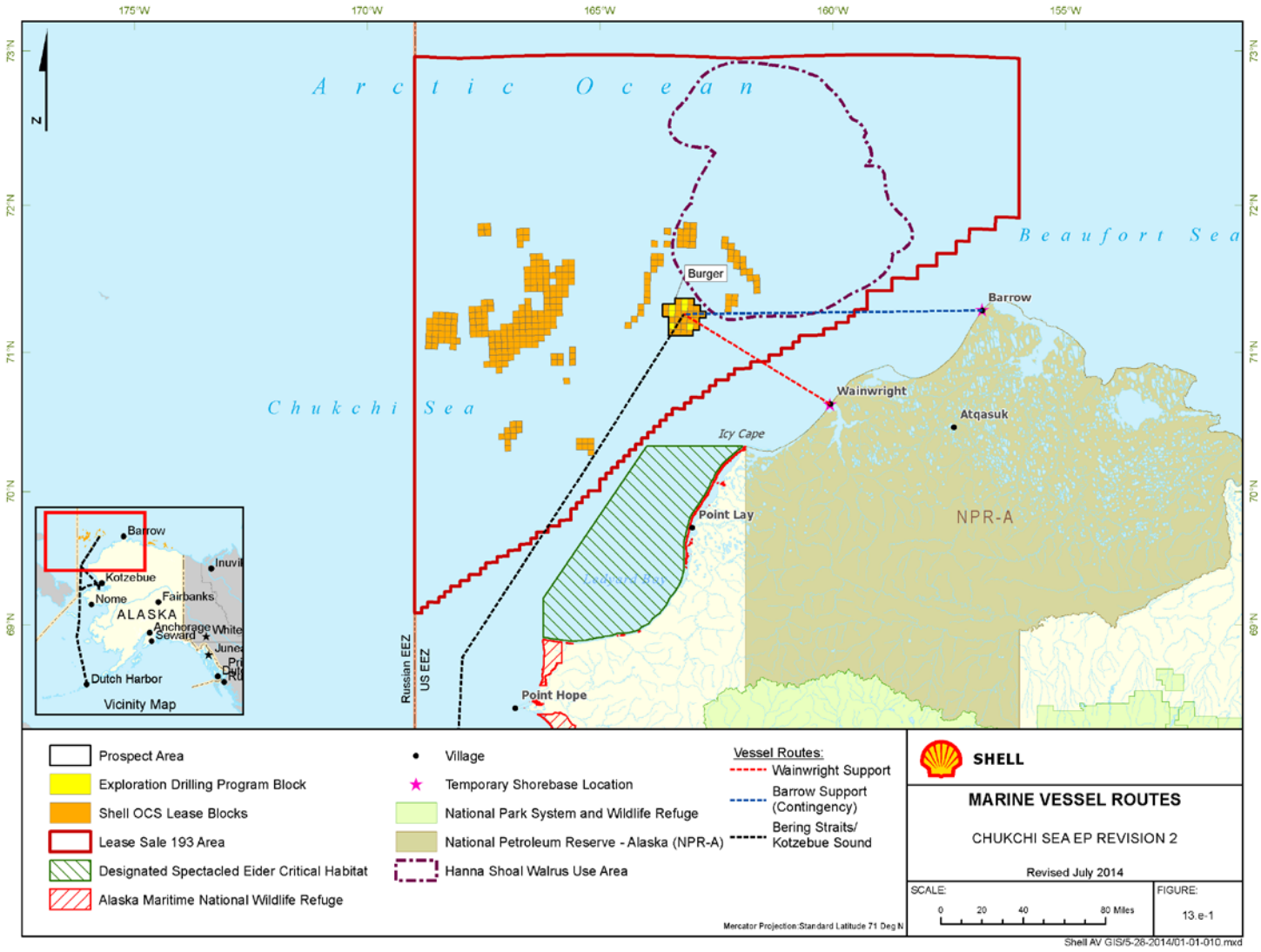
