SHELL OFFSHORE INC.

BEAUFORT SEA
REGIONAL EXPLORATION
OIL DISCHARGE PREVENTION
AND
CONTINGENCY PLAN

SHELL OFFSHORE INC.

ANCHORAGE, ALASKA

JANUARY 2010

MANAGEMENT APPROVAL AND MANPOWER AUTHORIZATION

OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN
BEAUFORT SEA EXPLORATION
NORTH SLOPE, ALASKA

This Oil Discharge Prevention and Contingency Plan (C-Plan) has been prepared for offshore exploration activities in the Beaufort Sea, Alaska, conducted by Shell Offshore Inc.

This plan is approved for implementation as herein described. Manpower, equipment, and materials necessary for oil discharge prevention and response will be provided as required in accordance with this plan.

Brent R. Ross

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24-may-2010
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RECORD OF REVISIONS

REVISION NUMBER	REVISION DATE	DATE ENTERED	SUMMARY OF REVISION
1	May 2011		Updates were made to reflect the agency name change from Minerals Management Service to Bureau of Ocean Energy Management, Regulation and Enforcement. The BOEMRE WCD scenario was recalculated based on NTL-06, along with response equipment, personnel manning, and timelines; consequently, the ADEC RPS scenario was also recalculated,

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OIL POLLUTION ACT OF 1990 (OPA 90)

~~U.S. MINERALS MANAGEMENT SERVICE~~BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT

U.S. COAST GUARD

~~U.S. MINERALS MANAGEMENT SERVICE~~BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT

BEAUFORT SEA DEVELOPMENT AREA
OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN

CROSS REFERENCE TO
~~U.S. MINERALS MANAGEMENT~~BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT ~~SERVICE~~ RESPONSE PLAN REQUIREMENTS
[30 CFR 254, SUBPART B]

REGULATION SECTION (30 CFR)	SECTION TITLE	PLAN SECTION
254.22	Introduction and Plan Contents	Introduction and Table of Contents
(a)	Identification of Facility, Including Location and Type	Introduction and Section 3.1
(b)	Table of Contents	Table of Contents
(c)	Record of Changes	OPA 90 Addendum
(d)	Cross-Reference Table	This section
254.23	Emergency Response Action Plan	Section 1.0
(a)	Designation of Trained Qualified Individual (with full authority to implement removal actions and notify federal officials and response personnel)	Sections 1.2 and 3.3
(b)	Designation of Trained Spill Management Team Available 24 hours (including organizational structure and responsibilities and authorities of team members)	Sections 1.2 and 3.3
(c)	Description of Spill Response Operating Team, Including Numbers and Types of Personnel (trained and available on 24-hour basis)	Figure 1-1, Table 1-4, Sections 1.1 and 3.1
(d)	Locations and Primary and Secondary Communications for Spill Response Operations Center (including phone numbers and radios)	Section 1.4, Table 1-4
(e)	List of Types of Oil Handled, Stored or Transported	Introduction and Appendix F
(f)	Procedures for Early Detection of a Spill	Sections 2.1 and 2.5
(g)	Procedures for Spill or Substantial Threat of a Spill for Differing Spill Sizes	Sections 1.6 and 1.6.13
(g)(1)	Notification Procedures (including reporting form from the C-Plan)	Section 1.2.1
(g)(1)(i)	Contact Information for Qualified Individual, Spill Response Coordinator and Alternates, and Other Spill Response Management Team Members	Section 1.2.1
(g)(1)(ii))	Names and Addresses for Oil Spill Response Organizations (OSROs) and Regulatory Agencies to be Notified and Contacted for Environmental Information	Sections 1.2.2 and1.2.3
(g)(2)	Methods to Monitor and Predict Spill Movement	Sections 1.6.4 and 1.6.13
(g)(3)	Methods to Identify and Prioritize Sensitive Areas	Sections 1.6.5, 3.2 and Appendix E
254.23 (g)(4)	Methods to Protect Sensitive Areas	Sections 1.6.5, 1.6.11, 1.6.12 and Appendix D
(g)(5)	Methods to Mobilize and Deploy Equipment and Personnel	Sections 1.5 and 1.6.13
(g)(6)	Methods for Storage of Recovered Oil (to allow containment and recovery to continue without interruption)	Sections 1.6.9, 1.6.10, 1.6.13, and Appendix C
(g)(7)	Procedures to Remove Oil and Oiled Debris from Shallow Areas and Along Shorelines and to Rehabilitate Oiled Waterfowl	Sections 1.6.12 and 1.6.13, Appendix E
(g)(8)	Storage, Transfer, and Disposal Procedures	Sections 1.6.9, 1.6.10, and Appendix E

CROSS REFERENCE TO ~~U.S. MINERALS MANAGEMENT SERVICE~~ BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT RESPONSE PLAN REQUIREMENTS [30 CFR 254, SUBPART B] (CONTINUED)

REGULATION SECTION (30 CFR)	SECTION TITLE	PLAN SECTION
(g)(9)	Methods to Implement Dispersant Use Plan and In situ Burning Plan	Sections 1.7 and 3.7
254.24	Equipment Inventory	Section 3.6
(a)	Inventory of Spill Response Materials and Supplies, Services, Equipment, and Response Vessels Available Locally and Regionally (identify supplier, location, and phone number)	Sections 3.6.1 and 3.8
(b)	Procedures for Inspecting and Maintaining Spill Response Equipment (inspected monthly; records of inspections and maintenance kept for at least 2 years)	Section 3.6.2
254.25	Contractual Agreements (copies of contracts or membership agreements or certification that they are in effect; must ensure 24 hour availability)	Section 3.8
254.26	Worst-Case Discharge Scenario	Section 1.6.13
(a)	Volume and Assumptions/Calculations	Section 1.6.13
(b)	Trajectory Analysis (including maximum extent of oil travel)	Sections 1.6.13 and 3.2
(c)	List of Sensitive Areas That Could Be Affected (from C-Plan) and Strategies for Protecting Them	Sections 1.6.13, 3.10 and Appendix E
(d)	Response to Worst Case Scenario in Adverse Weather Conditions	Sections 1.6.13 and 3.4.1
(d)(1)	Response Equipment Used for a 30-day Blowout (types, locations, owners, quantity, capabilities, and daily recovery capacities using 20% derate)	Section 1.6.13
(d)(2)	Personnel, Materials, and Support Vessels (Locations, Owners, Quantities, and Types)	Section 1.6.13
(d)(3)	Description of Oil Storage, Transfer, and Disposal Equipment (Location, Owners, Quantities, and Capacities)	Section 1.6.13
(d)(4)	Estimate of Response Times	Section 1.6.13
(d)(4)(i)	Procurement of Identified Containment, Recovery, and Storage Equipment	Section 1.6.13
(d)(4)(ii)	Procurement of Equipment Transportation Vessels	Section 1.6.13
(d)(4)(iii)	Procurement of Personnel to Load and Operate the Equipment	Section 1.6.13
(d)(4)(iv)	Equipment Loadout	Section 1.6.13
(d)(4)(v)	Travel to Deployment Site	Section 1.6.13
(d)(4)(vi)	Equipment Deployment	Section 1.6.13
(e)	Equipment, Materials, Support Vessels, and Strategies Must be Suitable to Range of Environmental Conditions. Discussion in (d) Must Use Standardized Defined Terms in ASTM F625-94 and F8 18-93	Section 1.6.13
254.27	Dispersant Use Plan Appendix	Not Applicable

CROSS REFERENCE TO
~~U.S. MINERALS MANAGEMENT SERVICE~~ BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT RESPONSE PLAN REQUIREMENTS
[30 CFR 254, SUBPART B]
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REGULATION SECTION (30 CFR)	SECTION TITLE	PLAN SECTION
(a)	Inventory and Location of Dispersants and Other Spill Response Chemicals	Not Applicable
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REGULATION SECTION (30 CFR)	SECTION TITLE	PLAN SECTION
(c)	Application Equipment and Time to Deploy	Not Applicable
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(e)	Conditions Under Which Product Use May be Requested	Not Applicable
(f)	Outline of Procedures for Obtaining Approval	Not Applicable
254.28	In situ Burning Plan Appendix	Sections 1.7 and 3.7
254.28(a)	Description of Equipment, Including Availability, Location, and Owner	Section 1.7
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(c)	Environmental Effects of Burn	Section 1.7
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(f)	Guidelines for making Decision to Ignite	Section 1.7
(g)	Outline of Procedures for Obtaining Approval	Section 1.7
254.29	Training and Drills	Sections 2.1.1 and 3.9
(a)	Training: Describe Dates and Types of Training Given to Response Team Personnel; Location of Certificates (annual hands-on training of spill response operating team) annual training for spill response management team, including locations, intended use, deployment strategies, and operation and logistics of response equipment; spill reporting; trajectory analysis; responsibilities (qualified individual sufficiently trained) (keep training certificates and attendance records for at least 2 years)	Sections 2.1 and 3.9
(b)	Exercise Plans (for Annual Spill Management Team Tabletop, Annual Deployment of Equipment Staged Onshore, Annual Notification Exercise, Semiannual deployment for Equipment and Facility) (entire plan must be exercised once every 3 years); (National Preparedness for Response Exercise Program [PREP] can be used)	Sections 2.1 and 3.9

WORST-CASE DISCHARGE VOLUME

ELEMENT	CAPACITY (BBL)	REFERENCE
Sum of Planning Capacity of Oil Storage Tanks	~~537,120~~643,220	Table 1-~~17~~18
Daily Production Volume of Highest Capacity Well	~~5,500~~16,000	18 AAC 75.434(b)
Total Worst-Case Discharge (WCD)	~~165~~480,000	Section 1.6.13

U.S. COAST GUARD

BEAUFORT SEA DEVELOPMENT AREA
OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN

CROSS REFERENCE TO U.S. COAST GUARD AND DEPARTMENT OF HOMELAND SECURITY RESPONSE PLANS FOR OIL FACILITIES TRANSFERRING OIL OR HAZARDOUS MATERIAL IN BULK [33 CFR 154]

REGULATION SECTION (33 CFR 154)	SECTION TITLE	PLAN SECTION
1035(a)	Introduction, Plan Contents, and Cross Index	OPA 90 Addendum, Introduction
(a)(1)	Facility name, address, telephone and fax numbers, mailing address	Introduction
(a)(2)	Facility's geographic location	Introduction, Figure I-1, and Section 3.1
(a)(3)	24-hour procedure for contacting facility owner	OPA 90 Addendum, Sections 1.1, and 1.2
(a)(4)	Table of contents	Table of Contents
(a)(5)	Cross index	This document
(a)(6)	Record of changes	Record of Revisions
(b)	Emergency Response Action Plan	Section 1
(b)(1)	Notification procedures	Sections 1.1, 1.2, and 3.3
(b)(1)(i)(A)	List of response personnel (include Qualified Individual)	OPA 90 Addendum, Sections 1.1, 1.2 and 3.3
(b)(1)(i)(B)	Government agencies	Section 1.2.3, Tables 1-2, 1-3, and 1-4
(b)(1)(ii)	Notification form	Figure 1-2
(b)(2)(i)(A)	Average most probable discharge	Page USCG-3
(b)(2)(i)(B)	Maximum most probable discharge	Page USCG-3
(b)(2)(i)(C)	Worst-case discharge	Page USCG-3
(b)(2)(i)(D)	Worst-case discharge from non-MTR portion	Not applicable
(b)(2)(ii)(A)	Failure of manifold, loading arm, hoses, other	Section 1.6
(b)(2)(ii)(B)	Tank overfill	Sections 2.1.9 and 3.1
(b)(2)(ii)(C)	Tank failure	Not applicable
(b)(2)(ii)(D)	Piping rupture	Not applicable
(b)(2)(ii)(E)	Piping leak	Not applicable
(b)(2)(ii)(F)	Explosion or fire	Section 1.6.2
(b)(2)(ii)(G)	Equipment failure	Sections 1.6 and 2.1.6
(b)(2)(iii)	List of equipment and responsibilities for mitigation of average most probable discharge	Sections 3.5 and 3.6
(b)(3)(i)	Facility's personnel responsibilities	Sections 1.1, 3.3; Table 1-1; and Figure 1-1
(b)(3)(ii)	Qualified Individual's responsibility and authorities	Sections 1.1 and 3.3
(b)(3)(iii)	Personnel to manage response actions	Sections 1.1and 3.3
(b)(3)(iv)(A)	Oil Spill Response Organization (OSRO) and spill management team capabilities	Sections 1.1, 1.2, and 3.3
(b)(3)(iv)(A)(1)	Provide equipment and supplies for the average most probable discharge	Section 3.6
(b)(3)(iv)(A)(2)	Trained personnel for 7 days	Section 3.8

BEAUFORT SEA DEVELOPMENT AREA
OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN

CROSS REFERENCE TO
U.S. COAST GUARD AND DEPARTMENT OF HOMELAND SECURITY
RESPONSE PLANS FOR OIL FACILITIES
TRANSFERRING OIL OR HAZARDOUS MATERIAL IN BULK
[33 CFR 154]
(CONTINUED)

REGULATION SECTION (33 CFR 154)	SECTION TITLE	PLAN SECTION
(b)(4)(i)	Sensitive areas	Sections 1.6.5 and 3.10
(b)(4)(ii)	Worst-case discharge	Sections 1.0 and 1.6.13
(b)(4)(ii)(A)	List of sensitive areas	Sections 1.6.12 and 3.10.2
(b)(4)(ii)(B)	Procedures to protect sensitive areas	Sections 1.6.5, 1.6.12, and 3.10
(b)(4)(ii)(C)	Depict response actions on map	Section 1.6.12
(b)(4)(iii)(A)	Personnel and equipment to protect sensitive areas	Sections 1.6.12 and 1.6.13
(b)(4)(iii)(B)(1), (2)	Persistent oils: distance traveled	Section 1.6.13
(b)(4)(iii)(B)(3)	Distance spill reaches in 24 hours at maximum current for discharge to non-tidal waters	Not applicable; no discharge possible to streams
(b)(4)(iii)(B)(4)	Distance spill reaches in tidal waters	Section 1.6.13
(b)(4)(iii)(B)(5)	Trajectory model	Section 1.6
(b)(4)(iii)(B)(6)	Additional areas	Section 1.6
(c)(1)	Training procedures	Sections 2.1.1 and 3.9
(c)(2)	Drill procedures	Sections 2.1.1 and 3.9
(d)	Plan review and update procedures	Introduction
(e)(1)(i)	Physical description of facility	Section 3.1
(e)(1)(ii)	Vessels transferring at facility	Section 2.1.5
(e)(1)(iii)	Location of first valve in secondary containment	Not applicable
(e)(1)(iv)	Information on oil	Appendix E
(e)(2)(i)	24-hour contact for Qualified Individual and alternate	OPA 90 Addendum and Table 1-2
(e)(2)(ii)	24-hour contact for OSRO	Sections 1.1 and 3.3
(e)(2)(iii)	24-hour contact for agencies	Section 1.2.2
(e)(3)(i)	Equipment and personnel for average most probable discharge	Sections 1.1, 3.3, and 3.6.1
(e)(3)(ii) & (iii)	Other equipment information	Section 3.6
(e)(4)	Communications Plan	Sections 1.4 and 4.1
(e)(5)	Site-specific Health and Safety Plan	Section 1.3
(e)(6)	List of acronyms and definitions	Acronyms List

POTENTIAL DISCHARGES

Average Most Probable Discharge

The average most probable discharge is calculated as approximately 0.5 barrel (bbl) of diesel fuel, based on the definition contained in 33 CFR 154.1020 (the lesser of 50 bbl or 1 percent of the volume of the worst-case discharge [WCD]).

Maximum Most Probable Discharge

The maximum most probable discharge is 5.0 bbl of diesel fuel, calculated from the definition contained in 33 CFR 154.1020 (the lesser of 1,200 bbl or 10 percent of the volume of the WCD).

Worst-Case Discharge

The WCD (for the purposes of the USCG) is 2,000 gallons (48 bbl), as calculated in Section 1.6 based on the definition contained in 33 CFR 154.1029(b)(2), using the following values:

- *Maximum Time to Discover Release:* 5 minutes
- *Maximum Time to Shutdown Pumping:* 0.5 minutes (30 seconds)
- *Maximum Transfer Rate:* 320 gallons per minute (gpm) (based on representative fuel transfer pumps on the oil spill response vessel (OSRV) = 7.6 bbl/min
- *Total Line Drainage Volume:* 163 gallons (premising 4-inch by 250-meter (m) marine hose between the pump manifold on the barge and the delivery flange on the inlet piping at the drilling vessel) or 3.9 bbl.

Type of product spilled:	Low-sulfur Arctic diesel (Refer to Appendix E)
Cause:	Hose flange cracks and/or hose ruptures during diesel fuel transfer operations to the ~~*Frontier*~~ *Noble Discoverer*
Environmental conditions:	Winds 10 knots northeast (prevailing wind direction), clear skies, average temperature 44° F (average for August)
Spill trajectory:	Approximately 10 percent of the spill is contained on the deck of the fueling barge, and 90 percent of the spilled diesel enters the water. Current is assumed to be 0.75 knots to the west-northwest.

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SHELL OFFSHORE INC.
OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN

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APPENDICES

LIST OF ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
AAC	Alaska Administrative Code
ACP	Area Contingency Plan
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AES	ASRC Energy Services
AEWC	Alaska Eskimo Whaling Commission
AFE	application for expenditure
ANWR	Arctic National Wildlife Refuge
AOGCC	Alaska Oil and Gas Conservation Commission
API	American Petroleum Institute
ARRT	Alaska Regional Response Team
ASI	Airborne Support, Inc.
ASRC	Arctic Slope Regional Corporation
ASTM	American Society for Testing and Materials
ATV	all-terrain vehicle
BAT	best available technology
bbl	barrel
bbl/hr	barrels per hour
bbl/min	barrels per minute
BD	Branch Director
BLM	Bureau of Land Management
BMPs	best management practices
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
bopd	barrels of oil per day
BOPE	blowout prevention equipment
BPXA	BP Exploration (Alaska) Inc.
CAA	Conflict Avoidance Agreement
CFR	Code of Federal Regulations
cm	centimeter
CO2	carbon dioxide
COCP	Critical Operations Curtailment Plan
COE	U.S. Army Corps of Engineers
C-Plan	Oil Discharge Prevention and Contingency Plan

CRT	Crisis Response Team
DNV	Det Norske Varitaes
DOI	Department of Interior
DOI-OEPC	Department of Interior Office of Environmental Policy and Compliance
DOT	U.S. Department of Transportation
DWOP	Drill the Well on Paper
EPA	U.S. Environmental Protection Agency
ESI	Environmental Sensitivity Index
FLIR	forward looking infrared radar
FOSC	Federal On-Scene Coordinator
gal	gallon
GMDSS	Global Maritime Distress and Safety System
gpm	gallon per minute
H2S	hydrogen sulfide
HAZWOPER	hazardous waste operations and emergency response
HDPE	high-density polyethylene
HSE	health, safety, and environment
HT	hazard time
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IMT	Incident Management Team
IR	infrared radar
ISB	in situ burning
ISO	International Organization for Standardization
kbps	kilobytes per second
kg/m2	kilograms per square meter
km	kilometer
km/day	kilometers per day
kbps	kilobytes per second
kW	kilowatt
L/T	level/temperature
LMRP	lower marine riser package
LOSC	Local On-Scene Coordinator
LS	level sensors
m	meter
m3	cubic meters
m3/hr	cubic meters per hour
MAD	Mutual Aid Drill

MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978
mcf	thousand cubic feet
MHz	megahertz
mm	millimeter
mm/min	millimeter per minute
MMO	mammal observer
MMS	Minerals Management Service
mmscf/d	million standard cubic feet per day
MODU	Mobile Offshore Drilling Unit
mph	miles per hour
MSAT	Mobile Satellite System
MSDS	material safety data sheet
MSRC	Marine Spill Response Corporation
NIMS	National Incident Management System
nm	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOFO	Norwegian Clean Seas Association for Operating Companies
NPR-A	National Petroleum Reserve Alaska
NPREP	National Preparedness for Response Exercise Program
NRC	National Response Center
NRDA	Natural Resources Damage Assessment
NSB	North Slope Borough
NSSAWG	North Slope Sensitive Areas Work Group
NSSRT	North Slope Spill Response Team
OCS	Outer Continental Shelf
OIM	Offshore Installation Manager
OOPS	O'Brien's Oil Pollution Services
OPA 90	Oil Pollution Act of 1990
OSHA	Occupational Safety and Health Administration
OSRB	oil spill response barge
OSRO	oil spill removal organization
OSRV	oil spill response vessel
PEL	permissible exposure level
PIC	person in charge
PLC	programmable logic controller
PPE	personal protective equipment
psi	pounds per square inch
psig	pounds per square inch gauge
QI	Qualified Individual

RAR	rig anchor release
ROV	remotely operated vehicle
RPS	response planning standard
RQ	reportable quantity
RRT	Regional Response Team
RTOC	real time operations center
RTTI	real time traffic and travel information
SAR	synthetic aperture radar
SCAT	Shoreline Cleanup Assessment Team
Shell	Shell Offshore Inc.
SMT	Spill Management Team
SOLAS	International Convention for the Safety of Life at Sea
SOSC	State On-Scene Coordinator
SPCC	spill, prevention, control, and countermeasure
SRT	Spill Response Team
SSB	single sideband
TF	task force
T-Time	total time
TVD	total vertical depth
UHF	ultra high frequency
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VFR	visual flight rules
VHF	very high frequency
VMT	Valdez Marine Terminal
VSAT	very small aperture terminal
WCD	worst-case discharge
WP	working pressure

INTRODUCTION

This Oil Discharge Prevention and Contingency Plan (C-Plan) has been developed for Shell Offshore Inc. (Shell), and is one important element of Shell's overall commitment to conduct its operations in a safe and environmentally sensitive manner. Oil spill prevention is Shell's first priority. That commitment is evident throughout the multitude of plans developed by Shell for its Beaufort Sea exploration drilling program, as well as the many local, state, and federal permit applications Shell has submitted or will submit to secure required authorizations prior to initiating its drilling program. This C-Plan is specifically designed to aid Shell in its efforts to prevent spills and, in the unlikely event of a spill, mitigate the impacts of that spill on the marine environment.