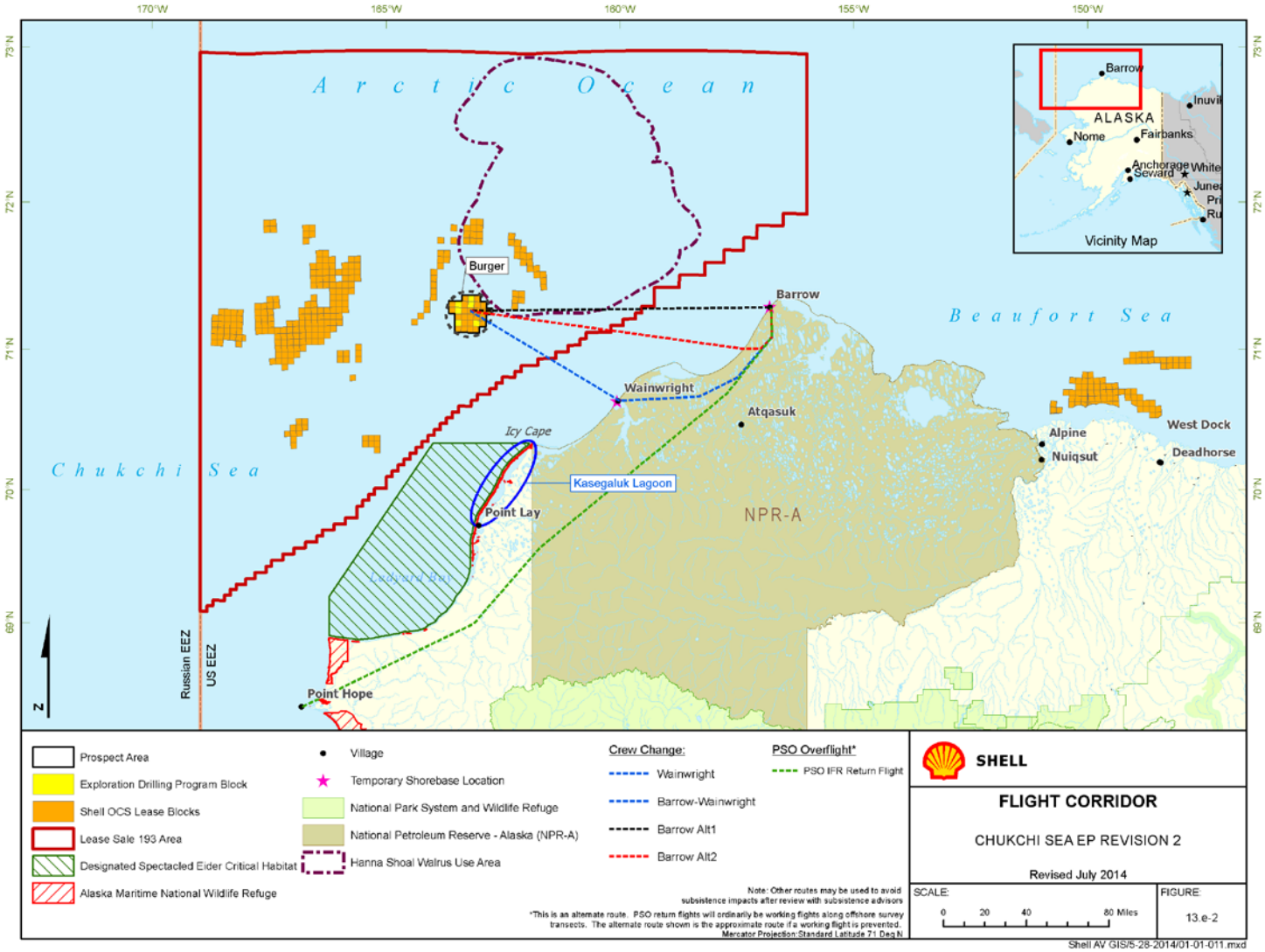