Shell Exploration and Production Company address, telephone, and fax numbers are provided below:

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Houston, TX 77054
Phone: (504) 728-4369

3601 C Street, Suite 1334
Anchorage, AK 99503
Phone: (907) 770-3700

The Shell Beaufort Sea Exploration Program goal is to permit and drill exploration wells within a geographic region representing current and future offshore lease holdings within the Beaufort Sea (see regional map Figure I-1) bounded by the following coordinates:

- 69º 57' 0" N – 71º 30' 0" N latitude, and
- 141º 48' 0" W – 156º 0' 0" W longitude.

The current and expected future leases and bottomhole locations are expected to be located on the federal Outer Continental Shelf (OCS) as regulated by the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)~~U.S. Department of Interior, Minerals Management Service (MMS)~~, and all exploration activities will be conducted in compliance with applicable local, state, and federal laws.

Shell recognizes the harsh conditions associated with operating in the Arctic and is committed to the prevention of oil spills of any size. To achieve this goal, Shell's preparation in terms of personnel training, equipment and operating conditions are geared to the preservation of well control and prevention of oil spills:

- Fuel transfers will be conducted in strict accordance with U.S. Coast Guard-approved procedures on board each vessel.
- Pollution prevention equipment, maintenance and surveillance will be focused on the prevention of unauthorized discharges.
- The design of drilling procedures will ensure our ability to maintain primary well control at all times.
- Equipment for secondary well control will be maintained in top condition, including functional testing as required.
- A state-of-the-art weather and ice forecasting and monitoring program will be in place to ensure safe operations.

- Deployment of ice breakers and the use of dynamic ice management will protect the drilling fleet enabling the rig to maintain station and ensuring the safety of personnel and operations.
- Real time operations monitoring using state of the art equipment will ensure early recognition of subsurface pressure increases and provide for a timely response to subsurface conditions.

Shell plans to conduct exploration drilling over multiple years in the Beaufort Sea using one of two floating ~~drillships~~ drilling vessels~~contracted by Shell~~, the *Noble* ~~*Frontier*~~ *Discoverer* or the *Kulluk*~~, a mobile offshore drilling unit~~. ~~Shell plans to use the *Frontier Discoverer* for drilling in the Beaufort Sea before 2012.~~ The ~~*Frontier*~~ *Noble Discoverer* is an ice-reinforced drillship that has been refurbished for use in the Arctic. The *Kulluk* has prior experience drilling in the Beaufort Sea.

~~During the 2010 drilling season, t~~The ~~*Frontier Discoverer*~~drilling vessel will be attended by a minimum of six vessels that will be used for ice management, anchor handling, oil spill response, refueling, resupply, and servicing of the drilling operations. The ice management vessels will consist of an icebreaker and an anchor handler. An ice-capable oil spill response barge (OSRB), with an associated tug will be located nearby during the planned drilling program. An OSR tanker also will be nearby for its storage capacity of recovered liquids. Deliveries of supplies and fuel are expected over the course of the drilling season and will be carried out either by support vessels or helicopters depending on the materials.

~~During 2010, t~~The ~~Frontier Discoverer~~drilling vessel and its ice management, and support vessels will arrive on location in the Beaufort Sea approximately July 10th and commence drilling as ice, weather, and other conditions allow for safe drilling operations, until October 31st. For ~~2010~~2012, Shell plans that the ~~Frontier Discoverer~~drilling vessel will drill two wells, at one ~~each at~~or both of the following prospects:

- Sivulliq~~ N~~, located 12 miles north of Flaxman Island, and
- Torpedo, located 18 miles north-northeast of Flaxman Island.

~~Drilling programs in years beyond 2010 will vary from that planned for 2010.~~ Plans, diagrams, and specific information for each future drilling season will be provided in pre-drilling season, project-specific ~~exploration plans and~~ permit application packages to federal and state agencies for review and authorization. The BOEMRE~~MMS~~, the Alaska Department of Natural Resources, and the Alaska Department of Environmental Conservation (ADEC) will be afforded pre-drilling season reviews of each exploration plan package for wells planned under coverage of this Beaufort Sea C-Plan.

During mobilization and subsequent drilling operations, every reasonable effort will be made to minimize conflict with the fall bowhead whale migration and related harvest conducted by the villages of Kaktovik and Nuiqsut. ~~Shell has commenced negotiations for a Conflict Avoidance Agreement (CAA) with the Alaska Eskimo Whaling Commission (AEWC), a non-profit organization that manages subsistence whaling activity that will include the mitigation of potential impacts arising from the proposed 2010 drilling program.~~ In addition, it is Shell's intent to adopt a Good Neighbor Policy that specifically addresses and mitigates the impacts of a spill on the subsistence lifestyle of the local residents.

Non-critical drilling activities involve activities that do not penetrate any potential hydrocarbon bearing formations. Such activities begin with spudding the well and include drilling tophole only sections to set conductor casing and surface casing. This is a necessary early step in exploratory well drilling. The depth of these wells will terminate well above any geologic formations that may potentially be hydrocarbon bearing. Nonetheless, two ice management/anchor handling vessels will assist these operations and Alaska Clean Seas (ACS) will be present to provide response equipment and personnel during these non-critical drilling operations. Additionally, the ACS response equipment and personnel will remain on-scene until drilling activities are complete. Drilling activities are complete when the well is plugged and abandoned in accordance with BOEMRE~~MMS~~ regulations, and there are no exposed formations capable of flowing oil or gas. This will occur no later than October 31.

Shell's Beaufort Sea Exploration C-Plan regional applicability is based on demonstrating a spill response capability up to 150 miles from a known infrastructure, such as Prudhoe Bay, or remote year-round aircraft-supported infrastructure. The plan is based on the deployment of oil spill response vessels and equipment "on the water," capable of providing an immediate response to oil spills in two discrete planning regimes:

- A spill response scenario written in compliance with BOEMRE~~MMS~~ and ADEC regulations, based on open water conditions; and
- An associated response strategy that demonstrates regional response capability under different accessibility criteria and assumptions.

It is Shell's intent that the C-Plan serve as a regional oil spill response plan for the Beaufort Sea ~~Exploration~~ exploration ~~Drilling~~ drilling ~~Program~~program~~, which is anticipated to run through 2012~~. This C-Plan is intended to be a planning document to help identify and establish the basis for Shell's oil spill prevention and recovery in the event of an oil spill, and as such, by its very nature, it cannot anticipate all possible contingencies. Shell plans to submit permit applications and a new Oil Discharge Prevention and Contingency Plan, including updated trajectory(ies) for new drill site(s) to local, state, and federal agencies yearly and in advance of each exploration drilling season. Federal and state regulators will be able to review the project-specific updates for a specified season and determine whether the Shell Beaufort Sea Exploration C-Plan is applicable for the individual well(s). Depending on the outcome of its exploration activities, Shell anticipates, in due course, to submit future applications for permits to proceed with development of its leases. Any subsequent development would require a separate C-Plan to address the facilities and activities related to such development. The C-Plan follows the ADEC format set forth in Title 18 of the Alaska Administrative Code Chapter 75, Part 425 (18 AAC 75.425). Controlled copies of the plan are available at the ADEC office located at 555 Cordova Street, Anchorage, Alaska, 99501.

The C-Plan also addresses federal oil spill planning regulations of the BOEMRE~~MMS~~ and the U.S. Coast Guard (USCG) calculated and planned worst case discharge (WCD) descriptions.

The WCD volume presented here is different than that presented in Shell's Exploration Plan submittal. The Exploration Plan WCD is based on proprietary reservoir characteristics and modeling which result in a "calculated" WCD, per Notice to Lessees (NTL) 10-06. The WCD presented in the scenarios is a "planning" volume and exceeds the daily release rate of the calculated WCD for the 30 day duration.

OBJECTIVES

The objective is to minimize potential environmental impacts and to provide for the safety of personnel during drilling operations by preventing petroleum hydrocarbon releases. Safety is a core value for Shell and is never compromised. As such, the primary emphasis in all drilling operations is to avoid hydrocarbon spills. This C-Plan provides guidelines in the unlikely event that one should occur, and provides Shell with the background information and response planning guidelines necessary to implement an efficient, coordinated, and effective spill response.

The following types of facilities and operations are covered by this plan:

- ~~Drillship~~ Drilling vessel and facilities, support vessels, and related operations;

- Storage operations (including recovered oil spill fluids); and
- Transfer options (including fuel and recovered oil spill fluids) involving Shell exploration and related support vessels.

ALASKA CLEAN SEAS TECHNICAL MANUAL AND SHELL BEAUFORT AND CHUKCHI SEAS REGIONAL TACTICS MANUAL

Shell is a member of ACS. ACS is the primary response contractor for all spill response activities. This C-Plan incorporates references to the ACS *Technical Manual*, consisting of Volume 1, Tactics Description; Volume 2, Map Atlas; and Volume 3, Incident Management System.

ASRC Energy Services (AES), a subsidiary of Arctic Slope Regional Corporation (ASRC) will ~~provide~~ operate Shell's response equipment for the offshore response. ACS will be available at the drill site while drilling operations are underway, and will provide response in the event of an actual oil spill incident, including related maintenance, ongoing assurance of response capabilities and coordination of all training activities. Response activities will be conducted using ACS tactics, as defined in the ACS *Technical Manual*, and the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.

PLAN DISTRIBUTION

The C-Plan is distributed to Shell management, staff, and regulatory agencies as appropriate. This C-Plan is accessible to Shell employees and contractors on Shell's intranet website.

UPDATING PROCEDURES

The C-Plan is reviewed and updated when major changes occur in the ability to respond to the worst case discharge, or when such changes could affect the implementation of the C-Plan. Below is a list of key factors that may cause revisions to the plan:

- Changes to response planning standards
- Change in oil spill response organizations
- Change in Qualified Individual (QI)
- Changes in a National Contingency Plan or Area Contingency Plan that have a significant impact on the appropriateness of response equipment or response strategies
- Change in response procedures, or
- Change in ownership

In addition, it is Shell's intent to provide administrative updates to drilling locations, vessel names, and other routine information of a project-specific nature, in advance of each drilling season, either as an update to the C-Plan or as part of annual permit applications, as appropriate.

TABLE I-1
RENEWAL REQUIREMENT

AGENCY	CITATION	REQUIREMENT
ADEC	18 AAC 75.415	Every five years from the date of approval or when changes are made that diminish the ability to respond.
BOEMRE~~MMS~~	30 CFR Part 254.30	Every two years, or when there is a reduction in response capabilities.
USCG	33 CFR Part 154	Annual review by operator. Resubmit every 5 years.

Shell will notify BOEMRE~~MMS~~ and ADEC, via plan amendment, with specific and applicable information prior to commencing drilling activities. Amendments or updates to the C-Plan are submitted to the appropriate regulatory agency for review and approval. Once the amendment or update has been approved, it is posted on the intranet site, and hardcopies are distributed to all plan holders. Plan holders are requested to replace the hard copy pages. Revisions are documented in the Record of Revisions history table, which is included with each approved amendment distribution. It is the responsibility of each plan holder to incorporate amendments or updates into the plan.

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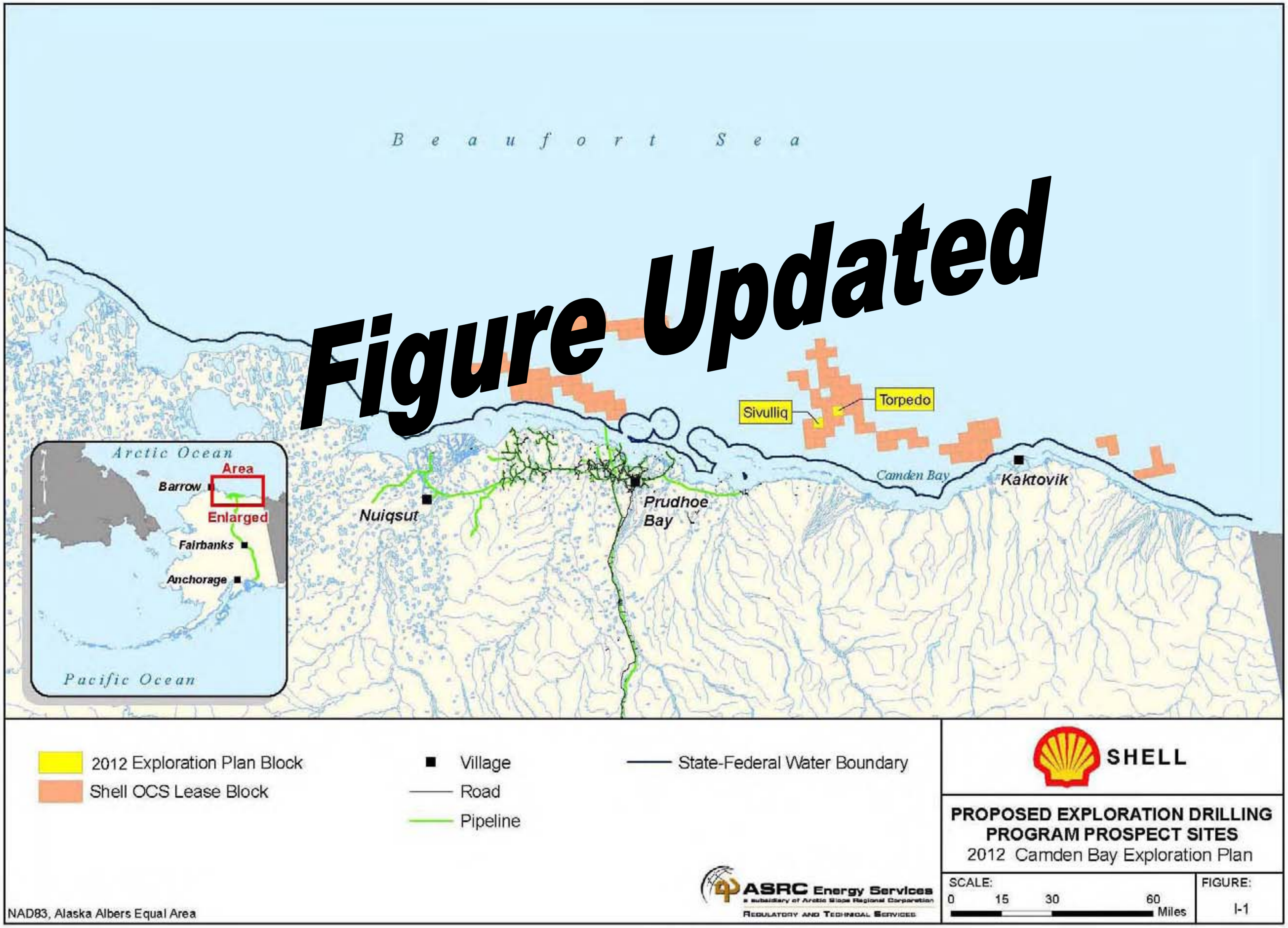

Beaufort Sea
Figure Updated
Sivulliq
Torpedo
Camden Bay
Kaktovik
Nuiqsut
Prudhoe Bay
Arctic Ocean
Area Enlarged
Barrow
Fairbanks
Anchorage
Pacific Ocean
2012 Exploration Plan Block
Shell OCS Lease Block
Village
Road
Pipeline
State-Federal Water Boundary
SHELL
PROPOSED EXPLORATION DRILLING PROGRAM PROSPECT SITES
2012 Camden Bay Exploration Plan
SCALE:
0 15 30 60
Miles
FIGURE:
I-1
ASRC Energy Services
Regulatory and Technical Services
NAD83, Alaska Albers Equal Area

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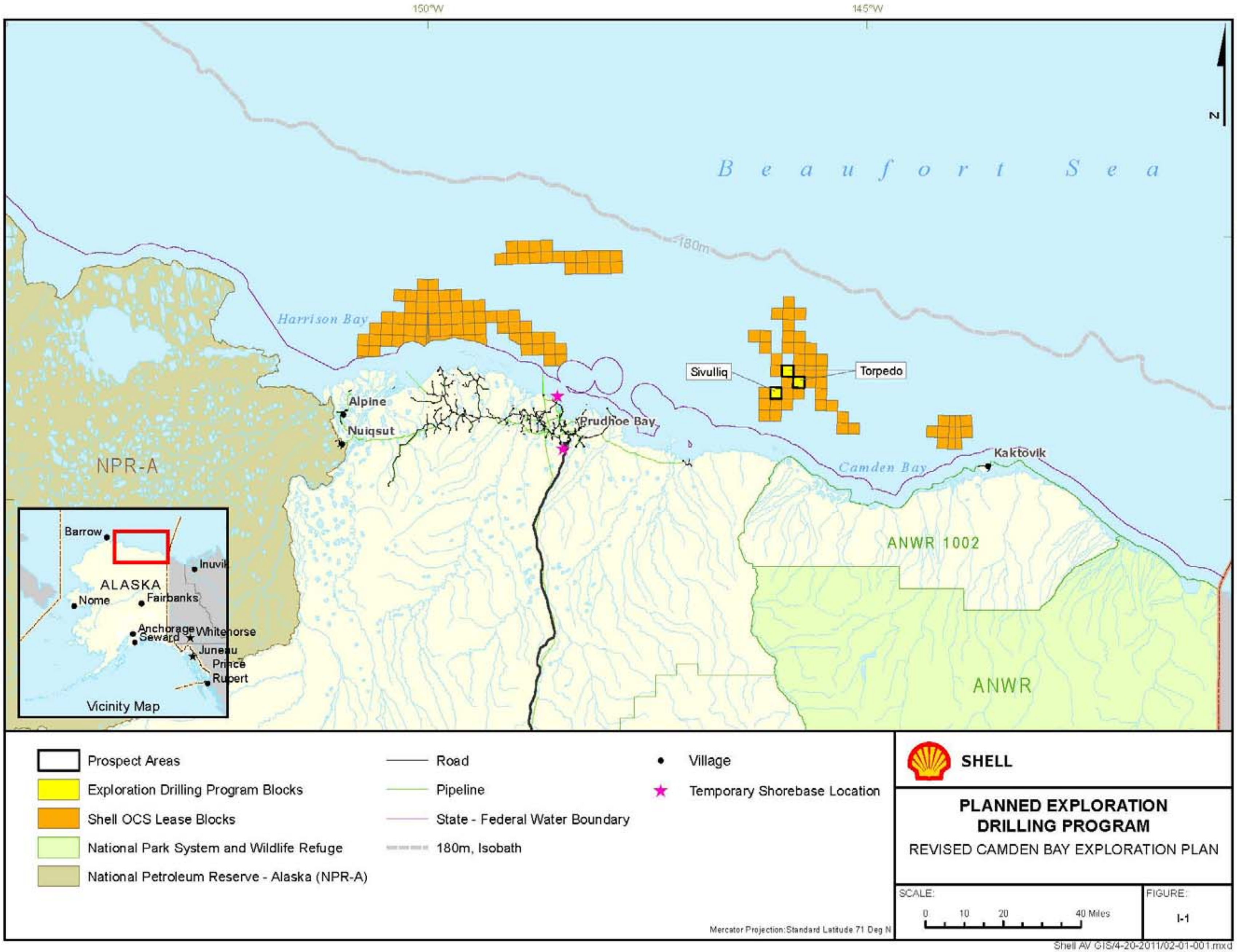
150°W
145°W
71°N
70°N
N
Beaufort Sea
180m
Harrison Bay
Alpine
Nuiqsut
Prudhoe Bay
Sivulliq
Torpedo
Camden Bay
Kaktovik
NPR-A
ANWR 1002
ANWR
Barrow
ALASKA
Inuvik
Nome
Fairbanks
Anchorage
Seward
Whitehorse
Juneau
Prince Rupert
Vicinity Map
Prospect Areas
Exploration Drilling Program Blocks
Shell OCS Lease Blocks
National Park System and Wildlife Refuge
National Petroleum Reserve - Alaska (NPR-A)
Road
Pipeline
State - Federal Water Boundary
180m, Isobath
Village
Temporary Shorebase Location
SHELL
PLANNED EXPLORATION DRILLING PROGRAM
REVISED CAMDEN BAY EXPLORATION PLAN
SCALE:
0 10 20 40 Miles
FIGURE:
I-1
Mercator Projection: Standard Latitude 71 Deg N
Shell AV GIS/4-20-2011/02-01-001.mxd

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TABLE I-2
LEASES OWNED BY SHELL AND PARTNER COMPANIES
IN THE EASTERN BEAUFORT SEA (AS OF NOVEMBER 2006)

PROTRACTION AREA	OPD NO.	BLOCK NO.	BOEMRE~~MMS~~ LEASE # OCS-Y-
Barter Island	NR 07-03	7067	1848
Barter Island	NR 07-03	7117	1849
Demarcation Point	NR 07-05	6019	1852
Demarcation Point	NR 07-05	6020	1853
Barter Island	NR 07-03	6962	1845
Barter Island	NR 07-03	6963	1846
Barter Island	NR 07-03	7013	1847
Flaxman Island		6610*	
Flaxman Island	NR 06-04	6657	1804
Flaxman Island	NR 06-04	6658*	1805
Flaxman Island	NR 06-04	6659	1806
Flaxman Island	NR 06-04	6707	1807
Flaxman Island	NR 06-04	6708	1808
Flaxman Island	NR 06-04	6709	1809
Flaxman Island	NR 06-04	6757	1812
Flaxman Island	NR 06-04	6758	1813
Harrison Bay	NR 05-04	6173	1742
Harrison Bay	NR 05-04	6222	1743
Harrison Bay	NR 05-04	6223	1744
Beechey Point	NR 06-03	6152	1761
Beechey Point	NR 06-03	6202	1762
Beechey Point	NR 06-03	6203	1763
Beechey Point	NR 06-03	6204	1764
Beechey Point	NR 06-03	6253	1767
Beechey Point	NR 06-03	6254	1768
Beechey Point	NR 06-03	6255	1769
Beechey Point	NR 06-03	6256	1770
Beechey Point	NR 06-03	6303	1772
Beechey Point	NR 06-03	6304	1773
Beechey Point	NR 06-03	6305	1774
Beechey Point	NR 06-03	6306	1775
Beechey Point	NR 06-03	6307	1776
Beechey Point	NR 06-03	6308	1777
Beechey Point	NR 06-03	6309	1778
Beechey Point	NR 06-03	6353	1780
Beechey Point	NR 06-03	6354	1781
Beechey Point	NR 06-03	6355	1782
Beechey Point	NR 06-03	6356	1783
Beechey Point	NR 06-03	6406	1788
Beechey Point	NR 06-03	6411	1791
Beechey Point	NR 06-03	6412	1792

TABLE I-2 (CONTINUED)
LEASES OWNED BY SHELL AND PARTNER COMPANIES
IN THE EASTERN BEAUFORT SEA (AS OF NOVEMBER 2006)

PROTRACTION AREA	OPD NO.	BLOCK NO.	BOEMRE~~MMS~~ LEASE # OCS-Y-
Beechey Point	NR 06-03	6460	1793
Beechey Point	NR 06-03	6461	1794
Beechey Point	NR 06-03	6462	1795
Beechey Point	NR 06-03	6463	1796
Beechey Point	NR 06-03	6512	1799
Beechey Point	NR 06-03	6513	1800
Beechey Point	NR 06-03	6404 A	1787
Flaxman Island	NR 06-04	6712	1810
Flaxman Island	NR 06-04	6713	1811
Flaxman Island	NR 06-04	6764	1816
Flaxman Island	NR 06-04	6814	1822
Flaxman Island	NR 06-04	6815	1823
Flaxman Island	NR 06-04	6765	1817
Flaxman Island	NR 06-04	6766	1818
Flaxman Island	NR 06-04	6767	1819
Flaxman Island	NR 06-04	6817	1824
Flaxman Island	NR 06-04	6818	1825
Flaxman Island	NR 06-04	6773	1820
Flaxman Island	NR 06-04	6774	1821
Flaxman Island	NR 06-04	6822	1826
Flaxman Island	NR 06-04	6823	1827
Flaxman Island	NR 06-04	6824	1828
Flaxman Island	NR 06-04	6873	1833
Flaxman Island	NR 06-04	6874	1834
Flaxman Island	NR 06-04	6923	1837
Flaxman Island	NR 06-04	6924	1838
Barter Island	NR 07-03	6751	1839
Barter Island	NR 07-03	6752	1840
Barter Island	NR 07-03	6801	1841
Barter Island	NR 07-03	6802	1842
Barter Island	NR 07-03	6851	1843
Barter Island	NR 07-03	6901	1844
Demarcation Point	NR 07-05	6017	1850
Demarcation Point	NR 07-05	6018	1851
Beechey Point	NR 06-03	6358	1784
Beechey Point	NR 06-03	6359	1785
Beechey Point	NR 06-03	6360	1786
Beechey Point	NR 06-03	6409	1789
Beechey Point	NR 06-03	6410	1790
Flaxman Island	NR 06-04	6870	1830
Flaxman Island	NR 06-04	6871	1831

TABLE I-2 (CONTINUED)
LEASES OWNED BY SHELL AND PARTNER COMPANIES
IN THE EASTERN BEAUFORT SEA (AS OF NOVEMBER 2006)

PROTRACTION AREA	OPD NO.	BLOCK NO.	BOEMRE~~MMS~~ LEASE # OCS-Y-
Flaxman Island	NR 06-04	6872	1832
Flaxman Island	NR 06-04	6921	1835
Flaxman Island	NR 06-04	6922	1836
Harrison Bay	NR 05-04	6369	1699
Harrison Bay	NR 05-04	6370	1700
Harrison Bay	NR 05-04	6419	1701
Harrison Bay	NR 05-04	6420	1702
Harrison Bay	NR 05-04	6421	1703
Beechey Point	NR 06-03	6352	1704
Beechey Point	NR 06-03	6402 & 6403	1705
Harrison Bay	NR 05-04	6272	1745
Harrison Bay	NR 05-04	6273	1746
Harrison Bay	NR 05-04	6320	1747
Harrison Bay	NR 05-04	6321	1748
Harrison Bay	NR 05-04	6322	1749
Harrison Bay	NR 05-04	6323	1750
Harrison Bay	NR 05-04	6371	1751
Harrison Bay	NR 05-04	6372	1752
Harrison Bay	NR 05-04	6373	1753
Harrison Bay	NR 05-04	6374 & 6424	1754
Harrison Bay	NR 05-04	6418	1755
Harrison Bay	NR 05-04	6422	1756
Harrison Bay	NR 05-04	6423	1757
Harrison Bay	NR 05-04	6468	1758
Harrison Bay	NR 05-04	6469	1759
Harrison Bay	NR 05-04	6518 & 6519	1760
Beechey Point	NR 06-03	6251 & 6301	1765
Beechey Point	NR 06-03	6252	1766
Beechey Point	NR 06-03	6302	1771
Beechey Point	NR 06-03	6351 & 6401	1779

* Torpedo ~~H~~ is in OCS block Flaxman Island 6610; Sivulliq ~~N~~ is in OCS block Flaxman Island 6658.

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United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

MAR 11 2010

Ms. Susan Childs
Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, Alaska 99503

Dear Ms. Childs:

The Minerals Management Service (MMS) has completed its review of Revision 1 (one) of the Shell Offshore Inc.'s (SOI) Beaufort Sea Regional Exploration Oil Discharge Prevention and Contingency Plan (ODPCP) dated January 2010. This revision incorporates information requested by MMS in our conditional approval dated October 21, 2009 and information requirements from the Alaska Coastal Management Plan review dated November 3, 2009. The updated information adequately addresses MMS' requirements, therefore the ODPCP is unconditionally approved.

The revised ODPCP now provides the following information:

- Clarifies the location from where a Tier II or III incident will be managed;
- Corrects the time of potential oil impact to Cross Island on page 1-63;
- Clarifies the activities of TF-2 before it starts oil recovery operations;
- Clarifies the reasoning behind the positioning of the recover oil storage tanker;
- Updates Figure 3-2 to include the LOSC as a member of the Unified Command;
- Includes response timeline modifications to reflect a nine (9) knot transit speed.

The MMS requires that two printed copies of the final ODPCP be provided to this office and that copies be distributed accordingly to all plan holders.

As required by 30 CFR 254.30, this plan must be reviewed at a minimum every two years and resulting changes submitted to the MMS. If no changes are required, SOI must submit written notification that the plan has been reviewed and that no changes are required. Also, SOI must submit revisions of the plan to MMS within 15 days of any changes that negatively impact your spill response capabilities, increase your worst case discharge scenario, change oil spill removal organizations, or when any significant changes are made to the Area Contingency Plans. The next biennial review of this document will be required on or before October 20, 2011.

If you have any questions regarding this action, please contact me at (907) 334-5309 or by email at Christy.bohl@mms.gov

Sincerely,

Christy A. Bohl
Oil Spill Program Administrator

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

OCT 21 2009

Ms. Susan Childs
Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, Alaska 99503

Dear Ms. Childs:

The Minerals Management Service (MMS) hereby approves the Shell Offshore Inc.'s (SOI), Beaufort Sea Regional Exploration Oil Discharge Prevention and Contingency Plan Revision 1, dated April 2009. Two copies of the final Revision 1 should be submitted to this office with copies provided to all plan holders as designated in the plan.

This revision was submitted in compliance with 30 CFR 254.30. Shell previously modified the subject plan in July 2007. Revision 1 contains several modifications to the approved Regional ODPCP, and is consistent with and accommodates Shell's 2010 exploratory drilling plans for Camden Bay, as summarized below:

- Changes the primary oil spill removal organization (OSRO) from AES to Alaska Clean Seas (ACS).
- Changes the spill location in the worst-case discharge scenario from the Olympia Exploration well site to the Torpedo Prospect.
- Revises the response scenarios to reflect more realistic response timeframes for response vessels.
- Adds Estimated Oil Trajectory map for the Torpedo Prospect.
- Includes the updated ACS Technical Manual, Volume 2 Map Atlas that contains maps covering the area from Brownlow Point to Demarcation Bay and detailed priority protection sites within these areas.
- Changes the role of the OSRV Nanuq from a primary response vessel to a berthing vessel for the OSRB Endeavor crew.
- Adds the Tor Viking II as a Vessel of Opportunity Skimming System for oil spill response activities.
- Removes the MODU Kulluk as a drilling platform for the 2010 season.
- Provides administrative updates to personnel and contact information.

Our review of Revision 1 concludes that SOI continues to maintain sufficient spill response equipment and personnel resources to respond to the worst-case discharge volume and has not reduced your response capability. MMS finds the worst-case discharge scenarios adequately address oil spill response operations for open water and freeze up conditions that may be encountered during exploratory drilling activities in the Beaufort Sea and demonstrate Shell's capability to cope with the initial spill volume upon arrival at the scene and then support operations for a blowout lasting 30 days. SOI and their OSRO ACS have developed a comprehensive array of oil spill response tactics and equipment inventory capable of mounting a response in variable conditions (open water, freeze-up, solid ice, break-up). These tactics are discussed in detail in the Shell Beaufort and Chukchi Seas Regional Tactics Manual and the Alaska Clean Seas Technical Manuals. ACS' Technical Manuals have been incorporated into the North Slope Subarea Contingency Plan, an Area Contingency Plan under the Alaska Federal and State Preparedness Plan for Response to Oil and Hazardous Substance Discharges and Releases.

The MMS identified the following provisions in the plan that do not affect response capability, but should be clarified or corrected:

- Clarify which of the three locations listed in the table will be the primary operations center in the event of a Tier II or Tier III release in Table 1-4.
- Clarify the correct time to oil first impact to Cross Island on page 1-63. The second full paragraph shows contact time at 67 hours but in Table 1-12 impact is shown at 42 hours.
- Clarify in Table 1-13 sections vi and vii, why TF-2 will not be on-site and skimming until hour 30. The TF-2 is located with the drilling vessels and would appear to be on-site and deployable in less time.
- Clarify on page 1-31, why the oil storage tanker could be up to 300 nm from the drill site.
- Include the North Slope Borough as the Local On Scene Coordinator in Figure 3-2.

As a reminder, MMS will require that SOI conduct a full deployment exercise to demonstrate their ability to implement the tactics described in this ODPCP. MMS also may periodically initiate unannounced drills to evaluate SOI readiness to implement your plan. Per 30 CFR 254.42 (f) you must inform the Regional Supervisor of the date of any exercises required by paragraphs (b)(1), (2) or (4) of this section 30 days in advance to allow for MMS to witness any exercises. MMS will also conduct an inspection of the oil spill response equipment maintained by SOI and their OSROs to verify inventory and readiness.

As required by 30 CFR 254.30 this plan must be reviewed at least every two years and resulting changes submitted to the MMS. If no changes are required, SOI must submit written notification that the plan has been reviewed and that no changes are required. In accordance with 30 CFR 254.30(b), Shell is required to submit revisions to the plan for approval within 15 days for specific conditions including: a change in the name(s) or capabilities of the oil spill removal organizations cited in the plan; a significant change to the worst case discharges scenarios; or significant changes to the Area Contingency Plans. The next biennial review of this document will be required October 21, 2011.

If you have any questions regarding this action please contact me at (907) 334-5300 or by email at Jeffrey.Walker@mms.gov.

Sincerely,

Jeffrey Walker
Regional Supervisor
Field Operations

cc: Graham Wood, ADEC

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF COASTAL AND OCEAN MANAGEMENT
http://www.alaskacoast.state.ak.us

SEAN PARNELL
GOVERNOR

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❑ *CENTRAL OFFICE*
P.O. BOX 111030
JUNEAU, ALASKA 99811-1030
PH: (907) 465-3562 / FAX: (907) 465-3075

❑ *PIPELINE COORDINATOR'S OFFICE*
411 WEST 4TH AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501-2343
PH: (907) 257-1351 / FAX: (907) 272-3829

January 22, 2010

Ms. Susan Childs
Shell Offshore Inc. (Shell)
3601 C Street, Suite 1000
Anchorage, Alaska 99503

Subject: 2010 Outer Continental Shelf Lease Exploration Plan, Camden Bay, Alaska
State ID NO. AK 0908-02OG
Final Consistency Response

Dear Ms. Childs:

The Division of Coastal and Ocean Management (DCOM) has completed coordinating the State's review of your proposed project for consistency with the Alaska Coastal Management Program (ACMP). DCOM has developed the attached final consistency response based on reviewers' comments.

Based on an evaluation of your project by the Alaska Departments of Environmental Conservation (DEC), Fish and Game (DFG), and Natural Resources (DNR) and the North Slope Borough Coastal District (NSB), DCOM *concurs* with your certification that the project is consistent with the ACMP. This concurrence is also based on your adoption of DEC conditions to achieve consistency with the ACMP enforceable policies.

This is the *final consistency decision* for your project.

DNR held an elevation hearing January 8, 2010 to consider the North Slope Borough's December 9, 2009 request for an elevation under 11 AAC 110.600. The attached Commissioner's Finding of Fact and Decision addresses those issues NSB raised in its request that were eligible for consideration in an elevation. Following the January 8, 2010 elevation hearing, DNR held two additional meetings with NSB, DEC and Shell representatives to consider alternative measures NSB proposed in its November 9, 2009 comments that were outside the scope of this consistency review. Since the alternative measures NSB proposed are related to air and water quality, the DEC has addressed them in its final consistency finding, also attached.

DCOM is committed to continue discussions between the NSB, U.S. DOI Minerals Management

Service (MMS), DNR, DEC and project proponents to ensure that Outer Continental Shelf (OCS) exploration, development, and production can occur in a manner that recognizes the economic importance of these activities while addressing the serious and important concerns the NSB raised during this consistency review.

NSB has requested that the State suspend this consistency review until a complete Prevention of Significant Deterioration (PSD) Air Permit for Shell's proposal is accepted by the U.S. Environmental Protection Agency (EPA) and becomes available for public review, or to allow for an amended consistency response. Since the PSD Air Permit is not included in the State's list of federal authorizations subject to ACMP review at 11 AAC 110.400, it is outside the scope of this review, and it would not trigger an ACMP review when the draft permit is published. As required at 15 CFR 930.70, DEC has reviewed those aspects of Shell's proposed 2010 Camden Bay drilling program related to air quality that were included in Shell's Exploration Plan (EP), and has issued its final consistency findings under AS 46.40.040(b)(2), attached.

This consistency response is only for the project as described. If you propose any changes to the approved project, including its intended use, prior to or during its siting, construction, or operation, you must contact this office immediately to determine if further review and approval of the revised project is necessary.

By copy of this letter, I am informing the U.S. Department of Interior, Minerals Management Service (MMS) of DCOM's final finding.

If you have any questions regarding this process, please contact me at 907-334-2563 or email nina.brudie@alaska.gov.

Sincerely,

Nina Brudie

Nina Brudie
Oil & Gas Project Review Manager

Enclosures:
ACMP Final Consistency Response, Concurrence
DNR Commissioner's Finding of Fact and Decision
DEC Final Consistency Finding

cc: Greg Horner, UIC/Umiaq
Don Perrin, DNR/OPMP
Randy Bates, Kim Kruse, Tom Atkinson, Dave Gann, DNR/DCOM
Gary Mendivil, DEC/Commissioner's Office
Betty Schorr, Bob Tisserand, DEC/SPAR
John Kuterbach, DEC/Air Quality
Gary Schultz, Melissa Head, DNR/MLW-Lands
Kellie Westphal, DNR/MLW-Water
Jonne Slemons, Matt Rader, DNR/DOG
Rod Combellick, DNR/DGGS

Jack Winters, DFG/Habitat
Bob Small, Lori Quakenbush, DFG/DWC
DNR/DPOR/SHPO
Mayor Edward Itta, Andrew Mack, Dan Forster, Ben Greene, Gordon Brower, NSB
Jeffrey Walker, Daniel Hartung, USDOI/MMS
Jim Ayers, Mike LeVine, Oceana
Kimbrough Mauney
Tom Lakosh

DATE ISSUED: January 22, 2010

PROJECT TITLE: Shell 2010 OCS Lease Exploration Plan, Camden Bay, Alaska

STATE ID. NO.: AK 0908-02OG

AFFECTED COASTAL RESOURCE DISTRICT: North Slope Borough

PROJECT DESCRIPTION: Shell Offshore Inc. (Shell) proposes to conduct an exploration drilling program on U.S. Department of the Interior, Minerals Management Service (MMS) Alaska Outer Continental Shelf (OCS) leases located north of Point Thomson near Camden Bay in the Beaufort Sea during the 2010 drilling season (*Camden Bay 2010 Exploration Plan*, hereinafter, *"EP")*. The leases were acquired during the Beaufort Sea Oil and Gas Lease Sales 195 (March 2005) and 202 (April 2007). In the EP, Shell plans to drill two wells, one each on the Torpedo prospect (NR06-04 Flaxman Island lease block 6610, OCS-Y-1941 [Flaxman Island 6610]) and the Sivulliq prospect (NR06- 04 Flaxman Island lease block 6658, OCS-Y 1805 [Flaxman Island 6658]). The planned drill site locations are: Torpedo H – latitude 70º 27' 01.6193" N and longitude 145º 49' 32.0650" W; and Sivulliq N – latitude 70º 23' 29.5814" N and longitude 145º 58' 52.5284" W. All drilling is planned to be vertical; therefore bottomhole locations will have the same latitude and longitude as surface locations.