Figure 13.e-2 Flight Corridors



SECTION 14.0 ONSHORE SUPPORT FACILITIES INFORMATION

a) General

Barrow Facilities

Shell plans to 1) maintain the existing 75-person man camp and kitchen/dining/recreation (KDR) area; and 2) lease / utilize additional accommodation opportunities in Barrow, which may include an existing 40-person Ukpeaġvik Iñupiat Corporation (UIC) construction camp. Additional blocks of hotel rooms and other accommodations may be used if required. The two pads where the 75-person and 40-person camps are located are in the Naval Arctic Research Laboratory (NARL) area approximately 4.0 mi from the center of Barrow, and are located approximately 0.75 mi from each other (Figure 14.a-1). Passenger processing facility expansion is planned for the Barrow airport area, to be completed prior to the commencement of the next exploration drilling season (Figures 14.a-2 and -3).

Shell's 75-person man camp consists of skid-mounted modular buildings. The camp is supported by a KDR unit, capable of providing meals for up to 200 persons, is approximately 166 ft. long by 64 ft. wide and is located on the pad at the southwest corner of the existing accommodations (Figure 14.a-4). The KDR provides service to all Shell and contractor employees in Barrow supporting Shell's exploration drilling program.

The 75-person camp and KDR unit have been permitted by UIC with the NSB with a Development Permit and a fill permit, and with the SOA Fire Marshal. In addition, UIC has obtained a Preapproved Emission Limit (PAEL) from the Alaska Department of Environmental Conservation (ADEC). The PAEL establishes an annual limit on diesel fuel usage for the 75-person camp and KDR unit which limits potential emissions below permitting thresholds. No State or Federal permits were required.

The UIC 40-person construction camp will be relocated by UIC from its existing location in Barrow to a similar sand pad constructed by the U.S. Navy in 1940's (Figure 14.a-1). The modular accommodations owned by UIC are currently unused and reside in Barrow. They will be moved to the pad and installed on pad pilings. Permitting of this facility is not Shell's responsibility as the facilities are not Shell's. Shell will only lease the facilities once installed at the new location.

Solid and liquid wastes that will be generated by these facilities are discussed in Section 14 c).

Wainwright Facilities

Shell reserves rooms at the existing Olgoonik Oil Field Services Camp in Wainwright (Figure 14.a-5). Shell's OSR group will be housed and fed at these facilities. Shell may utilize a larger camp of up to 55 accommodations to accommodate certain contingencies such as Shell conducting crew changes through Wainwright, or onshore environmental studies in the area. At this time this would involve only the potential reservation of additional rooms.

An existing secure yard approximately 100' x 300' has been leased from Olgoonik Oilfield Services, owned by Olgoonik Corporation, for storage of OSR equipment and load staging for the marine vessels in Wainwright. An additional existing yard space approximately 150 ft. x 200 ft. has been leased from Olgoonik Oilfield Services, owned by Olgoonik Corporation, for additional response equipment storage.

Kotzebue Facilities

To service vessels moored in Goodhope Bay (Kotzebue Sound), Shell will conduct crew changes between the vessels via Kotzebue. In addition to these vessels, Kotzebue Sound may also be used to resupply and crew change OSVs. Shell may utilize approximately 25 rooms in Kotzebue. Shell will lease storage facilities for groceries and materials in Kotzebue.

Figure 14.a-1 Barrow Camp Locations

Figure 14.a-2 Barrow Hangar and Passenger Processing Facility

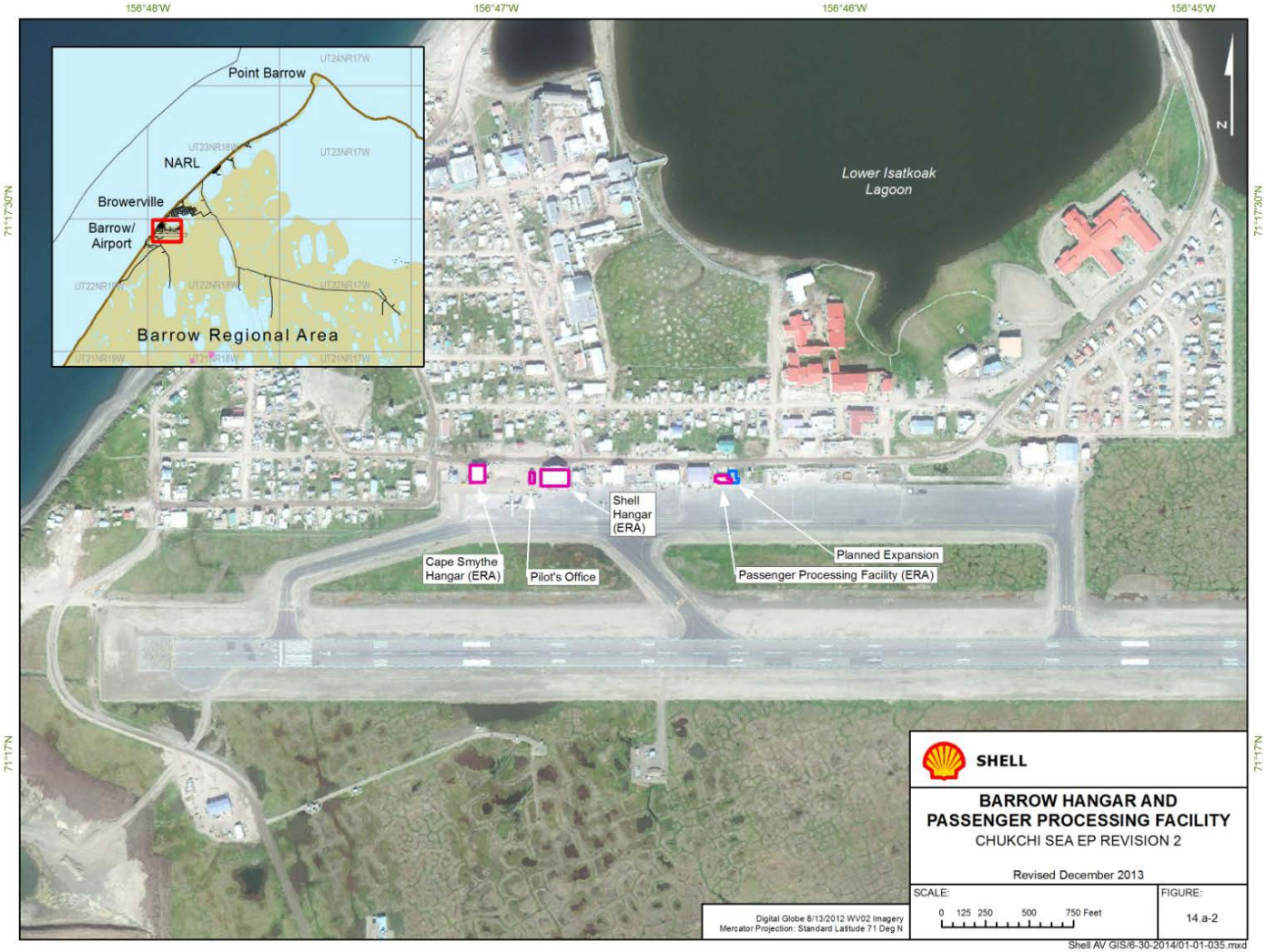