Shell plans to drill the Torpedo H drill site first, followed by Sivulliq N, unless adverse surface conditions or other factors dictate a reversal of drilling sequence. In that case, Shell will mobilize to the Sivulliq N drill site and drill this well first.

The ice-reinforced drillship Motor Vessel (M/V) *Frontier Discoverer* (*Discoverer*) will be used to drill the wells. Drillship specifications for the *Discoverer* are located at the end of Section 1.0 in the EP. While on location at the drill sites, the *Discoverer* will be affixed to the seafloor using eight 7-ton Stevpris anchors arranged in a radial array.

During the 2010 drilling season, the *Discoverer* will be attended by a minimum of six vessels that will be used for ice management, anchor handling, oil spill response (OSR), refueling, resupply, and servicing of the drilling operations (see Section 13.0 in the EP). The ice management vessels will consist of an icebreaker and an anchor handler. **Shell plans to use ultra-low sulfur fuel in the drilling program vessels.**

Resupply will be from West Dock to the drill sites and will use a coastwise qualified vessel. An ice-capable OSR barge (OSRB), with an associated tug will be located nearby during the planned drilling program. The OSRB will be supported by a berthing vessel for the OSR crew. An OSR tanker also will be nearby to store recovered liquids. A vessel will support the Marine Mammal Monitoring and Mitigation Plan (4MP) activities associated with the drilling program.

The *Discoverer* and associated support vessels will transit through the Bering Strait into the Chukchi Sea on or about July 1, arriving on location near Camden Bay approximately July 10.

Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run through October 31, 2010, with a suspension of all drilling operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The *Discoverer* and support vessels will either leave the Camden Bay project area and return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude or will leave the Beaufort Sea entirely. Activities will extend through October 31, depending on ice and weather. At the end of the drilling season, the *Discoverer* and associated support vessels will transit west into and through the Chukchi Sea.

Helicopters are planned to provide support for crew change, provision resupply, and search-and-rescue operations during the drilling season. The aircraft operations will principally be based in Deadhorse, Alaska. Section 13.0 of your EP provides additional information regarding aircraft operations.

NOTE: DCOM has modified the project description above from its December 4, 2009 Proposed Consistency Response to highlight a measure Shell has already taken to satisfy review participant concerns raised during this consistency review.

SCOPE OF THE PROJECT SUBJECT TO REVIEW: The project subject to this consistency review consists of the drilling activities described in detail in the Camden Bay 2010 Exploration Plan, as required in Federal regulation at 15 C.F.R. 930.70 and in State regulation at 11 AAC 110.400(b)(6)(D) and .455.

The planned drill site locations are: Torpedo H – latitude 70º 27' 01.6193" N and longitude 145º 49' 32.0650" W; and Sivulliq N – latitude 70º 23' 29.5814" N and longitude 145º 58' 52.5284" W.

CONSISTENCY STATEMENT: DCOM concurs with the consistency certification submitted by Susan Childs on behalf of Shell Offshore, Inc.

AUTHORIZATIONS:

United States Department of the Interior Minerals Management Service
OCS Exploration Plan (EP)
-Approval of applications for permits to drill (APDs)

The Department of Environmental Conservation (ADEC) has reviewed those aspects of the activities related to Air, Land and Water Quality for compliance with AS 46.03, AS 46.04, AS 46.09, AS 46.14, and the regulations adopted under those statutes, as applicable, and provided that department's findings under AS 46.40.040(b)(2) to DCOM.

Agencies will issue permits and authorizations only if they find the proposed project complies with their statutes and regulations in addition to being consistent with the coastal program. An agency may deny a permit or authorization even though the ACMP concurs with your consistency certification. Authorities outside the ACMP may result in additional permit/lease conditions. If a requirement set out in the project description (per 11 AAC 110.260) is more or less restrictive than a similar requirement in a resource agency authorization, the applicant shall comply with the more restrictive requirement. Applicants may not use any State land or water without Department of Natural Resources (DNR) authorization.

APPEAL: This final consistency response is a final administrative order and decision under the ACMP and for purposes of Alaska Appellate Rules 601-612. Any appeal from this decision to the superior court of Alaska must be made within thirty (30) days of the date this determination is issued.

ENFORCEMENT: Pursuant to 11 AAC 110.260(e) and 110.445(e), if after receiving this final consistency response, the applicant fails to implement an adopted alternative measure, or if the applicant undertakes a project modification not incorporated into the final determination and not reviewed under 11 AAC 110.800-11 AAC 110.820, a State resource agency may take enforcement action according to the resource agency's statutory and regulatory authorities, priorities, available resources, and preferred methods.

ADVISORIES: Please be advised that although the DCOM concurs with your certification that the project is consistent with the ACMP, you are still required to meet all applicable State and federal laws and regulations. This consistency finding may include reference to specific laws and regulations, but this in no way precludes your responsibility to comply with other applicable laws and regulations.

If the proposed activities reveal cultural or paleontological resources, please stop any work that would disturb such resources and immediately contact the State Historic Preservation Office (907-269-8720) and the U.S. Department of Interior, Minerals Management Service (907-334-5300) so that consultation per section 106 of the National Historic Preservation Act may proceed.

Final Consistency Response Prepared By:
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(907) 334-2563

Nina Brudie

[Name]

January 22, 2010

[date]

ACMP CONSISTENCY EVALUATION

Pursuant to the following evaluation, the project as proposed is consistent with applicable ACMP statewide and affected coastal resource district enforceable policies (copies of the policies are available on the ACMP web site at http://www.alaskacoast.state.ak.us).

STATEWIDE STANDARDS
11 AAC 112.200. Coastal development
Evaluation: **(a)** The planned drilling program does not require permanent shoreline or offshore facilities. Project activities subject to federal regulations include the planned drilling program, Oil Discharge Prevention and Contingency Plan (ODPCP), air emissions, National Pollutant Discharge Elimination System (NPDES) discharges, and potential interactions with protected and endangered species. **(b)(1) & (2)** The exploration drilling program is planned for federal OCS leases in Camden Bay located approximately 16 (Sivulliq) to 22 miles (Torpedo) offshore in the Beaufort Sea. **(b)(3)** Not applicable. **(c)** Shell has applied to the USACE, for coverage under the Nationwide Permit (NWP) program (Nationwide Permit #8 – Oil and Gas Structures in the OCS), to place a drilling vessel (*Frontier Discoverer*) in Alaskan coastal waters. The application is included in the EP as Appendix I. **Explanation of Consistency:** *Shell proposes exploration drilling on OCS leases for a single drilling season. OCS exploration drilling is a water-dependent and temporary activity and no permanent facilities are proposed. Shell has coordinated with the USACE for activities in waters of the U.S. and provided the USACE appropriate applications for those activities. Shell has demonstrated consistency with this standard.*
11 AAC 112.210. Natural hazard areas
Evaluation: **(a)** DCOM has granted the North Slope Borough's (NSB) request for designation of all state waters within the area bounded on the west by a longitudinal line at 148°31'40.36" (the longitude of West Dock) due north to federal waters to a longitudinal line in the east at 143°36'31" (longitude of Kaktovik) due north to federal waters as a natural hazard area containing permafrost. DCOM has also granted the NSB's request that these same state waters be designated as natural hazard areas for ice hazards. Ice hazards may include "ice ridging, shear zones, ice break-off, strudel scour, ice gouging, ice override, and ice pileup." **(b), (c) and (d)** In conducting its temporary and seasonal 2010 drilling program, Shell intends to utilize chilled drilling muds to mitigate potential impacts to permafrost that may be present at the drill sites. Drilling activity will take place 16 and 22 miles offshore (from Pt. Thompson) in Camden Bay on the Sivulliq and Torpedo prospects, respectively. The closest North Slope villages to the Torpedo and Sivulliq prospects in Camden Bay are Kaktovik and Nuiqsut. The Torpedo drill site is 55 miles from Kaktovik and 125 miles from Nuiqsut. The Sivulliq drill site, 5.5 miles southwest of the Torpedo prospect drill site, is 60 miles from Kaktovik and 118 miles from Nuiqsut. The planned drilling program will occur in approximately 107-120 ft of water in areas where no permanent structures are located. Shallow hazard survey reports prepared for the planned drill sites prepared by Fugro did not report any permafrost. Untreated seawater at ambient temperature near freezing, ±32ºF (±0ºC) taken directly from the sea will be used to drill the MLC, 36- and 26-in hole sections to mitigate permafrost thawing. Shell plans to use a mud chiller will mitigate potential permafrost thawing behind pipe while drilling below the 20-in casing setting point in each well. Shell will also use permafrost cement on select upper portions of wells. This cement has a very low heat of hydration, and will develop adequate compressive strength at low temperatures. Both of these ensure that permafrost thawing will be minimized if any is present. The planned offshore drilling program will not present a threat to public safety, services, and the environment as a result of permafrost

potentially present in the drilling area.

Shell is not proposing to construct any new onshore facilities, nor is any other entity proposing to construct or enhance onshore facilities to support Shell's planned activities, thus Shell will utilize existing onshore facilities at Deadhorse and West Dock. All siting, design, construction and operations of the onshore facilities proposed to be utilized by Shell are the responsibility of the owners and operators of said onshore facilities. Shell does not own or operate the onshore facilities that will be utilized in Deadhorse and West Dock. Any proposed onshore activity will not present a threat to public safety, services, and the environment as a result of permafrost present onshore.

Shell recognizes the drilling program is located in an area that is characterized by active sea ice movement, ice scouring, and storm surges. In anticipation of potential ice hazards that may be encountered, Shell has developed and will implement an Ice Management Plan (IMP) to ensure real-time ice and weather forecasting to identify conditions that might put operations at risk and modify its activities accordingly. The IMP also contains ice threat classification levels depending on the time available to suspend drilling operations, secure the well and escape from advancing hazardous ice. Realtime ice and weather forecasting will be available to operations personnel for planning purposes and to alert the fleet of impending hazardous ice and weather conditions. Ice and weather forecasting is provided by Shell's Ice and Weather Advisory Center. This center is continuously manned by experienced personnel who rely on number of data sources for ice forecasting and tracking including:

- Radarsat and Envisat data – satellites with Synthetic Aperture Radar providing all-weather imagery of ice conditions with very high resolution

- Moderate Resolution Imaging Spectroradiometer – a satellite providing lower resolution visual and near infrared imagery

- Aerial reconnaissance – provided by specially deployed fixed wing or rotary wing aircraft for confirmation of ice conditions and position

- Reports from Ice Specialists on the ice management vessel and anchor handler and from the Ice Observer on the drillship

- Incidental ice data provided by commercial ships transiting the area

- Information from the National Oceanographic and Atmospheric Administration ice centers and the University of Colorado

Drift ice will be actively managed by ice management vessels, consisting of an ice management vessel and an anchor handling vessel. Ice management for safe operation of Shell's planned drilling program will occur far out in the OCS, remote from the vicinities of any routine marine vessel traffic in the Beaufort Sea causing no threat to public safety or services that occurs near to shore. Shell vessels will also communicate movements and activities through the 2010 North Slope Communications Centers.

Lastly, the management of ice by ice management vessels will occur during a drilling season predominated by open water and thus will not contribute to ice hazards, such as ridging, override, or pileup in an offshore or nearshore environment.

Shell has developed and will implement a Critical Operations and Curtailment Plan (COCP), which establishes protocols to be followed in the event potential hazards, including ice, are identified in the vicinity of the drilling operations (e.g., ice floes, inclement weather, etc.). Like the IMP, the COCP threat classifications are based on the time available to prepare the well and escape the location. The COCP also contains provisions for not initiating certain critical operations if there is insufficient time available before the arrival of the hazard at the drill site. In addition, Shell will meet the MMS oil spill response requirements for offshore facilities as required by 30 CFR 250.

The planned offshore drilling program will not present a threat to public safety, security, and the environment as a result of operating in an area that may present ice hazards.

Shell has conducted shallow hazards surveys, and provided the following information from these surveys to supplement its evaluation of consistency with the Natural Hazard Areas standard.

The identification of permafrost is based on interpretations of acoustic data as amplitude pull-ups in the geophysical record. Additionally, near-seafloor amplitude anomalies within buried channel margins could represent localized permafrost layers. Subbottom profiler systems and 2D high-resolution seismic are both used to recognize these signatures.

Sivulliq N
The shallow subbottom profiles were collected at a 328 ft (100 m) interval with a depth of penetration of 98 ft (30m) The intermediate subbottom profiles were collected at a 984 ft (300 m) interval and recorded to 750 ms (~2132 ft, or 650 m, below the mudline.) The 2D HR profiles were collected at a 3937 ft (1200 m) interval with a depth limit of investigation of 1400ms (~4725 ft, or 1440 m, below the mudline.)

Copies of shallow hazards reports covering the planned Sivulliq N drill site have been submitted to MMS under separate covers. The reports are entitled:

- *Exploration Wellsites Geohazards Assessments, Sivulliq Prospect, Beaufort Sea, Alaska* (GeoLLC author submitted to MMS March 2007)
- *Shallow Hazards Assessment, Sivulliq G, V, W and Supplemental N Wellsites, Blocks 6658, 6659, 6708 and 6709, Flaxman Island Area, Beaufort Sea Alaska, Report No. 27.2008-2266* (Fugro Geoconsultants, Inc. author submitted to MMS March/April 2009)

Due to their large volume, the shallow hazards reports were not appended to the EP and the reader was directed to the original MMS submissions for the full text and maps of the reports.

GeoLLC Report

The 2007 GeoLLC report assessed the following parameters:

- Bathymetry
- Ice gouging
- Buried channels
- Seafloor obstructions
- Surficial sediments
- **Permafrost**
- Faulting
- Seismicity
- Shallow gas
- Gas hydrates
- Water column anomalies
- Archaeological features

Fugro Report
The supplemental data taken over the Sivulliq N drill site was requested by MMS in order to confirm the

evaluation presented in the GeoLLC (now part of Fugro GeoServices, Inc.) report.

The following shallow hazards parameters were assessed in the supplemental Fugro report:

- Man-made infrastructure
- Seafloor conditions
- Stratigraphy and structure
- **Permafrost**
- Shallow gas
- Gas hydrates

The Fugro report confirmed the findings of the GeoLLC report. No shallow hazards, including permafrost, were identified at the Sivulliq N drill site.

Torpedo H

The shallow subbottom profiles were collected at a 328 ft (100 m) interval with a depth of penetration of 98 ft (30 m) The intermediate subbottom profiles were collected at a 984 ft (300 m) interval and recorded to 750 ms (~2287 ft, or 697 m, below the mudline.) The 2D HR profiles were collected at a 3937 ft (1200 m) interval with a depth limit of investigation of 1400ms (~4701 ft, or 1433 m, below the mudline.)

Copies of the following shallow hazards reports covering the planned Torpedo H drill site have been submitted to the MMS under separate covers:

- *Exploration Wellsites Geohazards Assessments, Torpedo Prospect, Beaufort Sea, Alaska* (GeoLLC author submitted to MMS March 2008)
- *Shallow Hazards Assessment, Torpedo A, B, G, and H Wellsites, Blocks 6609 and 6610, Flaxman Island Area, Beaufort Sea, Alaska, Report No. 27.2008-2267* (Fugro Geoconsulting, Inc. author submitted to MMS March/April 2009)

Due to their large volume, the shallow hazards reports were not appended to the EP and the reader was directed to the original MMS submission for the full text and maps of the reports.

The Fugro report includes shallow hazards data collected by GeoLLC (now part of Fugro GeoServices, Inc.) in 2008 plus reinterpretation of data collected in 2007 by GeoLLC. The 2007 survey data has variable line spacing and limited aerial coverage due to challenging ice conditions at the time of acquisition and was supplemented with 2008 survey data to achieve the required 100 m/300 m/1200 m line spacing.

GeoLLC Report

The following shallow hazards parameters were assessed in the GeoLLC report:

- Bathymetry
- Ice gouging
- Buried channels
- Seafloor obstructions
- Surficial sediments
- **Permafrost**
- Faulting
- Seismicity
- Shallow gas
- Gas hydrates
- Water column anomalies
- Archaeological features

The presence of permafrost was noted at the Torpedo H drillsite and identified as a constraint. With the presence of permafrost, the main constraint is the loss of soil strength as a result of thaw around the drillpipe. However, because of the the highly overconsolidated nature of the subbottom soils expected at the Torpedo prospect, permafrost thaw consolidation is not expected to present a hazard to drilling operations.

<u>Fugro Report</u>
The following shallow hazards parameters were assessed in the supplemental Fugro report:

- Man-made infrastructure
- Seafloor conditions
- Stratigraphy and structure
- **Permafrost**
- Shallow gas
- Gas hydrates

The Fugro report confirmed the findings of the GeoLLC report, except that no permafrost was interpreted to be present in the subsurface at the Torpedo H drill site after re-examination of the 2007 data and gathering additional shallow hazards data in 2008.

Explanation of Consistency:
The standard requires applicants to take appropriate measures to protect public safety, services, and the environment from the effects of the identified natural hazards. In the judgment of the coordinating agency, Shell has taken appropriate measures to achieve consistency with this standard in accordance with 11AAC112.210 (d)(2)(B). To achieve consistency with the standard the project is designed and operated so that "the level of risk presented by the design of the project is low and appropriately addressed by the project plans."

Appropriate measures addressed in project plans:

For Permafrost:

1. *Shallow hazard surveys conducted to locate geologic hazards, including permafrost*
2. *Use of untreated seawater and chilled mud, and low temp concrete during drilling operations*
3. *Project location proximity to coastal communities minimizes potential to impact public safety and services*

For Ice:

1. *Ice Management Plan*
    a. *Real time ice and weather forecasting*
    b. *Drift ice will be actively managed by ice management vessels*
    c. *Management of ice by ice management vessels will occur during a drilling season predominated by open water and thus will not contribute to ice hazards, such as ridging, override, or pileup in an offshore or nearshore environment*
2. *Critical Operations and Curtailment Plan (COCP)*
    a. *Establishes protocols to be followed in the event potential hazards based on the time available to prepare the well and escape the location.*

3. *MMS approved Shell's Beaufort Sea Regional Exploration Oil Discharge Prevention and Contingency Plan Revision 1, dated April 2009 for offshore facilities as required by 30 CFR 250 on October 21, 2009. The MMS states that "historical and modeling data demonstrates that the probability of a large spill occurring during exploration is insignificant." (Environmental Assessment Shell Offshore Inc. 2010 Outer Continental Shelf Lease Exploration Plan Camden Bay, Alaska Beaufort Sea Leases OCS-Y-1805 and 1941)*

In developing and implementing the exploration drilling plan, Shell employs numerous licensed engineers experienced in design and operations in arctic environments. Given the temporary and seasonal nature of the activity, risks presented by permafrost and ice are further minimized. The measures above constitute *appropriate measures for the project and demonstrate consistency with this standard.*

Review Participant Comments Regarding Consistency with the Natural Hazard Areas Standard

The North Slope Borough submitted timely comments that found the project inconsistent with the Natural Hazard standard, for the following reasons:

1. Shell did not provide specific details regarding what ice management vessels would do in different scenarios or what specific protocols are contained in the Critical Operations and Curtailment Plan.

2. Shell has not demonstrated its ability to pick up oil in broken ice and fall freeze-up conditions.

3. Shell has not adequately addressed the requirement in this standard that a project is designed to withstand the natural hazards in the project area, meets relevant codes, or absent those, is designed by engineers registered in Alaska with expertise in the specific hazards.

DCOM carefully considered these comments and provides the following analysis.

1. As described in the above evaluation under this standard, Shell has developed an ice management plan (IMP) that describes what actions would be taken to avoid ice hazards that occur in the project area. NSB doesn't feel that the information contained in the EP regarding the IMP or the COCP provides enough detail to meet the requirements of this standard, but does not explain what information is needed to meet this standard. Comments related to a project's inconsistency with state standards must explain how the project is inconsistent, and NSB has not met the threshold for demonstrating inconsistency with this standard.

2. Methods for cleaning up oil spills are more appropriately addressed in Shell's Oil Discharge Prevention and Contingency Plan (ODPCP), which ADEC has reviewed for consistency with state air, land and water quality standards. ADEC's preliminary findings are attached to this document.

3. For projects in the OCS, applicants rely on standards set by MMS. The MMS approved Shell's project design on October 21, 2009, certifying that the project meets relevant standards required by federal regulation.

   In general, the NSB has not met the requirements for consistency comments under 11 AAC 110.435(a)(2)(B) because it has not adequately explained how the project is not consistent with the natural hazard areas standard, and has not offered an alternative measure that, if adopted, would achieve consistency with the standard.

11 AAC 112.220. Coastal access

Evaluation:

This EP contains two planned drill sites. The closest drill site is Sivulliq N, located approximately 16 mi (26 km) north of the mainland, approximately 118 mi (190 km) east of Nuiqsut and approximately 60 miles (97 km) west of Kaktovik. Drill site Torpedo H is approximately 5.5 miles (8.8 km) east-northeast of Sivulliq N. The drill site areas are known to have very little vessel traffic and the nearest commercial fishery is located approximately 100 mi (160 km) to the west near the mouth of the Colville River (see also Appendix H, EIA Section 3.12).

In Section 3.11.7 of the Shell Environmental Impact Analysis a review is provided of subsistence hunting resources utilized and hunting activities within the east-Alaskan Beaufort Sea. This area includes the native villages of Kaktovik and Nuiqsut. Generally, the coastal waters of the Camden Bay are utilized for a variety of subsistence hunting activities including transit and transport for onshore resources such as caribou, use of bays, lagoons, barrier islands and deltas for hunting of waterfowl, and other marine mammals.

Both vessel traffic and aircraft have the potential to impact distribution and behavior of wildlife and the ability of hunters to effectively harvest these resources. The Shell exploration plan specifically limits both vessel and aerial support traffic to narrow corridors and altitude limitations within the project area to minimize potential impacts on subsistence resources or subsistence activities. A further lessening of impacts from vessel and aircraft traffic to coastal subsistence activities will occur during the suspension of all drilling operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The Discoverer and drilling support vessels will move out of Camden Bay to the northwest and remain north of latitude 71.25° N and west of longitude 146.4° W during these whale hunts, hence further from any coastal subsistence activities. Aside from these necessary but controlled transits of the coastal waters, the described project will not limit access or impact subsistence activities.

Explanation of Consistency:
The standard requires applicants to consider project-related impacts to public access to, from, and along coastal waters, and take appropriate measures to maintain public access for the duration of the project. The project is located 16 miles offshore in an area known to have little vessel traffic and will not impede access along coastal water. Given the location and temporary nature of the activity, access along coastal water will be maintained. Shell has demonstrated consistency with this standard.

11 AAC 112.230. Energy facilities

Evaluation:
(a)(1) Reasonably foreseeable adverse environmental and social impacts may include the temporary deflection of bowhead whales from their migratory route that may result in increased effort, risk, and expense associated with additional travel to conduct the subsistence hunt. Concerns have also been raised by North Slope residents with regard to how other subsistence species may be affected by drilling activities.

Shell has developed, in consultation with North Slope communities, a Plan of Cooperation (POC) which identifies the mitigation measures that Shell intends to implement during its planned 2010 Camden Bay exploration drilling program to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC details Shell's communications and consultations with local communities concerning its proposed 2010 exploration drilling program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)). Shell has documented its contacts with North Slope communities, as well as the substance of its communications with subsistence stakeholder groups. Tables summarizing the substance of Shell's communications, and responses thereto are included in the POC (Appendix B). This Plan may be supplemented, as appropriate, to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements.

For Shell's temporary, seasonal activities of transit of vessels in the Chukchi and Beaufort Seas, and placement of the anchored drillship at up to two locations in the Beaufort Sea, a number of mitigation measures have been designed into the planned 2010 drilling program. These mitigation measures are drawn from the results of POC meetings for the 2010 exploration drilling program in North Slope communities and from past IHAs and LOAs issued to Shell by NMFS and USFWS, respectively. In 2007, NMFS and USFWS issued authorizations to Shell for that year's planned exploratory drilling program and these concluded Shell's planned activities will have no more than a negligible impact on marine mammals and no unmitigable adverse impact to subsistence uses of marine mammals, as long as the mitigation measures designed into the program were implemented. Shell has adopted mitigation measures into the 2010 drilling program that can specifically apply avoidance, minimization, and/or mitigation applicable to paragraphs (a)(1), (2), (5), (8), (9), (11)-(14), and (16). Example mitigation measures to proposed to be implemented to avoid, minimize, or mitigate adverse environmental and social effects for 2010 are:

- Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run to November 1, 2010 with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The Discoverer and support vessels will leave the Camden Bay project area and will return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude. Activities will extend to November 1, depending on ice and weather.

- To minimize impacts on marine mammals and subsistence hunting activities, the drillship and support vessels traversing north through the Bering Strait will transit through the Chukchi Sea along a route that allows for the highest degree of safety regarding ice conditions and sea states. Those vessels that can safely travel outside of the polynya zone will do so unless it is necessary to break ice (as opposed to managing ice by pushing it out of the way). In this case those vessels will move into the polynya zone far enough so that ice breaking is not necessary. If it is necessary for any vessel to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Communication and Call Centers (Com Centers).

- Shell has developed a Communication Plan and will implement the plan before initiating exploration drilling operations to coordinate activities with local subsistence users as well as Village Whaling Associations in order to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale migration, as well as the timing and status of other subsistence hunts. The Communication Plan includes procedures for coordination with Com Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed activities in 2010.

- Shell will employ local Subsistence Advisors from the Beaufort and Chukchi Sea villages to provide consultation and guidance regarding the whale migration and subsistence hunt. There will be a total of nine subsistence advisor-liaison positions, one per village, to work approximately 8-hours per day and 40-hour weeks through 2010. The subsistence advisor will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and to advise in 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; and advising how to avoid subsistence conflicts. A subsistence advisor handbook will be developed prior to the operational season to specify position work tasks in more detail.

- Shell will recycle drilling muds (e.g., use those muds on multiple wells), to the extent practicable based on operational considerations (e.g., mud properties have deteriorated to the point where they cannot be used further), to reduce discharges from its operations. At the end of the season excess water base fluid, approximately 1500 bbl, will be pre-diluted to a 30:1 ratio with seawater and then discharged.

- Shell will implement flight restrictions prohibiting aircraft from flying within 1,000 ft (300 m) of marine mammals or below 1,500 ft (457 m) altitude (except during takeoffs and landings or in emergency situations) while over land or sea.

- Anchored vessels, including the drilling vessel, will remain at anchor and continue ongoing operations if approached by a marine mammal. An approaching animal, not exhibiting avoidance behavior, is likely curious and not regarded as harassed. The anchored vessel will remain in place and continue ongoing operations to avoid possibly causing avoidance behavior by suddenly changing noise conditions or position.

- Aircraft will not operate within 500 yd (460 m) of whale groups. Aircraft and vessels will not operate within 0.5 mi (800 m) of walruses or polar bears when observed on land or ice.

- When within 300 yd (275 m) of marine mammals, vessels will reduce speed, avoid separating members from a group and avoid multiple course changes. Vessel speed is to be reduced during inclement weather conditions in order to avoid collisions with marine mammals

- A polar bear culvert trap will be established for oil spill response needs near Pt Thomson or Kaktovik prior to drilling in Camden Bay.

- Shell has established and will follow transit routes that avoid known fragile ecosystems and critical habitat areas to reduce the possibility of impacting those resources in the unlikely event of a diesel fuel spill.

- Shell has developed and will implement an Ice Management Plan (IMP) to ensure real-time ice and weather forecasting to identify conditions that might put operations at risk and modify its activities accordingly. The IMP also contains ice threat classification levels depending on the time available to suspend drilling operations, secure the well and escape from advancing hazardous ice.

- Shell has developed and will implement a Critical Operations and Curtailment Plan (COCP), which establishes protocols to be followed in the event potential hazards, including ice, are identified in the vicinity of the drilling operations (e.g., ice floes, inclement weather, etc.). Like the IMP, the COCP threat classifications are based on the time available to prepare the well and escape the location. The COCP also contains provisions for not initiating certain critical operations if there is insufficient time available before the arrival of the hazard at the drill site.

- Shell has developed and will implement a Well Control Contingency Plan (WCCP) in the extremely unlikely event of a well control event to minimize the risk of oil coming in contact with the water. Shell will prepare a Relief Well Drilling Plan for each location in advance of spudding the well to ensure that a relief well can be started quickly to kill the well as a part of the Well Control Contingency Plan.

- Shell has developed and will implement a Fuel Transfer Plan (FTP), which, among other things, requires the deployment of containment boom prior to any refueling operation to minimize the risk of a diesel fuel spill.

- Shell will station and maintain its Oil Spill Response vessels in the immediate vicinity of its drilling operations to ensure timely response to any spill event.

The results of the POC meetings have been documented and submitted to MMS in this EP (Appendix B), and contemporaneously to NMFS, and USFWS in applications for MMPA authorizations of incidental take of the trust species for which these agencies are responsible. The requirements of MMS Stipulation No. 5 parallel requirements of the USFWS LOA and the NMFS IHA. The LOA and IHA provide authorization for the nonlethal harassment of species protected by the Marine Mammal Protection Act. Shell has identified the measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses and has consulted with local subsistence communities concerning the proposed activity, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)).

Section 4.0 of the EIA (Appendix H) details the environmental impacts of the following drilling activities, discharges or emissions: vessel traffic; vessel mooring and mudline cellar construction; aircraft traffic; sound energy from drilling and ice management; drill cuttings and drilling mud discharges; other permitted discharges; liquid hydrocarbon spill; and project air emissions. The environmental impacts of these drilling activities, discharges or emissions on various resources, conditions, and activities are found in the following subsections: 4.1.1 (Meteorology); 4.1.2 (Oceanography); 4.1.3 (Ice); 4.1.4 (Geology); 4.1.5 (Shallow Geological or Man-Made Hazards); 4.1.6 (Air Quality); 4.1.7 (Water Quality); 4.1.8 (Sediments); 4.1.9 (Lower Trophic Organisms); 4.1.10 (Marine Mammals); 4.1.11 (Coastal and Marine Birds); 4.1.12 (Fish and Shellfish); 4.1.13 (Terrestrial Mammals); 4.1.14 (Threatened and Endangered Species and Critical Habitat); 4.1.15 (Sensitive Biological Resources or Habitats); 4.1.16 (Archaeological resources); 4.1.17 (Socioeconomic Impacts); 4.1.18 (Coastal and Marine Uses); and 4.1.19 (Potential Hydrocarbon Spills, Probabilities and Response Planning).

(2) The energy facilities involved in Shell's 2010 exploration activities in Camden Bay will be temporary and will be in the area on or around July 10 through August 25, and September to November1, depending on ice and weather conditions. Shell's planned exploration drilling activities will take place 16 and 22 miles offshore (from Pt. Thompson) in Camden Bay on the Sivulliq and Torpedo prospects, respectively. The closest North Slope villages to the Torpedo and Sivulliq prospects in Camden Bay are Kaktovik and Nuiqsut. The Torpedo drill site is 55 miles from Kaktovik and 125 miles from Nuiqsut. The Sivulliq drill site, 5.5 miles southwest of the Torpedo prospect drill site, is 60 miles from Kaktovik and 118 miles from Nuiqsut. Each drill site has been surveyed by Shell and determined not to contain any shallow hazards that could interfere with drilling, or archeological and historical resources.

Existing and subsequent adjacent uses during Shell's 2010 Camden Bay exploration drilling July – October are fall subsistence activities. Shell, utilizing the feedback from extensive community outreach, project meetings with communities and co-management groups, and a Plan of Cooperation that addresses several conflict avoidance mechanisms, will shut down drilling on August 25 and move off location. Drilling operations will not recommence until after the Kaktovik and Nuiqsut (Cross Island) bowhead whale hunts are complete, generally first or second week of September.

All operations will comply with applicable federal, state and local laws, regulations, and lease and permit requirements. Shell will have trained personnel and monitoring programs in place to ensure compliance with permits and authorizations governing safety, environmental protection, and avoiding interference with subsistence resources and activities, and mitigating any potential adverse impacts. Mitigation measures and safety programs include:

- Plan of Cooperation to coordinate exploration activities with Alaska Native subsistence activities to avoid unreasonable interference with subsistence resources and activities;
- Oil Spill Response Plan (federal) and Oil Discharge Prevention and Contingency Plan (state) to prevent oil spills from ever occurring, and requiring contingency response plans in the highly unlikely event of any spill;
- Marine Mammal Monitoring and Mitigation Measure Program, to avoid impacts to marine mammals and collect scientific data on marine mammal species;
- Bird Strike Avoidance and Lighting Plan; and,
- Polar bear, Pacific walrus, and brown bear avoidance and encounter interaction plan, Beaufort Sea, Alaska

The mitigation measures Shell will employ were developed over several years of Arctic exploration activities in consultation with Inupiat stakeholders. Bowhead whales are a vital cultural and subsistence resource for the Native Inupiat. Shell's measures to protect this important resource include staffing all vessels with trained on-board marine mammal observers (MMO), and ceasing all activities prior to the beginning of the fall whale hunts in late August until the end of the hunts for the villages of Kaktovik and Nuiqsut.

Projected Community Needs
Community needs in Kaktovik and Nuiqsut relate to:

- Subsistence activities,
- Minimal impact from exploration activities such as crew changes on the villages of Nuiqsut and Kaktovik, and
- Workforce development and opportunities for employment.

Subsistence is both an existing and subsequent adjacent use as well as a projected community need. To mitigate potential effects on existing subsistence, Shell will implement the measures discussed above. Shell's proposed exploration activities will also result in increased aircraft traffic in the Camden Bay project area, which has potential to affect subsistence activities on and off shore. To mitigate this potential impact on existing and subsequent adjacent uses, aircraft shall not operate below 1500 ft unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, or unless engaged in providing assistance to a whaler or in poor weather (low ceilings) or any other emergency situations. Aircraft engaged in marine mammal monitoring shall not operate below 1500 ft in areas of active whaling; such areas to be identified through communications with the Com-Centers. Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least five miles inland until the aircraft is directly south of its offshore destination, then at that point it shall fly directly north to its destination. Aircraft travel routes associated with Camden Bay exploration activities were discussed with village residents during the Plan of Cooperation meetings. Final routes were determined based on regulatory requirements and village input.

Workforce Development and Employment. During Shell's proposed 2010 operations, best efforts will be made to hire and train local residents for the exploration program. Providing these employment opportunities to local residents creates the potential for positive economic benefits to the communities most affected by Shell's activities. These efforts will also provide a conduit for communication between Shell and residents.

Since 2005, Shell has implemented several programs that involve the training and subsequent hiring of local residents. Programs include the following:

- Marine Mammal Observer (MMO);
- Subsistence Advisor (SA); and
- Communication and Call Centers (Com Centers)

The MMO program employs local Inupiat residents to monitor and document marine mammals in the project area. The MMOs participate in intensive training for marine mammal identification and documentation, and in computer use and health and safety regulations.

The SA program recruits a local resident from each village to communicate local concerns and subsistence issues from residents to Shell. The SA speaks with other village members and documents subsistence information. Shell may then uses that information to develop appropriate mitigation measures to address issues of concern related to subsistence activities and avoid potential conflicts with exploration activities. Shell plans to continue its SA program during the 2010 exploration season.

The Com Center program involves hiring one or two individuals from each of the Beaufort and Chukchi Sea villages. These individuals monitor and relay radio transmissions between subsistence vessels and industry vessels. This sharing of information is intended to reduce or eliminate the potential conflict between subsistence users and industry vessels. Shell will implement a Communications Plan during the 2010 exploration season in order to avoid conflicts with subsistence users.

(3) Facility consolidation will include capitalization on synergies between the planned drilling program, resupply, ice management, vessel fueling operations, spill prevention and response equipment, and crew change-outs. Facilities will be consolidated in Deadhorse to support Drilling, Ice/Weather, Logistics, and Oil Spill response. Facilities include a retainer on 40 rooms at an existing Deadhorse hotel, office space at the existing Carlile building, rental of existing Carlile yard space for short term Oil Response and Drilling equipment staging, and the leasing of ERA's terminal building to support crew change operations across the different function of Shell offshore drilling. By combining these operations, Shell will be able to maintain the smallest ecological footprint, better account for all Company employees/contractors/inventories, and allow for the best utilization of Logistical Assets. Additionally, this reduces vehicular and helicopter activity by maximizing loads over shorter distance, sharing support equipment such as forklifts or loaders, and reducing Shell's visibility and possible impact among the other Oilfield operators. In addition to minimizing helicopter and marine vessel trips between Deadhorse and the Drilling fleet, Shell intends to minimize impacts on the surrounding area by strictly following minimum altitudes of 1500 ft above ground level, flying agreed upon flight routes, avoiding sensitive marine areas, and minimizing vessel time at any single given location (for example sitting at West Dock). These mitigation measures will be continuously assessed using local subsistence advisors, as well as locally hired contractors and public comment.

(4) Concurrent use of facilities is described in (3) above.

(5) The planned drilling program is temporary and seasonal. Drilling operations will be conducted in consultation and coordination with federal agency approvals.

(6) The project area is neither constrained for the planned drilling program nor for future expansion.

(7) The drilling program is temporary and seasonal, and located on OCS leases with no industrial infrastructure. Existing industrial facilities such as the Deadhorse Airport, West Dock, the oilfield road system, and potential staging areas proximal to these facilities are available to provide operational and logistic support.

(8) No harbors are planned for the drilling program. The drilling program targets resource assessment in OCS waters north of the barrier islands and is generally outside established shipping lanes in the Beaufort Sea. Shallow hazards and site clearance surveys ensure the planned drilling program is conducted in areas without seafloor obstructions or limitations. These surveys gather data on: (1) bathymetry, (2) seabed topography and other seabed characteristics (e.g., boulder patches), (3) potential geohazards (e.g., shallow faults and shallow gas zones), and (4) the presence of any archeological features (e.g., shipwrecks). Qualified and experienced personnel must perform the field survey, process and analyze the data, prepare the report, and acknowledge responsibility by signing the appropriate datalogs, analysis and reports. These reports are submitted for review along with the EP to verify that the site is clear of shallow hazards. When anchoring the drillship or other vessels, any potential archaeological resources identified by the site clearance survey will be avoided by adjusting the anchor pattern appropriately or by moving the vessel to an area without such resources nearby. Drift ice will be actively managed by ice management vessels, consisting of an ice management vessel and an anchor handling vessel.

(9) Vessel traffic will be coordinated through the use of normal USCG and industry vessel communication protocols. Collision avoidance systems include the use of shipboard GPS tracking and radar systems.

(10) This is an exploration drilling program with temporary and seasonal operations. There will be minimal subsea bed disturbance for MLCs at the drill sites. MLCs are designed to protect the wellhead, casing and blowout preventers from potential ice gouge events. Vessel anchoring systems employed during operations will be removed upon abandonment of each well. Permanent facilities will be limited to the casing and the guide base after well abandonment. The top of any remaining equipment will be well below the mudline after abandonment in compliance with MMS regulations.

(11) Impacts to passage and movement of fish and wildlife will be minimal since only a moored drillship and several support vessels will be involved. There will be no constructed facilities such as gravel islands or other structures involved in the proposed drilling operations. The only impediments to passage and movement will be a 21-in diameter marine riser extending from the drillship to the top of the blowout preventer (the Lower Marine Riser Package) plus eight anchor wires extending from the base of the moonpool to the seafloor. These are not expected to impede passage or movement of fish and wildlife.

When drilling is finished, the wells will be permanently abandoned and all equipment will be below the mudline in accordance with MMS regulations. All moorings and equipment will be recovered from the site. A seabed survey will be taken to ensure that there is no debris, trash, equipment or other items left on the seafloor. Thus, there will be no permanent structure left at either well above the mud line to impede passage or movement of fish and wildlife away from historic migratory patterns.

The use of water-based drilling fluid containing only non-hazardous additives is expected to prevent long-term turbidity, total suspended solids, or other materials in the water column that could contribute to avoidance behaviors thus mitigating the impacts to passage or movement of fish and wildlife away from the area. Computer modeling shows that discharges from the drillship, including mud and cuttings, will remain in the water column only temporarily and will affect a very small area of the Beaufort Sea. Cooling water temperature will return to ambient conditions within only 450 ft of the drillship. Thus, water quality and temperature will only impact the passage and movement of fish and wildlife temporarily affected if at all.

Impacts to fish and wildlife are discussed in Appendix H in the following sections:

- 4.1.9, Lower Trophic Organisms, p. 228
- 4.1.10, Marine Mammals, p. 245
- 4.1.11, Coastal and Marine Birds, p. 255
- 4.1.12, Fish and Shellfish, p. 262
- 4.1.13, Threatened and Endangered Species and Critical Habitats, p. 269
- 4.1.14, Sensitive Biological Resources, p. 289

Impacts to each of these species are minimal and temporary and will not impede passage or movement of fish and wildlife. Some temporary avoidance of the immediate drill site could occur affecting some individuals, but these deflections should be temporary.