Figure 14.a-3 Barrow Proposed Passenger Processing Facility Expansion

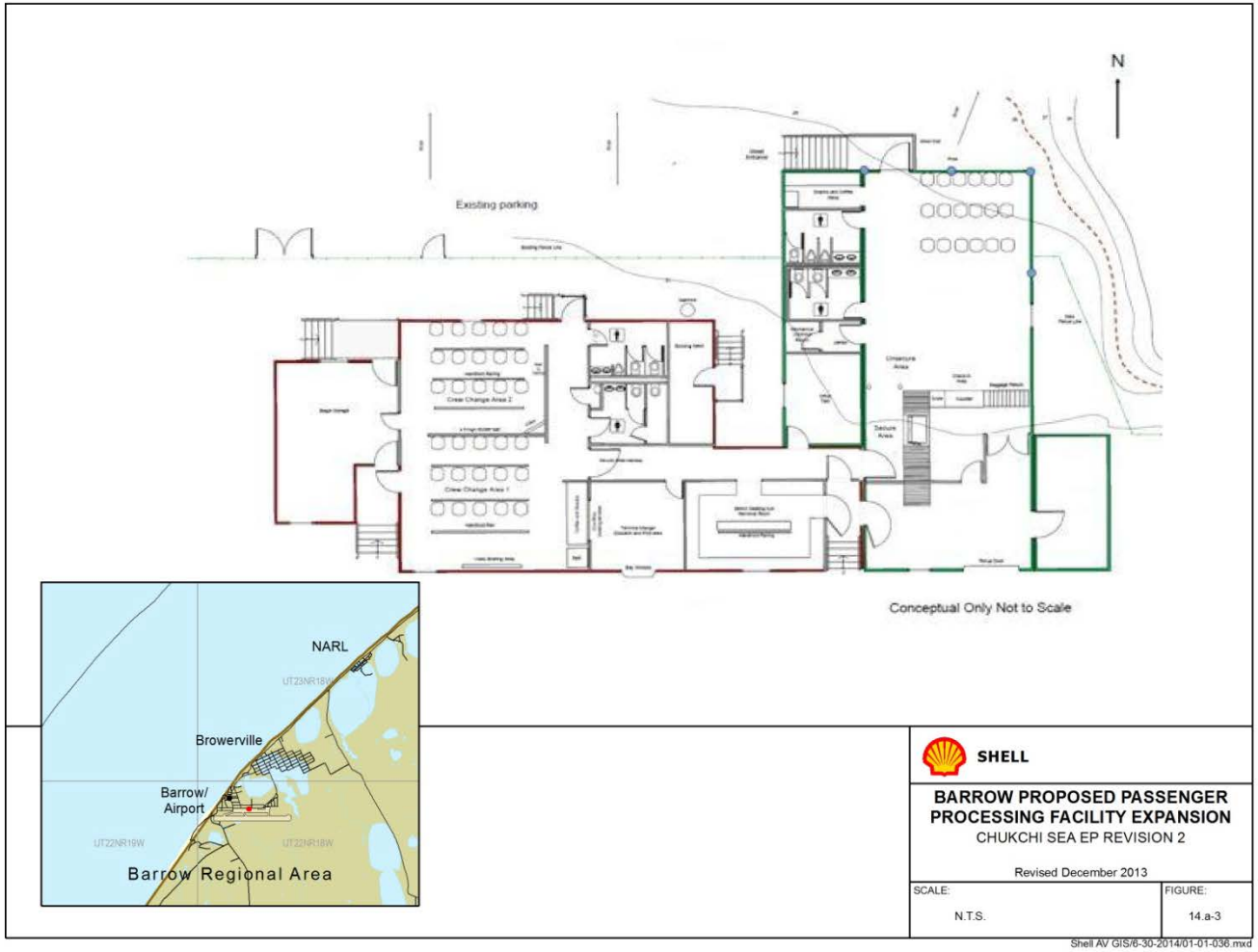