The effect of sound associated with drilling operations is discussed in several places in Appendix H (see Response to NSB-6). Other than possible deflection of bowhead whales and other marine mammals due to the ensonification of the water column in the immediate vicinity of the drillship will likely be only temporary and localized and will not impact passage or movement of fish and wildlife away from historic migratory patterns.

Aircraft operating in support of drilling operations will fly at a minimum elevation of 1,500 ft except during takeoffs and landings at Deadhorse and the drillship to avoid disturbing land animals, birds, marine mammals and whale that might cause them to divert from their traditional migratory routes. The aircraft will depart Deadhorse, fly 5 miles inland from the shore to a location near Pt. Thomson, turn northward, and fly through the Mary Sachs Entrance directly to the drill site. They will return to Deadhorse along the same flight path. This flight path was chosen after consultation with AEWC and NSB to further avoid impacts to marine mammals and whales. Both the increased elevation and the aircraft transit route were discussed with NSB residents to capture traditional knowledge about wildlife migratory patterns and to reach consensus on the best way to avoid impacting passage and movement of wildlife during aircraft operations.

Similarly, vessels transiting to the drill sites will leave West Dock and travel inside the barrier islands to a location near Pt. Thomson before turning north and transiting directly to the drillship through the Mary Sachs Entrance. This should minimize exposure of marine mammals and whales to vessel sound thereby mitigating deflection and impacting passage and movement of these species from historic migratory patterns.

Appendix G, Bird Strike Avoidance Plan, discusses measures to shield lighting on the drillship or to use special lights that will avoid bird strikes and mitigate temporary navigational difficulties experienced by some bird species. This mitigation should reduce the impact of rig lighting on bird movement.

Shell intends to cease operations and move the entire offshore fleet (drillship, ice management vessel, anchor handler, berthing vessel and tanker) away from the drill sites and into a “parking area” designated by AEWC. This will remove all impediments from the traditional bowhead migratory route for the duration of the Kaktovik and Cross Island (Nuiqsut) whale hunts and will permit passage and movement of bowhead whales and other mammals.

All vessels will have Marine Mammal Observers aboard to assist in spotting marine mammals and whales. Vessels in transit will slow their progress and avoid approaching areas used by marine mammals, and the locations used by these mammals will be monitored for future reference. The MMO program is intended to mitigate impacts to marine mammals and whales to reduce impacts to passage and movement of these animals from their historic migratory patterns.

Spill prevention and response assets will be positioned at the drill site and immediately ready to stop the spread of any released oil, and thus protect marine resources that might otherwise be impacted by a slick of larger spatial area.

(12) The temporary and seasonal drilling program may have minimal to no impact on fish and wildlife migration patterns. Marine mammals, fish, and seabirds are the fish and wildlife resources present in the area during the time that these operations are planned. The short-term and negligible effects will likely be localized displacement of fish and wildlife. Disturbances will not result in long-term effects to fish, marine mammals, and seabirds that may be foraging or congregating in the area (Appendix, EIA Section 4.1).

Section 4.0 of the EIA (Appendix H) details of the environmental impacts for the following: drilling activities, discharges or emissions: vessel traffic; vessel mooring and mudline cellar construction; aircraft traffic; sound energy from drilling and ice management; drill cuttings and drilling mud discharges; other permitted discharges; liquid hydrocarbon spill; and project air emissions. The environmental impacts of these drilling activities, discharges or emissions on fish, wildlife and their habitats are found in the following subsections: 4.1.6 (Air Quality); 4.1.7 (Water Quality); 4.1.8 (Sediments); 4.1.9 (Lower Trophic Organisms); 4.1.10 (Marine Mammals); 4.1.11 (Coastal and Marine Birds); 4.1.12 (Fish and Shellfish); 4.1.13 (Terrestrial Mammals); 4.1.14 (Threatened and Endangered Species and Critical Habitat); 4.1.15 (Sensitive Biological Resources or Habitats); and 4.1.19 (Potential Hydrocarbon Spills, Probabilities and Response Planning).

(13) At this time the North Slope Borough does not have an approved District CMP, therefore there are no identified areas of particular scenic, recreational, environmental, or cultural value.

(14) The 2010 Camden Bay exploration drilling program consists of the temporary "siting" of an anchored drillship at up to two offshore locations during the 2010 drilling season in the OCS. Neither of these drill sites is located in areas of "above Beaufort Sea background habitat values" with respect to biological productivity, diversity, or vulnerability. This conclusion is supported by habitat discussion and analysis in the EIA (Appendix H) Section 3.9, Sensitive Biological Resources (pages 146-147) and Section 4.1.15, Sensitive Biological Resources or Habitats (pages 288-291) , respectively. Specifically, chemical and biological sampling of the water and benthos during 2008 in the project area found no measurable differences in benthic community abundance (Dunton, K., S. Schonberg, and N. McTigue. 2008). In summary, the temporary siting and operation of a drillship at locations of no heightened value of biologic productivity will have negligible impact on this resource.

The planned drilling program will be conducted in a manner that controls effluents pursuant to the NPDES General Permit AKG-28-0000 guidelines. Shell has submitted NOIs for authorizations to discharge under this general permit for the *Discoverer*. Spill prevention strategies are designed to avoid and minimize the release of hydrocarbons and other contaminants. In the event of a spill, response equipment will be available and deployed to control the release and foster product recovery and proper disposal in accordance with an approved ODPCP.

(15) The program will be conducted in compliance with an EPA air quality permit for the planned drilling program. PSD regulations require Shell to demonstrate that predicted cumulative concentrations with a proposed project will comply with NAAQS and PSD requirements. Shell has completed modeling that demonstrates the Discoverer will be in compliance with PSD increments, NAAQS, and AAAQS at all locations Shell proposes for exploration drilling. These standards include the criteria pollutants of NO_2, PM_{10}, $PM_{2.5}$, SO_2, CO & NH_3 (NH_3 AAAQS only). The modeling is performed in accordance with Appendix W of 40 CFR Part 51 (Guidelines on Air Quality Models). Shell has applied conservative screening dispersion modeling for this analysis. The ICS-PRIME model is used with EPA screening meteorology and EPA-recommended persistence factors for converting one-hour maximum concentrations to other averaging periods. Owner Requested Restrictions are taken into account in the analysis.

By applying Best Available Control Technology (BACT), Shell offers several emissions control devices and restrictions on its operation for purposes of limiting emissions and air quality impacts from the Discoverer. The primary generators on the Discoverer will be retrofitted with selective catalytic reduction devices (SCR) to reduce nitrogen oxide (NOx) emissions by over 90% and with catalytic oxidation devices to reduce carbon monoxide (CO), volatile organic compounds (VOC) and fine particulate matter by at least 60%. All remaining engines on the Discoverer will either be Tier 3 low emission engines or retrofitted with catalytic oxidation filters to reduce CO, VOC and fine particulate matter by at least 60%. To reduce sulfur dioxide (SO_2) emissions the Discoverer will be limited to ultra low sulfur diesel fuel with a sulfur content of 0.0015% and the support vessels will be limited to diesel fuel with sulfur content of 0.19%.

The Discoverer also has several Owner Requested Restrictions (ORRs) associated with the operations. The MLC compressors are limited to operating 2 of the 3 while the Discoverer is occupying a drill site; only using emergency equipment during emergencies, testing and routine maintenance; and daily cementing, logging, and cranes are limited to 30% of combined engine capacity. Shell will limit the drilling season to 168 drilling days in any rotating 12-month period.

(16) The planned program will not result in the overcrowding of harbors. Activities at West Dock will be few and considered to have no significant impact on existing commercial activity, area, or local residents. This will be accomplished through careful load planning to maximize each resupply trip. Onsite activity at West Dock will be limited and temporary in nature, with no long term staging or vessel overnight anchorage. In addition to minimizing safety and environmental risk, this is also a best practice Shell will perform to maintain a cooperative relationship with the other Oil and Gas Operators and local residents.

The planned drilling program will not interfere with fishing operations and equipment. The planned drill sites are located over 100 mi (160 km) to the west near the mouth of the Colville River where the only commercial fishery in the Beaufort Sea exists. Any fish are harvested from the marine environment for subsistence use by Nuiqsut or Kaktovik, will be located approximately 120 mi (200 km) west and 60 mi (100 km) east of Camden Bay, respectively, therefore the drilling program activities, including transit of the West Dock shuttle or vessels offshore in the OCS (approximately 16 miles offshore or more), or will avoid impact to subsistence fishing operations and equipment.

(b) In this EP Shell plans to drill two wells, one each on the Torpedo prospect (NR06-04 Flaxman Island lease block 6610, OCS-Y-1941 [Flaxman Island 6610]) and the Sivulliq prospect (NR06-04 Flaxman Island lease block 6658, OCS-Y 1805 [Flaxman Island 6658]). Shell will secure all appropriate federal approvals and permits prior to operations.

Explanation of Consistency:
Siting and approval of major energy facilities requires the applicant to conform with, to the extent practicable, sixteen criteria. (Emphasis added. The term "practicable" defined in 11AAC112.990 (18), means feasible in light of overall project purposes after considering cost, existing technology, and logistics of compliance with the standard). Shell's evaluation of the sixteen criteria is based on its Environmental Impact Analysis (EIA) included in the MMS Exploration Plan, other federal requirements, and its own internal requirements. The MMS has reviewed, evaluated, and verified the information and analysis in the EIA and performed an environmental analysis of the proposed project in accordance with the National Environmental Policy Act. The MMS concluded that no population-level effects to bird, mammal, or fish species are anticipated as a result of the proposed exploration drilling or support activities and with mitigations incorporated in the proposed activities, most species occurring in the vicinity of the prospects are expected to be affected negligibly or at most to a minor level.

As described above, Shell has consulted with North Slope communities and developed mitigation measures to minimize any impacts to subsistence activities. Shell has designed the project to have a minimal impact on adjacent communities to the extent practicable, and has developed training and employment opportunities for community residents nearest the project location.

Of the sixteen criteria listed in the standard, eleven are for the actual siting of the facilities. Given the project is located on federal lease blocks acquired through the MMS lease sale process, Shell is constrained in terms of the Energy Facilities standard's siting requirement. Nonetheless, Shell has demonstrated consistency with the sixteen criteria.

Review Participant Comments Regarding Consistency with the Energy Facilities Standard
On November 9, 2009 the North Slope Borough submitted timely comments to DCOM that referenced the Energy Facilities statewide standard. These comments are summarized below.

1. To comply with subsections (a)(11) and (a)(12) of the Energy Facilities standard Shell should conduct its proposed activities at a time of year when biological activity is low, which would be during winter months and not during open water season.

2. Shell has not complied with subsection (a)(1) of this standard which requires that Shell "minimize all adverse environmental and social effects" because it has not explained why drilling muds and cuttings could not be disposed of using existing onshore disposal facilities. An oil spill is a reasonably foreseeable adverse impact and a spill would have significant environmental and social effects.

3. Shell has not demonstrated how it would consolidate facilities as required under subsections (a)(3) and (a)(4) of this standard because it has not explained why drilling muds and cuttings could not be disposed of using existing onshore disposal facilities.

4. The proposal is not consistent with subsections (a)(11) and (a)(14) because Shell has not demonstrated it would site facilities so as to minimize the probability of spills or other forms of contamination, or site facilities in an area where effluents and spills can be controlled or contained. Shell has not demonstrated why it has not adopted a zero discharge policy.

5. NSB has included an alternative measure that, if adopted by Shell would “significantly reduce the potential adverse impacts to vulnerable habitats” and other provisions of the Energy Facilities standard. The alternative measure offered is described above under item number one.

DCOM carefully considered these comments and provides the following analysis.

1. The management threshold for the Energy Facilities standard is siting and approval of major energy facilities, to the extent practicable, on a set of 16 standards. 11 AAC 112.990(18) defines “practicable” as feasible in light of overall project purposes after considering cost, existing technology, and logistics of compliance with the standard. The proposal currently in review is designed for and will be executed in open water. NSB’s suggestion of changing the proposal from a summer, open water project to a winter, on-ice project goes beyond the management threshold for siting and approval of major energy facilities.

2. As mentioned above, the management threshold for Energy Facilities is to site and approve facilities “to the extent practicable” based on the 16 standards listed. Subsection (a)(1) specifically requires that facilities be sited “so as to minimize adverse environmental and social effects while satisfying industrial requirements.” NSB’s comments regarding this subsection expand the management threshold beyond what the standard requires by rewording it, saying that Shell should demonstrate that its activities “minimize all adverse environmental and social effects” to be consistent with this subsection of the standard. Shell is not required to meet this threshold to be consistent with this standard.

   Shell’s proposed discharges will be covered under the Arctic NPDES General Permit, which is consistent with the ACMP. EPA determines if the proposed discharges meet the standards of the Arctic NPDES GP. If EPA finds the discharges do not meet the standards of the GP, and an individual permit is required, DCOM and review participants would review that individual permit for consistency with the ACMP.

   In this section NSB refers to an oil spill as a reasonably foreseeable event, but later downgrades the likelihood to “unlikely” at the bottom of Page 9. As mentioned previously, the MMS states in its Environmental Assessment of Shell’s EP that “historical and modeling data demonstrates that the probability of a large spill occurring during exploration is insignificant.”

3. This is not a valid application of the Energy Facilities standard; Shell has not proposed a new disposal facility as part of its Exploration Plan, so using the existing onshore Badami facility as NSB suggests would not consolidate facilities – it would actually expand the proposed operation if Shell were to haul discharges to an onshore facility.

4. As mentioned above, a zero discharge policy, which would require hauling discharges to an approved onshore disposal facility, would actually expand the proposed operation because it would require an increased number of vessels, increased amount of vessel traffic, personnel and air emissions, and would increase the risk of accidental discharges along shipping routes and in biologically productive or vulnerable habitats. Shell has demonstrated in its Oil Discharge Prevention and Contingency Plan, to the extent practicable, how its facilities are sited in areas where effluents and spills can be controlled or contained.

5. The NSB has not met the requirements under 11 AAC 110.435(a)(2)(B) because it has not adequately explained how the proposal is not consistent with the Energy Facilities standard, as detailed in items 1 through 4 above. Although it did offer an alternative measure under this standard, NSB has not adequately explained how the alternative measure, if adopted, would achieve consistency with the standard.

11 AAC 112.240. Utility routes and facilities

Evaluation:
(a) and (b) (1) through (3) The planned drilling program will not be constructing any utility routes or facilities, therefore this standard is not applicable.

11 AAC 112.250. Timber harvest and processing

Evaluation:
Timber harvest and processing is not within the scope of the planned drilling program, therefore this standard is not applicable.

11 AAC 112.260. Sand and gravel extraction

Evaluation:
Sand and gravel will not be used for the planned drilling program, therefore this standard is not applicable.

11 AAC 112.270. Subsistence

Evaluation:
(a) DCOM has granted the NSB’s request for designation of all state waters within the area bounded on the west by a longitudinal line at 148°31’40.36” (the longitude of West Dock) due north to federal waters to a longitudinal line in the east at 143°36’31” (longitude of Kaktovik due north to federal waters as subsistence use areas for the following subsistence species and activities:

- **Marine Mammals:** Polar bear, bearded seal, harbor or spotted seal, ribbon seal, ringed seal, walrus, beluga whale, and gray whale. Bowhead whale subsistence-use areas are described below.

- **Land Mammals:** Black bear, grizzly bear, caribou, moose, and Dall sheep.

- **Fish:** Blackfish, capelin, herring, Arctic Char, Arctic cod, ling cod, tom cod, Arctic flounder, grayling, northern pike, chum salmon, humpback salmon, Coho salmon, king salmon, sculpin, smelt, sucker, lake trout, Arctic cisco, least cisco, Bering cisco, rainbow trout, broad whitefish, humpback whitefish, round whitefish, and sheefish.

- **Waterfowl:** Eggs, lesser brant, sandhill crane, common eider, king eider, spectacled eider, Stellar's eider, Canada goose, lesser snow goose, white-fronted goose, Arctic loon, common, loon, red throated loon, common murre, thickbilled murre, oldsquaw, snowy owl, pintail, rock ptarmigan, and willow ptarmigan.

- **Furbearers:** Arctic fox, red fox, snowshoe hare, lynx, hoary marmot, mink, porcupine, Arctic ground squirrel, weasel, wolf, and wolverine.

- **Gathering:** Clams, king crab, tanner crab, shrimp, blueberry, cloudberry, cranberry, crowberry, Hudson's Bay tea, salmon berry, sourdock, swamp grass, wild celery, wild chives, wild potato, wild rhubarb, wild spinach, willow leaves, alder bark, birch trees, willow brush, driftwood, sod, spruce trees, and timber logs.

Subsistence resources reportedly used by the communities of Kaktovik and Nuiqsut are discussed in Section 3.11.7 under Socioeconomic Resources (pages 171 through 185) of the Environmental Impact

Analysis (EIA) for Shell's 2010 Outer Continental Shelf Exploration Drilling Program. Subsistence uses include hunting, fishing, and/or gathering of the following: large land mammals (including caribou, musk ox, Dall sheep, bear, and moose); furbearers (including fox, wolverine, wolves, and ground squirrels); fishing (marine and fresh water); coastal and marine birds; marine mammals (including polar bear, seals, and whales [bowhead and beluga]); plants/berries/wood. Surveys of subsistence harvests are summarized in the EIA in this section and confirm the resources evaluated and analyzed continue to be vital in household economies of Kaktovik and Nuiqsut (Table 3.11.7-1).

Potential impacts to subsistence resources are evaluated in the EIA in Section 4.1.17 under Socioeconomic Impacts, pages 296-329. Specific impacts to the subsistence resources of marine mammal and large mammal hunting, fishing, bird hunting and egg collection include the following analyses: vessel traffic; MLC and vessel mooring; aircraft traffic; sound from drilling and ice management; drill cuttings and drill mud discharge; other NPDES regulated discharges; liquid hydrocarbon spills; and air emissions. Beginning on page 300 of the EIA in Section 4.1.17, each of these impacts were analyzed versus the subsistence activities highlighted. Measures to minimize and mitigate the impacts from planned drilling program activities are summarized below, in addition to the Plan of Cooperation drafted for the program (Appendix B of the EP), and in Section 4.3.3 of the EIA.

As required by MMS Lease Stipulation No. 5 as well as NMFS and USFWS regulations, Shell has held POC meetings with various individuals and groups from affected communities and has adopted mitigation measures designed to avoid and/or minimize unreasonable conflicts with subsistence hunting activities or subsistence resources. The mitigation measures include the following:

Subsistence

- Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run to November 1, 2010, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The *Discoverer* and support vessels will leave the Camden Bay project area and will return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude. Activities will extend to November 1, depending on ice and weather.

- To minimize impacts on marine mammals and subsistence hunting activities, the drillship and support vessels will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drillship and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers.

- Shell has developed a Communication Plan and will implement the plan before initiating exploration drilling operations to coordinate activities with local subsistence users as well as Village Whaling Associations in order to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale migration, as well as the timing and status of other subsistence hunts. The Communication Plan includes procedures for coordination with Communication and Call Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed activities in 2010.

- Shell will employ local Subsistence Advisors from the Beaufort and Chukchi Sea villages to provide consultation and guidance regarding the whale migration and subsistence hunt. There will be a total of nine subsistence advisor-liaison positions, one per village, to work approximately 8-hours per day and 40-hour weeks through 2010. The subsistence advisor will use local knowledge

(Traditional Knowledge) to gather data on subsistence lifestyle within the community and to advise in 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; and advising how to avoid subsistence conflicts. A subsistence advisor handbook will be developed prior to the operational season to specify position work tasks in more detail.

- Shell will recycle drilling muds (e.g., use those muds on multiple wells), to the extent practicable based on operational considerations (e.g., mud properties have deteriorated to the point where they cannot be used further), to reduce discharges from its operations. At the end of the season excess water base fluid, approximately 1500 bbl, will be pre-diluted to a 30:1 ratio with seawater and then discharged.

- In addition to minimizing helicopter and marine vessel trips between Deadhorse and the Drilling fleet, Shell intends to minimize impacts on the surrounding area by strictly following minimum altitudes of 1500 ft above ground level, flying agreed upon flight routes, avoiding sensitive marine areas, and minimizing vessel time at any single given location (for example sitting at West Dock) to avoid disturbance of birds or mammals both onshore and offshore.