Figure 14.a-4 Barrow 75 Man Camp Location

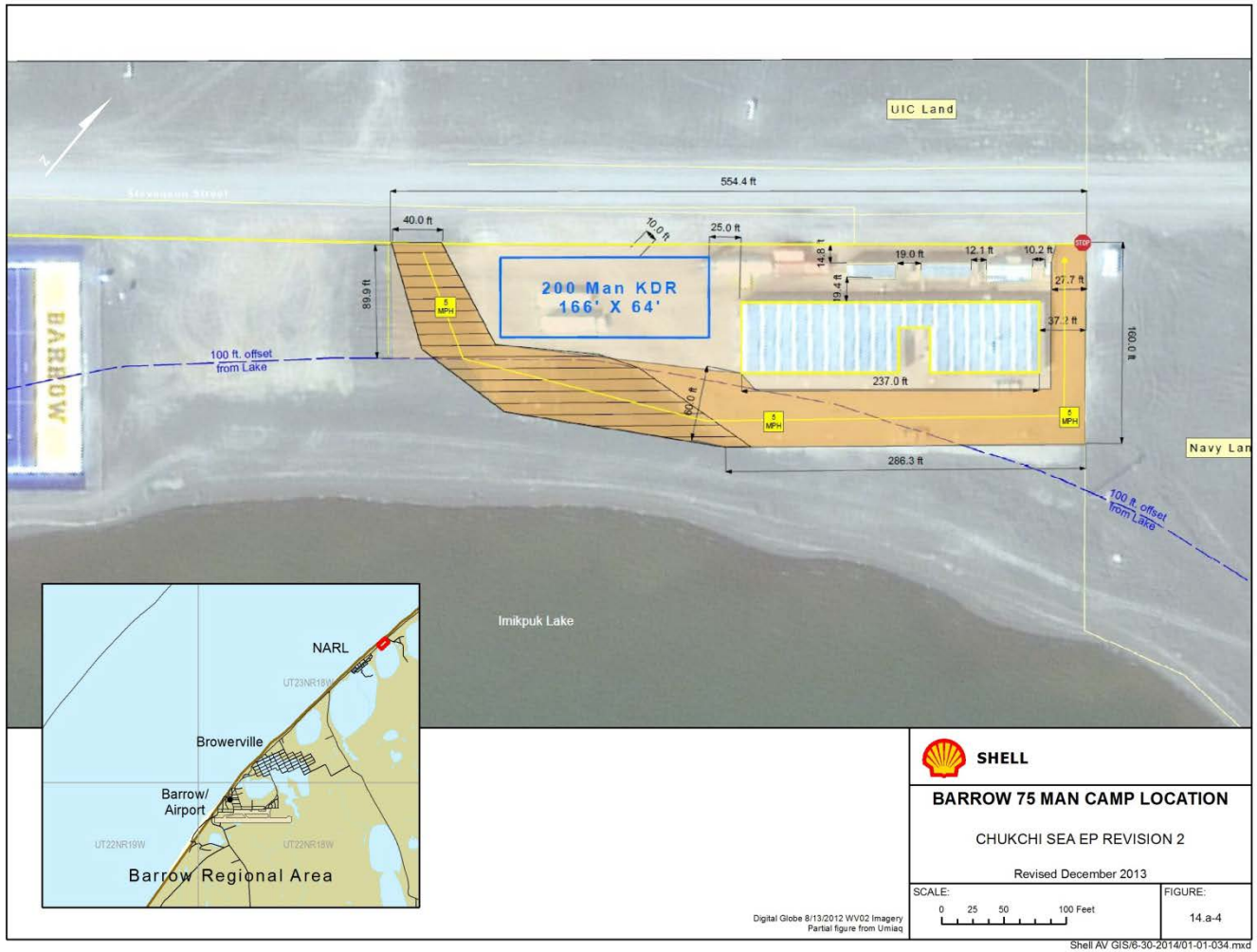
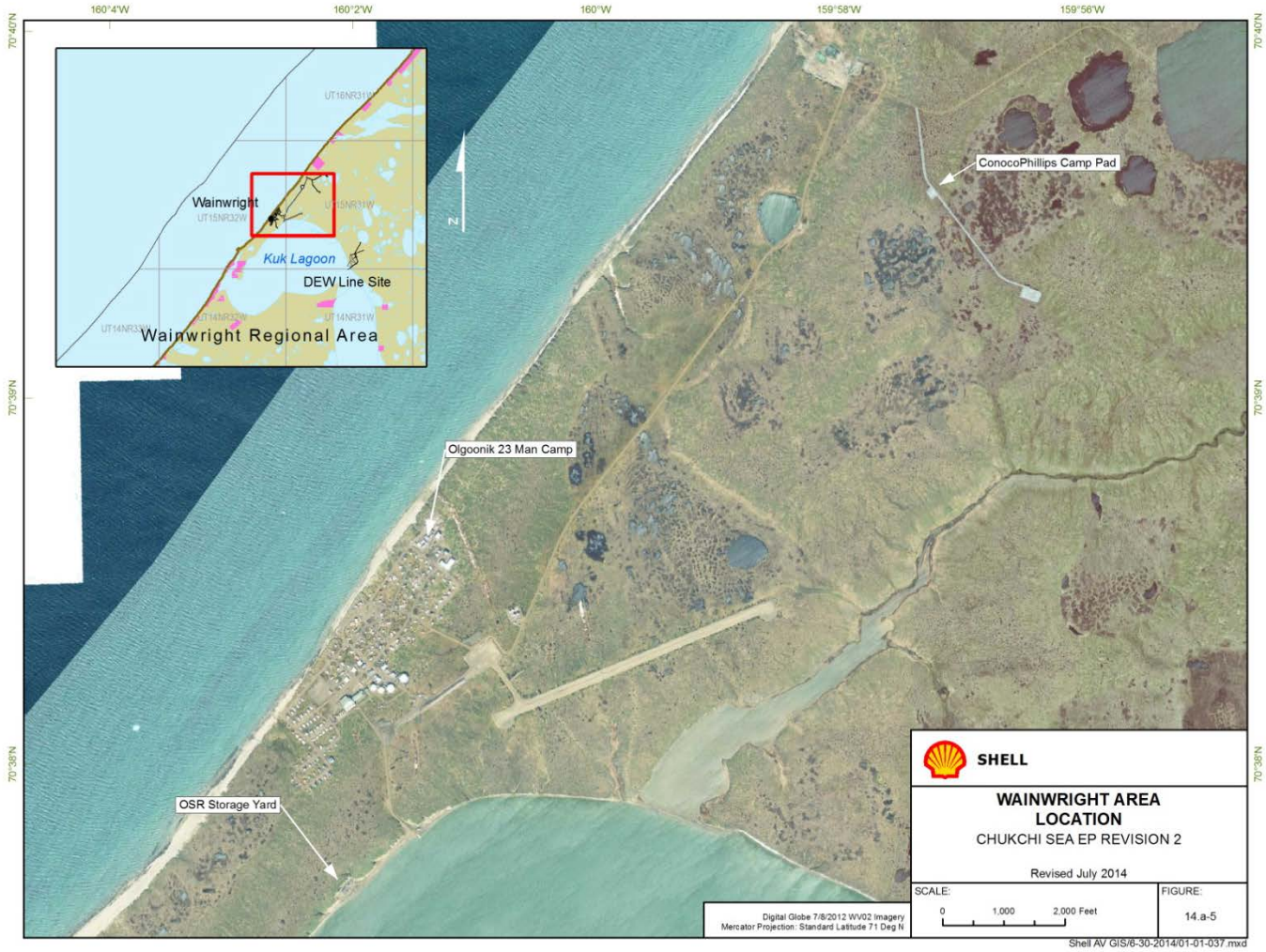