- To minimize impacts to onshore and offshore subsistence species and activities, Shell will utilize existing onshore facilities and infrastructure including an existing Deadhorse hotel, office space at the existing Carlile building, rental of existing Carlile yard space for short term Oil Response and Drilling equipment staging, and the leasing of ERA's terminal building to support crew change operations across the different function of Shell offshore drilling. By combining these operations, Shell will be able to maintain the smallest ecological footprint, better account for all Company Employees/contractors/inventories, and allow for the best utilization of Logistical Assets. Additionally, this reduces vehicular and helicopter activity by maximizing loads over shorter distance, sharing support equipment such as forklifts or loaders, and reducing Shell's visibility and possible impact among the other Oilfield operators. These mitigation measures will be continuously assessed using local subsistence advisors, as well as locally hired contractors and public comment.

Marine Mammals

- Marine mammal observers on the *Discoverer* and support vessels; see Marine Mammal Monitoring and Mitigation Plan

- A Marine Mammal Monitoring protocol

- Aircraft shall not operate below 1500 ft (457 m) unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, or unless engaged in providing assistance to a whaler or in poor weather (low ceilings) or any other emergency situations. Aircraft engaged in marine mammal monitoring shall not operate below 1500 ft (457 m) in areas of active whaling; such areas to be identified through communications with the Com-Centers. Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least 5 mi (8 km) inland until the aircraft is directly south of its offshore destination, then at that point it shall fly directly north to its destination

- Aircraft will not get closer than 500 yards (457 m) of groups of whales

- Aircraft and vessels will not operate within 0.5 mi (0.8 m) of walruses or polar bears when observed on land or ice

- When within 300 yards (274 m) of marine mammals, vessels will reduce speed, avoid separating members from a group and avoid multiple changes of direction

- Vessel speed to be reduced during inclement weather conditions in order to avoid collisions with marine mammals

- A polar bear culvert trap has been constructed in anticipation of oil spill response needs and will be deployed near Point Thomson or Kaktovik prior to drilling

Birds

- Lighting on the drillship will be shaded or replaced as appropriate to reduce the possibility of a bird collision with the drillship (see Appendix G)

Drilling Transit and Operations; Oil Spill Response

- Shell will recycle drilling muds (e.g., use those muds on multiple wells), to the extent practicable based on operational considerations (e.g., mud properties have deteriorated to the point where they cannot be used further), to reduce discharges from its operations. At the end of the season excess water base fluid, approximately 1500 bbl, will be pre-diluted to a 30:1 ratio with seawater and then discharged.

- Drilling muds are to be chilled in a heat exchanger to mitigate any potential permafrost thawing or thermal dissociation of any methane hydrates encountered during drilling

- To minimize impacts on marine mammals and subsistence hunting activities, the drillship and support vessels traversing north through the Bering Strait will transit through the Chukchi Sea along a route that allows for the highest degree of safety regarding ice conditions and sea states. Those vessels that can safely travel outside of the polynya zone will do so unless it is necessary to break ice (as opposed to managing ice by pushing it out of the way). In this case those vessels will move into the polynya zone far enough so that ice breaking is not necessary. If it is necessary for any vessel to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers.

- The transit route will avoid known fragile ecosystems and critical habitat areas

- The *Discoverer* and support vessels will not enter the Chukchi Sea until after July 1 which will minimize effects on marine mammals and birds that frequent open leads and minimize effects on spring bowhead whale hunting

- Ice management will involve preferentially redirecting, rather than breaking, ice floes while the floes are well away from the drill site

- 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 complete the critical operation before the arrival of the hazard at the drill site

- OSR vessels will be on standby at all times when drilling into zones containing oil to ensure that oil spill response capability is available, if needed

- Real-time ice and weather forecasting will be available to operations personnel for planning purposes and to alert the fleet of impending hazardous ice and weather conditions.

With regard to bowhead whales, DCOM has designated the following areas for subsistence uses related to bowhead whales. A description of techniques for minimization and mitigation of impacts to the subsistence use of bowhead whales follows the description of each area.

Kaktovik: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from August to October: The area circumscribed from Anderson Point in Camden Bay due north to the coastal zone boundary, to Humphrey Point due north the coastal zone boundary.

Response:
Shell's planned 2010 Camden Bay exploration drilling program will avoid impacts to the Kaktovik fall bowhead whale subsistence hunt. The primary mitigation measure focused on the bowhead subsistence hunt is that exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run to November 1, 2010, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. All vessels will either proceed from the Camden Bay project area to the northwest and remain north of latitude 71.25° N and west of longitude 146.4° W during these whale hunts as depicted on the imbedded Figure 1.1 from the EP, or leave the Beaufort Sea entirely. This location has been historically agreed to between industry and whaling captains as sufficiently distant from the traditional bowhead whale subsistence hunt areas of Kaktovik and Cross Island.

Furthermore, 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 Associations in order to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale migration, as well as the timing and status of other subsistence hunts. The Communication Plan includes procedures for coordination with Communication and Call Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed activities in 2010. Shell will employ local Subsistence Advisors from the Beaufort and Chukchi Sea villages to provide consultation and guidance regarding the whale migration and subsistence hunt.

Aircraft engaged in marine mammal monitoring shall not operate below 1500 ft (457 m) in areas of active whaling; such areas to be identified through communications with the Com-Centers.

Nuiqsut: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from August to October: The area circumscribed from the Nechelik Channel of the Colville River due north to the coastal zone boundary, to the eastern point of Flaxman Island due north to the coastal zone boundary and due south to the shore.

Response:
Shell's planned 2010 Camden Bay exploration drilling program will avoid impacts to the Nuiqsut fall bowhead whale subsistence hunt. The primary mitigation measure focused on the bowhead subsistence hunt is that exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run through October 31, 2010, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. All vessels will either proceed from the Camden Bay project area to the northwest and remain north of latitude 71.25° N and west of longitude 146.4° W during these whale hunts as depicted on the imbedded Figure 1.1 from the EP, or leave the Beaufort Sea entirely. This location has been historically agreed to between industry and whaling captains as sufficiently distant from the traditional bowhead whale subsistence hunt areas of Kaktovik and Cross Island.

Furthermore, 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 Associations in order to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale migration, as well as the timing and status of other subsistence hunts. The Communication Plan includes procedures for coordination with Communication and Call Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed activities in 2010. Shell will employ local Subsistence Advisors from the Beaufort and Chukchi Sea villages to provide consultation and guidance regarding the whale migration and subsistence hunt.

Aircraft engaged in marine mammal monitoring shall not operate below 1500 ft (457 m) in areas ofactive whaling; such areas to be identified through communications with the Com-Centers.

Barrow Fall Subsistence Area: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from September to October: The area circumscribed from the mouth of Tuapaktushak Creek due north to the coastal zone boundary, to Cape Halkett due east to the coastal zone boundary.

Response:
Following suspension of all drilling operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts and through the conclusion of those hunts, then the *Discoverer* and support vessels will return from latitude 71.25° N and west of longitude 146.4° W to resume activities in Camden Bay or will have already left the Beaufort Sea entirely. If the Discoverer resumes drilling program activities in Camden Bay, these activities will be nearly 150 miles east of Cape Halkett the easternmost boundary of the Barrow Fall Subsistence hunt area. Given this distance the Camden Bay exploration drilling program will entirely avoid impact to the fall bowhead whale subsistence harvest in Barrow. Should it be argued that whales would be diverted in their westward migratory path by drilling activities during late September or October, temporary diversions of the swim path of migrating whales have been documented yet the whales have generally been observed to resume their initial migratory route within a distance of 6-20 mi or 10-30 km (Davis 1987; Brewer et al. 1993; Hall et al. 1994). The cited and other studies conducted to test the hypothesis of the deflection response of bowheads have determined that bowheads return to the swim paths they were following at relatively short distances after their exposure to the received sounds.

If the Discoverer has left the Beaufort Sea entirely prior to the Barrow fall bowhead subsistence harvest, then impacts to the fall bowhead whale subsistence harvest in Barrow will entirely be avoided. Even transit by all vessels associated with the drilling program will have occurred prior to the harvest along a route(s) chosen to avoid impacts to subsistence via the implementation of the Communication Plan via the Com and Call center network.

Wainwright Fall Subsistence Area: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from September to October: The area circumscribed from Point Franklin due north to the coastal zone boundary, to the Kuk river mouth due west to the coastal zone boundary.

Response:
If the Discoverer resumes drilling program activities in Camden Bay, Beaufort Sea following the conclusion of the Kaktovik and Nuiqsut hunts, these activities will be hundreds of miles east of Point Franklin on the Chukchi Sea coast, the easternmost boundary of the Wainwright Fall Subsistence hunt area. Given this distance the Camden Bay exploration drilling program will entirely avoid impact to the fall bowhead whale subsistence harvest in Wainwright.

If the Discoverer has left the Beaufort Sea entirely prior to the Barrow fall bowhead subsistence harvest, then impacts to the fall bowhead whale subsistence harvest in Wainwright will entirely be avoided. Even transit by all vessels associated with the drilling program will have occurred prior to the harvest along a route(s) chosen to avoid impacts to subsistence via the implementation of the Communication Plan via the Com and Call Center network.

To minimize impacts on marine mammals and subsistence hunting activities, the drillship and support vessels will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drillship and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers.

Point Hope Fall Subsistence Area: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from September to October: The area circumscribed from Cape Lisburne due north to the coastal zone boundary, to Cape Thompson due south to the coastal zone boundary.

Response:
If the Discoverer has left the Beaufort Sea entirely prior to the Barrow fall bowhead subsistence harvest, then impacts to the fall bowhead whale subsistence harvest in Point Hope will entirely be avoided. Even transit by all vessels associated with the drilling program will have occurred prior to the harvest along a route(s) chosen to avoid impacts to subsistence via the implementation of the Communication Plan via the Com and Call center network.

To minimize impacts on marine mammals and subsistence hunting activities, the drillship and support vessels will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drillship and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers.

(b) Reasonably foreseeable adverse impacts potentially include the temporary deflection of bowhead whales from their migratory route that may result in increased effort, risk, and expenses associated with additional travel to conduct the subsistence hunt.

The planned drilling program may have some level of disturbance on subsistence species such as bowhead whales, beluga whales, and seals. Sound associated with drilling activities varies considerably with ongoing operations, location, and environmental factors. In addition, marine mammal responses to drilling sound are variable. Nonetheless, the great concern expressed by residents on the North Slope of Alaska of the effects of drilling sound on the success of subsistence hunts is noted (MMS 2003).

The bowhead whale is of primary importance because it provides for a cultural basis for sharing and community cooperation and is the foundation of the Inupiat sociocultural system (MMS 2003). Impacts on Inupiat bowhead whalers may occur if whales are deflected seaward (further from shore) in the traditional hunting areas north of Point Thomson in Camden Bay. Some bowhead whales in the vicinity of the planned drilling program might be expected to respond to sound by changing their speed and direction, thus avoiding close encounters of these sound sources. Bowhead whales exposed to drilling operations could experience temporary, nonlethal effects, and some avoidance behavior could persist up to 12 hours (MMS 2003). Whaling crews may have to travel greater distances to intercept westward migrating whales, thereby increasing risk for whaling crews and/or limiting chances of successfully striking and landing bowheads.

Seals, beluga whales, polar bears, and walrus may also respond to drilling activity that could potentially interrupt subsistence activities. However, these species are often closely associated with ice-covered waters (Burns 1967; Kelly 1988; Richard et al. 1998; Durner et al. 2004; Angliss and Outlaw 2005) or use coastal haulouts in the case of the spotted seal (Angliss and Lodge 2002). During the drilling season, the planned drilling program will be well away from coastal haulouts and likely well away from ice-covered waters.

Impacts from drilling sound to subsistence users or subsistence resources are likely to be low given the project location and time of season of project activities. Potential disturbance by drilling activity may only affect Fall whaling rather than Spring whaling. The planned drilling program will not occur during the time of Spring bowhead migration; therefore, drilling sounds will be nonexistent during the Spring bowhead migration. In addition, exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run to November 1, 2010, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts.

The *Discoverer* and support vessels will leave the Camden Bay project area and will return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude. Activities will extend to November 1, depending on ice and weather.

The planned drilling program is likely not in prime hunting areas that are easily reached by subsistence hunters. The general location of the planned drilling program in the Camden Bay area is approximately 45 mi (72 km) from Cross Island (a subsistence area for Nuiqsut residents), and 60 mi (97 km) from Kaktovik.

Additional information regarding effects of sound on marine mammals.
Marine mammals generally respond to anthropogenic sound in a number of ways including avoidance, alteration of breathing and diving behavior, and alteration of calling behavior (Richardson et al. 1995; National Research Council 2003; National Research Council 2005; Southall et al. 2007; Draft Comprehensive Report 2009). Investigations conducted in relation to previous exploratory drilling programs in Camden Bay have indicated that distribution and behavior of bowhead whales may be impacted to a distance of 10-17 kilometers (6-10 miles). Other marine mammals including the beluga whale and ice seals also exhibit varying levels of response to anthropogenic sound with belugas relatively more reactive than bowheads and pinnipeds generally less reactive. While Camden Bay is located between the primary bowhead whale hunting areas, other subsistence hunting activities do occur in the nearshore Camden Bay area and hunters have reported past impacts to hunting prior to adoption of conflict avoidance measures.

To the extent possible sound-producing activities will be separated from traditional hunting areas and activities in space and/or time. The current exploration plan includes measures at virtually all phases of operation that are designed to reduce or mitigate potential impacts of sound production. Transit plans are established in both space and time to avoid critical hunting areas and times, such as beluga hunting in the Chukchi coastal villages. Drilling operations will cease in Camden Bay by August 25 and vessels related to drilling operations will be moved out of identified traditional hunting areas until after completion of the bowhead hunt of the villages of Kaktovik and Nuiqsut.

Transit and other operations in hunting areas remote from Camden Bay will be coordinated with local hunters through the use of communication centers and subsistence advisors.

For the proposed 2010 drilling operation the *Discoverer* will be utilized, which acoustic modeling of underwater noise (JASCO Research Limited 2007) indicates will emit sound at a lower level relative to rigs previously used in Camden Bay exploratory drilling. Modeled sound levels for the drillship predict the sound of this acoustic source will not exceed 160 dB beyond 35m from the drillship. Operational sound assessments will be conducted prior to drilling and sound mitigation measures will be identified and implemented potentially including both physical sound reduction measures and operational measures.

In addition to extensive autonomous acoustic recording networks that have been deployed by Shell in the

Beaufort Sea since 2007 (Draft Comprehensive Report, 2009), real-time acoustics measurements will be conducted around the drilling and other vessel operations to monitor sound production and identify opportunities for additional operational mitigation measures. Aerial and vessel based monitoring programs will also be in place to assist in the assessment of operational protocols. Aircraft operating in support of drilling operations will fly at a minimum elevation of 1,500 ft except during takeoffs and landings at Deadhorse and the drillship to avoid disturbing land animals, birds, marine mammals and whale that might cause them to divert from their traditional migratory routes. The aircraft will depart Deadhorse, fly 5 miles inland from the shore to a location near Pt. Thomson, turn northward, and fly through the Mary Sachs Entrance directly to the drill site. They will return to Deadhorse along the same flight path. This flight path was chosen after consultation with AEWC and NSB to further avoid impacts to marine mammals and whales. Both the increased elevation and the aircraft transit route were discussed with NSB residents to capture traditional knowledge about wildlife migratory patterns and to reach consensus on the best way to avoid impacting passage and movement of wildlife during aircraft operations.

Vessel activities will observe sound and disturbance reduction protocols, including reduction of speed and course adjustment management, when operating in proximity of marine mammals and other subsistence resources. Marine mammal observers will be on duty during all daylight hours to reduce the potential for negative interactions with marine mammals and other wildlife resources.

Known fragile ecosystems and habitats in the project area.
Using Environmental Sensitivity Index Maps, North Slope, Alaska, published by NOAA in 2005, known fragile ecosystems and critical habitats in the Beaufort Sea in the regional area of the drill sites include the Stefansson Sound boulder patches, concentrated offshore between Prudhoe Bay and Foggy Island Bay, and the onshore Arctic National Wildlife Refuge (closest point is Brownlow Point to the south of the drill sites). Small areas of boulder patch also occur offshore near Brownlow Point and near the Stockton Islands. As noted in the EIA Section 3.9 (Appendix H of the EP) these habitat areas are well outside the Torpedo and Sivulliq drill sites where the drillship *Discoverer* and its support vessel will be working. Resupply vessel traffic from West Dock to the drill sites will avoid the boulder patches by transitting outside the barrier islands until west of the boulder patch areas, and then will traverse south to West Dock.

During transit through the Chukchi and Beaufort Seas to get to the drill sites (as noted in Figure 13.1 of the EP and Figure 2.0-1 of the EIA), planned vessel travel routes will avoid critical habitat areas (i.e. Ledyard Bay Critical Habitat Area). In addition, the planned transit route is located well offshore and as a result will avoid any other potential important non-designated habitat in the nearshore.

Section 3.11.7 of the Shell Environmental Impact Analysis identifies the subsistence resources and general trends of subsistence resource use by the villages of the Beaufort coast in relative proximity to the project area. The Camden Bay area utilized for subsistence hunting for a variety of species including ice seals, waterfowl, polar bear, and onshore species including caribou.

With the exception of bowhead whales, the majority of these hunting areas, are located onshore, relatively nearshore (within 5-10 miles of shore), or on the barrier islands. Seals and beluga whales are sometimes harvested opportunistically during offshore bowhead whale hunting activities and are subject to mitigation measures in place for the bowhead hunt.

(c) No response required.

(d) DCOM has designated the areas described above as subsistence use areas. Shell will shut down drilling operations during the fall Cross Island and Kaktovik bowhead whaling season from August 25 through the date when the harvest is completed. Cross Island is located approximately 45 mi (72 km) west of the drill sites area and Kaktovik is located approximately 60 mi (97 km) east of the drill sites area.

(e) No response required.

Explanation of Consistency:
The subsistence standard requires that projects within a designated area avoid or minimize impacts, to the maximum extent practicable (11AAC 112.900(a)), to subsistence use of coastal resources. Shell has conducted an evaluation of coastal resources (e.g., marine mammals, land mammals, fish, waterfowl, clams, crab, shrimp) general abundance, range and distribution, subsistence uses of those resources, and an assessment of the potential impacts to those coastal resources that could occur as a result of the project. Based on this evaluation, Shell has determined that potential impacts to subsistence uses can be avoided or minimized by designing the project to avoid impacts to the bowhead whale subsistence hunt and avoid or minimize impacts to other identified subsistence uses. Measures Shell will take to avoid or minimize impacts to subsistence activities include suspension of drilling operations on August 25 until the conclusion of the hunts for the villages of Kaktovik and Nuiqsut; communication and call centers and local subsistence advisors to provide consultation and guidance regarding the whale migration and subsistence hunt; aircraft altitude restrictions; and vessel routes and traffic measures.

Shell has evaluated potential impacts to subsistence use and appropriately designed the project to avoid potential impacts, and has taken appropriate measures to protect the environment from identified natural hazards. In addition, Shell currently holds an MMS-approved ODPCP. Based on Shell's evaluation and project design measures to avoid subsistence impacts, Shell has demonstrated consistency with the subsistence standard.

Review Participant Comments Regarding Consistency with the Subsistence Standard
On November 5, 2009, DCOM received timely comments from the Alaska Department of Fish and Game (ADFG) that found the proposal consistent with ACMP standards. ADFG also made the following recommendations regarding subsistence uses in the North Slope Borough:

- Copies of all data, reports and Shell-derived assessments resulting from the Subsistence Advisor efforts, by community, and Marine Mammal Observer activities, by ship, should be made available in a timely manner to the State and the North Slope Borough, Departments of Planning and Wildlife Management, for review and independent analysis. There are ongoing local, state and Federal subsistence harvest documentation, assessment and monitoring efforts in NSB communities which could benefit in a number of ways from access to the Subsistence Advisor-collected community subsistence data.

- The assessment of whether or not subsistence mitigation is performing as designed should be performed by a third party, preferably a non-profit entity representing Inupiat interests such as the Inupiat Community of the Arctic Slope (ICAS), or a similar entity.

- An adaptive subsistence mitigation and monitoring plan for the proposed exploration phase should be devised. The plan should also take into account and be tightly related to a long-term mitigation, monitoring and assessment framework should the proposed exploration evolve into full-scale development, production and transportation.

- Consideration should be given to establishing a locally-based (NSB or ICAS), state and federally funded, North Slope (Mineral/Energy Development) Subsistence Impact Screening/Review Committee to provide a local forum for systematically addressing region-wide subsistence mitigation, monitoring, and evaluation efforts, as well as developing recommendations on such efforts based on adaptive management principles. The number of existing, planned and potential mineral/energy projects within the boundary of the North Slope Borough is substantial and a more centralized mechanism to address subsistence issues should help streamline mitigation design, application review, and project implementation as well as resulting in more responsible resource development.