Figure 14.a-5 Wainwright Camp Location



b) Air Emissions

Air emissions are attributable to the operation of the man camp, airport facilities and vehicle use in Barrow, Alaska. Table 14.b-1 provides the anticipated hourly air emissions associated with the onshore facilities in Barrow. Table 14.b-2 provides the anticipated seasonal (or annual) air emissions associated with the Barrow onshore facilities. Shell will have oil spill contingency response personnel stationed in Wainwright but there are no planned major activities that will contribute to air emissions. Shell onshore support activities in Kotzebue will utilize existing infrastructure and therefore will not contribute to air emissions beyond normal use. Appendix K provides a detailed explanation of the activities and lists the source, composition, frequency and duration of air emissions.

Table 14.b-1 Hourly Air Emissions Associated with Onshore Facilities in Barrow, Alaska

Emission Unit	NO_X lb./hr.	CO lb./hr.	PM_{10} lb./hr.	$PM_{2.5}$ lb./hr.	VOC lb./hr.	SO_2 lb./hr.
Aircraft Support	5.2	33.5	1.1	1.1	24.8	1.5
Hangar/Storage Building	0.5	0.4	3.7E-2	3.7E-2	2.7E-2	2.9E-3
NARL Man Camp	17.6	6.8	0.5	0.5	2.3	0.1
Vehicles	1.3E-2	1.1E-2	4.5E-5	4.5E-5	1.7E-3	3.4E-5

Table 14.b-2 Annual Air Emissions Associated with Onshore Facilities in Barrow, Alaska

Emission Unit	NO_X ton/year	CO ton/year	PM_{10} ton/year	$PM_{2.5}$ tons/year	VOC ton/year	SO_2 ton/year
Aircraft Support	0.6	4.3	0.1	0.1	4.4	0.2
Hangar/Storage Building	0.4	0.3	2.7E-2	2.7E-2	1.9E-2	2.1E-3
NARL Man Camp	29.2	8.2	0.7	0.7	2.6	0.2
Vehicles	5.7E-3	4.3E-3	2.6E-5	2.6E-5	6.3E-4	2.0E-5

c) Unusual Solid and Liquid Wastes

Barrow Facilities

Blackwater (sewage) and graywater (showers, kitchen) from the two camps will be held in holding tanks at each site. Based on a camp occupancy of 100 percent of capacity, and average per capita waste generation factors provided by the local utility, Shell expects to generate about 2,300 gal of combined blackwater and graywater wastes per day. These wastes will be picked up by the NSB during routine service and treated in their waste water plant. These wastes generated by camps with temporary population of 115 persons, will not tax Barrow's municipal wastewater treatment system, which accommodates a population of over 4,000 people, and consists of a series of large water treatment lagoons.

Household trash from the camps will be stored in bear proof containers or areas for all locations. These household wastes will be set up for collection by NSB's regular dumpster service, and will be disposed of at the NSB Landfill. Shell estimates, based on 2012 Barrow operations and accounting for the additional planned camp accommodations, that the two man camps may generate up to 600 cubic yards (cu yd) of household trash per season, which represents less than 1.3 percent of the average annual volumes disposed of at the landfill.

Non-household waste generated at the camps will be stored in a 20 ft. shipping container set up as a waste accumulation area located behind the primary camp. The accumulation area will hold any hazardous, non-hazardous and liquid wastes. All of Shell's Barrow facilities are operated as a CESQGs of Hazardous Waste by the EPA, and therefore a permit is not required and hold times do not apply. These wastes will be transported out of the Arctic and disposed of at licensed facilities.

Wainwright Facilities

With the exception of food waste from the camp kitchen, all wastes generated at the Wainwright camp (Figure 14.a-5) will be containerized and transported out of the Arctic to a licensed facility. Food wastes from the kitchen will be disposed in the Wainwright landfill. This approach to waste handling will minimize the impact to the community, including the landfill. Based on water usage information provided by the Alaska Department of Environmental Conservation (ADEC) website, it is estimated that Shell's OSR group housed in Wainwright will generate less than 200 gal of black and gray water per day on average. This equates to approximately 2% of the estimated average generation rate for the entire village, based on a 2012 population of 575.

All wastes generated at the Wainwright OSR yard will be containerized and transported out of the Arctic to an approved disposal facility. This approach to waste handling will minimize the impact to the community, including the landfill.

Kotzebue Facilities

Waste generated on the marine vessels supporting Shell's operations in Kotzebue Sound will be collected, segregated, stored, labeled and manifested onboard the vessels in accordance with each vessel's Waste Management Plan. Each vessel will store household waste in super sacks, which will be removed, as needed, in coordination with resupplies and transported to the Port of Kotzebue. The household trash will be unloaded to dedicated dumpsters for transportation to the Kotzebue landfill. All other waste will remain on the vessels to be containerized and transported to a Shell approved disposal facility in the Pacific Northwest at the end of the season. All hazardous waste will be consolidated, stored and transported to an approved subtitle C landfill at the end of the season.

While operating in Kotzebue Sound, all vessels will discharge effluent within compliance of USCG regulations and the Vessel GP.

Shell does not plan to generate waste onshore in Kotzebue as there are no dedicated camps or facilities. Shell plans to have support personnel staying at local hotels, but wastes generated would be managed by the hotel.

d) Waste Disposal

The anticipated volumes and types of wastes that may be generated by the exploration drilling program and transported to shore for disposal, along with the disposal location/facility, are indicated in Table 13.d-1.

SECTION 15.0 COASTAL ZONE MANAGEMENT ACT

The State of Alaska did not pass legislation required to extend the Alaska Coastal Management Program (ACMP), allowing the ACMP to sunset at 12:01 AM, Alaska Standard Time, on 1 July 2011. Therefore no Coastal Project Questionnaire and Certification Statement or Other Information required as part of the Coastal Zone Management Act (CZMA) is provided.

SECTION 16.0 ENVIRONMENTAL IMPACT ANALYSIS

The EIA is provided in Appendix C.

SECTION 17.0 ADMINISTRATIVE

Exempted Information (public information copies only)

The following information is considered proprietary and has been removed from the public copies of the EP Revision 2:

- Bottomhole location, TVD and MD of proposed wells in the Form 137 OCS Plan Information Forms (Appendix A)
- All of Section 3 including:
  - Geologic descriptions, surface location & bathymetry maps (Section 3.a)
  - Structure contour maps (Section 3.b)
  - Key seismic lines (Section 3.c)
  - Geologic cross-section maps (Section 3.d)
  - Shallow hazards reports (Section 3.e)
  - Shallow hazards assessments (Section 3.f)
  - High resolution seismic lines (Section 3.g)
  - Stratigraphic columns (Section 3.h)
  - Time/depth tables (Section 3.i)
  - Geochemical information (Section 3.j)
  - Future G&G activities (Section 3.k)
  - Basis for calculation of WCD (Section 3.l)

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