On November 9, 2009 the North Slope Borough submitted timely comments to DCOM that referenced the Subsistence statewide standard. These comments are summarized below.

1. The proposal is not consistent with the Subsistence standard because Shell cannot guarantee that the drilling program will avoid or minimize impacts, especially with regard to discharges of oil, muds and cuttings and other hazardous materials. Shell has taken measures to reduce impacts to subsistence whaling, but these measures do not avoid or minimize all potential impacts to subsistence from project activities.

2. The proposal does not avoid or minimize impacts to subsistence resources because it includes planned offshore discharges, rather than onshore disposal or other "zero discharge" methods. Industry has not demonstrated the ability to clean up oil in broken ice or fall freeze-up conditions.

3. NSB suggests an alternative measure that would change the timing of the project to a time of year when biological vulnerability and productivity are at a minimum, such as during winter months.

DCOM carefully considered NSB's comments and our analysis is below.

1. The management threshold for the Subsistence standard is to avoid or minimize impact to subsistence uses of coastal resources, for projects within a subsistence use area. NSB's comments go beyond the management threshold for this standard by saying that Shell must guarantee that the drilling program will avoid or minimize "all potential impacts" to subsistence. Shell is not required to make such a guarantee.

2. As stated above under the Energy Facilities standard, Shell's proposed discharges will be covered under the Arctic NPDES General Permit, which is consistent with the ACMP. EPA determines if the proposed discharges meet the standards of the Arctic NPDES GP. If EPA finds the discharges do not meet the standards of the GP, and an individual permit is required, DCOM and review participants would review that individual permit for consistency with the ACMP.

3. The NSB has not met the requirements under 11 AAC 110.435(a)(2)(B) because it has not adequately explained how the proposal is not consistent with the Subsistence standard, as detailed in items 1 and 2 above. In addition, NSB has not adequately explained how the proposed alternative measure, if adopted, would achieve consistency with the standard.

11 AAC 112.280. Transportation routes and facilities

Evaluation:
(1) The planned drilling program will not alter surface water or groundwater drainage patterns.

(2) The program will not disrupt terrestrial wildlife transit. Appropriate mitigation measures have been adopted to avoid and/or minimize disruptions or deflections of marine mammals. Section 4.0 of the EIA (Appendix H) details the environmental impacts of the following drilling activities: discharges or emissions: vessel traffic; vessel mooring and mudline cellar construction; aircraft traffic; sound energy from drilling and ice management; drill cuttings and drilling mud discharges; other permitted discharges; liquid hydrocarbon spill; and project air emissions. The environmental impacts of these drilling activities, discharges or emissions on wildlife transit are found in the following subsections: 4.1.10 (Marine Mammals); 4.1.11 (Coastal and Marine Birds); 4.1.12 (Fish and Shellfish); 4.1.13 (Terrestrial Mammals); 4.1.14 (Threatened and Endangered Species and Critical Habitat); and 4.1.19 (Potential Hydrocarbon Spills, Probabilities and Response Planning).

(3) Existing or traditional access will not be blocked.

Explanation of Consistency:
The Transportation routes and facilities standard requires that transportation routes and facilities avoid, minimize, or mitigate:
(1) alterations in surface and ground water drainage patterns;
(2) disruption in known or reasonably foreseeable wildlife transit; and
(3) blockage of existing or traditional access.

"Transportation routes and facilities" is defined at 11 AAC 112.990(28) as to include "natural transportation routes dictated by geography or oceanography, roads, highways, railways, air terminals, and facilities required to operate and maintain the route or facility."

Given the project location in the marine waters of the outer continental shelf, Shell proposes no alterations in surface and groundwater drainage patterns.

As described in its initial evaluation of consistency with this standard, Shell has implemented appropriate measures to avoid and minimize disruption of known and reasonable foreseeable wildlife transit that could result from vessel traffic to and from the project location.

Shell's demonstration of consistency with the coastal access standard ensures that the project will not cause blockage of existing and traditional access.

11 AAC 112.300. Habitats

Evaluation:
(b)(1) Offshore Areas
Some of the planned drilling activities will be conducted in habitats fitting the description of Offshore Areas. The planned Sivulliq N drill site is located approximately 16 miles north of the coastline in water depths of approximately 107 ft, and the planned Torpedo H drill site is located approximately 22 miles north of the coastline in water depths of approximately 120 ft. These drill sites, where most of the planned activities will occur, are located in Federal waters of the OCS, outside of the coastal zone. Vessel and aircraft servicing the operations at these drill sites will traverse Offshore Areas located within the coastal zone and located between the drill sites and the existing shorebase facilities at West Dock and the Deadhorse airport. These habitats are described in detail in Sections 3.2, 3.3, and 3.4 of the EIA in Appendix H of the EP.

The Statewide Standard for Offshore Areas is that they should be managed to avoid, minimize, or mitigate significant adverse impacts to competing uses, only to the extent that those uses are determined o be in competition with the proposed use. Uses of the coastal habitats in the area, including the subject Offshore Areas, are few and are described in detail in Section 3.12 of the EIA in Appendix H of the EP.

Potential effects on subsistence use were evaluated in detail in Section 4.1.17 of the EIA in Appendix H of the EP and are summarized in the Subsistence Section of this CPQ. The potential that the proposed activities could affect other land uses (excluding subsistence) was evaluated in Section 4.1.18 of the EIA in Appendix H of the EP; it was determined that the proposed activities will have no impact on these other land uses. Descriptions of the potential impacts and measures used to avoid or minimize any effect on these competing uses are summarized below.

Competing Uses: No commercial fishing occurs in offshore waters of the Beaufort Sea at the proposed drill site; none is allowed under the current Arctic Fishery Management Plan. The nearest commercial fishing is a small whitefish/cisco fishery conducted in the delta Colville River more than 100 miles from the drill sites and more than 50 miles from the planned shorebase facilities, therefore there will be no competition between this use (commercial fishing) and the proposed use. Recreational fishing is not known to occur in Offshore Areas of the Beaufort Sea. Some recreational fishing may occur in coastal rivers;

helicopter flights associated with the proposed activities will traverse some of the rivers but will not impact recreational fishing. Any and all potential effects on commercial and recreational fishing have been avoided because of the location of the proposed project.

Besides subsistence (addressed in the Subsistence Section of this CPQ), the only other identified land uses of Offshore Areas in the Beaufort Sea are military activities (USCG) and shipping. Military activities in the U.S. Beaufort are described in Section 3.12.2 of the EIA (Appendix H of the EP), and are expected to consist of limited use of the USCG ice management vessels, primarily for scientific investigations. USCG air patrol operations may also increase in the area in the near future. Commercial shipping in the U.S. Beaufort is also limited, consisting largely of barge traffic bringing fuel and supplies to North Slope villages, some sealift barging of materials associated with oil and gas operations in and near Prudhoe Bay from other parts of the U.S. or the Mackenzie River area of Canada, and occasionally small cruise ships. The proposed drilling program includes the use of a drillship, ice management vessels, OSRB, and other support vessels that will be operated in a manner that avoids, minimizes, and mitigates impacts to these land uses (military activities, shipping). Barge traffic supplying villages is generally restricted to the area within a few miles of the coastline and will therefore occur 10-15 miles from the drill sites where the drillship and large support (ice management, anchor handler) vessel activity will occur, thus most or all opportunity for competition between the proposed activities and barge traffic will be avoided. Potential effects on other shipping and military activities will be minimized by Shell's filing of a Local Notice to Mariners that will provide the operators of other vessels with information on when and where Shell's drilling activities will occur. Vessel traffic will also be coordinated through the use of normal USCG and industry vessel communications protocols to avoid potential conflicts and ensure safe operations. The proposed activities will therefore be expected to have no impact on these land uses.

Project activities in the Offshore Areas are also subject to federal regulations regarding the planned drilling program, ODPCP, air emissions, NPDES discharges, and potential interactions with protected and endangered species. The mechanisms to be employed during the proposed drilling program to avoid, minimize, and mitigate adverse impacts to offshore areas and barrier islands and lagoons include the following: the use of planned travel corridors for aircraft and vessel transit to avoid or minimize impacts to marine and terrestrial mammals and birds; the siting of the drilling operations offshore and the use of existing onshore support facilities to avoid modification of coastal infrastructure or the physical coastline; posting of marine mammal observers on the Discoverer and support vessels; limiting aircraft operations to above 1,500 feet in elevation with exceptions for take-offs, landings, and HSE considerations; and restriction of operation of aircraft and vessels to no closer than 0.5 miles of observed walrus and polar bears.

(b)(6) Barrier Islands and Lagoons
Some of the planned drilling activities will be conducted in habitats fitting the description of Barrier Islands and Lagoons. The planned Sivulliq N drill site is located approximately 16 miles north of the coastline in water depths of approximately 107 ft, and the planned Torpedo H drill site is located approximately 22 miles north of the coastline in water depths of approximately 120 ft. These drill sites, where most of the planned activities will occur, are located in Federal waters of the OCS, outside of the coastal zone and more than 12 miles from the nearest barrier island. Barrier islands are located along the Beaufort Sea coastline, between the offshore drill sites and the existing shorebase facilities at West Dock from Camden Bay west to Prudhoe Bay. Lagoons lie shoreward of these barrier islands. These habitats are described in detail in Sections 3.2, 3.3, and 3.4 of the EIA in Appendix H of the EP. Vessel and aircraft servicing operations at the offshore drill sites will traverse Barrier Island and Lagoon habitats.

These operation aircraft and vessels will generally follow the travel corridors identified on Figure 13-2 in the EP. No other activities associated with the exploration drilling program are planned to occur in these Barrier Island and Lagoon habitats.

The Statewide Standard for Barrier Island and Lagoon habitats is that they should be managed to avoid, minimize, or mitigate significant adverse impacts to (A) flows of sediment and water, (B) alteration or redirection of wave energy or marine currents that would lead to filling in of lagoons or the erosion of barrier islands, and (C) the use of barrier islands by coastal species including polar bears and nesting birds.

Flow of Sediment and Water: Drilling will be conducted with a moored, floating drillship, more than 16 miles offshore and more than 12 miles from the nearest barrier island or lagoon. This is a floating structure on location for less than four months in water depths of more than 100 ft, and as discussed in Section 4.1.2 will have no effect on the flow of sediment or water. The operation of the West Dock Supply vessel along the route described in Figure 13-2 of the EP will also have no effect on sediment for water flow. Only existing shorebase facilities will be utilized at West Dock and at the Deadhorse airport, thus there will be no modification of coastal infrastructure or the physical coastline that could result in impacts to the flow of sediment and water in Barrier Island and Lagoon habitats. The selection of offshore drill sites and the use of existing coastal infrastructure for shorebase facilities avoids all impacts to Barrier Island and Lagoon habitats due effects on the flow of sediment and water.

Alteration or Redirection of Wave Energy or Marine Currents that Would Lead to Filling in of Lagoons or the Erosion of Barrier Islands: Drilling will be conducted with a moored, floating drillship, more than 16 miles offshore and more than 12 miles from the nearest barrier island or lagoon. This is a floating structure on location for less than four months in water depths of more than 100 ft, and as discussed in Section 4.1.2 will have no effect on wave energy or marine currents. The infrequent operation of the West Dock Supply vessel along the route described in Figure 13-2 of the EP will also have no effect on marine currents and will not result on erosion. Only existing shorebase facilities will be utilized at West Dock and at the Deadhorse airport, thus there will be no modification of coastal infrastructure or the physical coastline that could result in alteration or redirection wave energy or marine currents that would lead to filling in of lagoons or erosion of barrier islands. The selection of offshore drill sites and the use of existing coastal infrastructure for shorebase facilities avoid all impacts to Barrier Island and Lagoon habitats due to potential alteration of wave energy or marine currents.

Use of Barrier Islands by Coastal Species: The uses of barrier islands by birds, marine mammals, and polar bears are described in Sections 3.6, 3.7, 3.8.2 of the EIA in Appendix H of the EP. Drilling will be conducted with a moored, floating drillship, more than 16 miles offshore and more than 12 miles from the nearest barrier island or lagoon. Therefore drilling and associated offshore activities in the prospects have little or no opportunity to affect the use of barrier islands by birds and mammals. Vessel and aircraft servicing operations at the offshore drill sites will traverse Barrier Island and Lagoon habitats. These operation aircraft and vessels will generally follow the travel corridors identified on Figure 13-2 in the EP. No other activities associated with the exploration drilling program are planned to occur in these Barrier Island and Lagoon habitats.

The effects of vessel and aircraft traffic on birds, marine mammals, and polar bears are discussed in detail in Section 4.1.11 (pages 254-256), Section 4.1.10 (pages 245-247), and Section 4.1.14 (page 272) respectively in the EIA in Appendix H of the EP. Mitigation measures that will be implemented to avoid or minimize any effects of vessel and aircraft traffic on birds and marine mammals are detailed in Section 12 of the EP, in Section 4.3.3 of the EIA in Appendix H of the EP, and the most relevant measures concerning wildlife use of barrier islands are summarized below.

As discussed in the above-referenced impact assessment sections of the EIA, effects of aircraft and vessel traffic in the Barrier Island and Lagoon habitats will be limited to brief, temporary, behavioral responses by the birds and animals, including alert postures, attraction, flushing, deflection, and displacement. These effects will be avoided and/or minimized by the following:

- Marine mammal observers on the *Discoverer* and support vessels will direct the vessel master to avoid birds and animals in the path of the vessel; see Marine Mammal Monitoring and Mitigation

Plan

- Aircraft shall not operate below 1500 ft (457 m) unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, or unless engaged in providing assistance to a whaler or in poor weather (low ceilings) or any other emergency situations. 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. Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least 5 mi (8 km) inland until the aircraft is directly south of its offshore destination, then at that point it shall fly directly north to its destination

- Aircraft and vessels will not operate within 0.5 mi (0.8 km) of walrus or polar bears when observed on land or ice

Effects will also be minimized by the selection of aircraft traffic route. The aircraft travel corridor (EP Figure 13-2) was selected so that aircraft will travel over land for most of the route between the Deadhorse airport and the drill sites, traveling at least 5.0 miles inland of the coastline until perpendicular with the prospects, at which point the route turns and proceeds directly offshore. This route maximizes the amount of time the helicopter will be overland, minimizes the amount of any trip that will be over coastal habitats such as barrier islands, and restricts aircraft traffic to a small area. Given these mitigation measures, aircraft traffic will have little or no impact on the use of barrier islands by birds, polar bears, and other marine mammals.

Effects will also be minimized by Shell's selection of vessel traffic routes. The vessel travel corridor is indicated in EP Figure 13-1 for the fleet transit route, and EP Figure 13-2 for the West Dock Supply Vessel traveling between the prospects and the West Dock shorebase facilities. The fleet transit route is located more than 12 miles offshore of any barrier islands and will result in the avoidance of all effects on the use of barrier islands from drilling fleet transit. The supply vessel route between the prospects and West Dock traverses lagoon habitats, but will not approach barrier islands due to water depths required for vessel traffic. Additional mitigation measures as listed above (e.g. vessels will not operate within 0.5 mi (0.8 km) of walrus or polar bears when observed on land or ice) will further reduce the potential for effects on the use of barrier islands by polar bears and other marine mammals. Given these mitigation measures and the infrequency of planned vessel traffic between the prospects and shorebase, vessel traffic will have little or no impact on the use of barrier islands by birds, polar bears, and other marine mammals.

(c) No response required.

Explanation of Consistency:
Shell has determined that "offshore areas" and "barrier islands and lagoons" habitats apply to the proposed project. ***Offshore areas*** *must be managed to avoid, minimize or mitigate significant adverse impacts to competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use; and* ***barrier islands and lagoons*** *must be managed to avoid, minimize, or mitigate significant adverse impacts: (A) to flows of sediments and water; (B) from the alteration or redirection of wave energy or marine currents that would lead to the filling in of lagoons or the erosion of barrier islands; and (C) from activities that would decrease the use of barrier islands by coastal species, including polar bears and nesting birds. Shell conducted an evaluation of what potential competing uses, including subsistence, occur in these habitats and the potential effects of the proposed project on those competing uses. Based on this evaluation, Shell has implemented project designs and mitigation to avoid significant adverse impacts to uses by coastal species and competing uses in these habitats, as described above. Shell has demonstrated consistency with this standard.*

Review Participant Comments Regarding Consistency with the Habitats Standard
On November 9, 2009, NSB submitted timely comments regarding the Habitats standard, summarized below.

1. The project is not consistent with the requirements of the Habitats standard because it does not avoid, minimize or mitigate impacts to subsistence uses, for reasons discussed under the Energy Facilities and Subsistence standards in NSB's comments.

DCOM carefully considered these comments and provides the following analysis.

1. The NSB has not met the requirements under 11 AAC 110.435(a)(2)(B) because it has not adequately explained how the project is not consistent with the habitats standard, and has not offered an alternative measure that, if adopted, would achieve consistency with the standard.

11 AAC 112.310. Air, land, and water quality.

Evaluation: Notwithstanding any other provision of this chapter, the statutes and regulations of the Department of Environmental Conservation with respect to the protection of air, land, and water quality identified in AS 46.40.040(b) are incorporated into the program and, as administered by that department, constitute the exclusive components of the program with respect to those purposes. (Eff. 7/1/2004, Register 170)

In accordance with 11 AAC 110.010(e), for activities in the OCS, DCOM coordinated with the ADEC and issued that department's finding under AS 46.40.040(b)(2) and 11 AAC 110.010(e) of whether the relevant aspects of the activities satisfy the requirements of AS 46.03, AS 46.04, AS 46.09, or AS 46.14 and the regulations adopted under those statutes, as applicable.

DCOM defers to ADEC to determine consistency with 11 AAC 112.310, and hereby incorporates ADEC's Preliminary Findings of Consistency (Attachment A).

11 AAC 112.320. Historic, prehistoric, and archeological resources.

Evaluation:
(a) There are currently no designated areas within the North Slope coastal zone important to the study, understanding, or illustration of national, State, or local history or prehistory, including natural processes. Neither the State Historic Preservation Office (SHPO) nor MMS have documented sites within the exploration drilling program area that would be encountered by drilling or other seabed disturbing operations. Shallow hazards site clearance data did not detect any historic, prehistoric or archaeological resources at any of the planned locations (see Shallow Hazards reports submitted to MMS). Qualified MMS personnel also examine the site clearance data for potential hazards. If the shallow hazards site clearance data suggests potential resources lie below the seabed, further evaluation will be initiated in consultation with MMS and the State Historic Preservation Officer.

(b) This section is not applicable as the State has not designated an area within the North Slope coastal zone under (a) above.

AFFECTED COASTAL RESOURCE DISTRICT ENFORCEABLE POLICIES

The North Slope Borough does not currently have a coastal district plan with enforceable policies in effect.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
INDUSTRY PREPAREDNESS PROGRAM
DIVISION OF AIR QUALITY
DIVISION OF WATER

Final ACMP Consistency Review Findings
For
SHELL OFFSHORE INC.
BEAUFORT SEA EXPLORATION, NORTH SLOPE ALASKA
EXPLORATION PLAN
AND
OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN
January 22, 2010

INTRODUCTION

The Alaska Department of Environmental Conservation (ADEC) has reviewed Shell Offshore, Inc.'s Exploration Plan (EP), as well as the Shell Offshore, Inc.'s Oil Discharge Prevention and Contingency Plan (ODPCP) for the Beaufort Sea Offshore Exploration Drilling Program adjacent to the North Slope of Alaska.

The official submittal of Shell Offshore, Inc.'s Exploration Plan to the ADEC was on August 13, 2009 under the Alaska Coastal Management Program (ACMP) consistency review procedures and the public comment period began on September 1, 2009. The ACMP consistency review process clock was stopped on September 15, 2009 for a stop in Minerals Management Service's (MMS) federal review process, pending receipt and approval of materials regarding air emissions. The public comment period was restarted on September 21, 2009. The ACMP consistency review process was stopped again on Day-25 following the submittal of Request for Additional Information (RFAI) letters from ADEC and the North Slope Borough. ADEC's two RFAI letters were responded to by Shell Offshore, Inc. (SOI), but the responses were deemed inadequate on October 14, 2009. The public comment period was restarted on November 4 and the public comment period ended on November 9, 2009. Since this plan was reviewed under the ACMP, ADEC public notice procedures and deadlines did not apply.

This document outlines ADEC's final consistency review findings for the proposed activities as well as proposed conditions that DEC finds necessary for the plans to be considered consistent with Alaska statutes and regulations. The consistency review findings are provided below for each individual division. This findings document also discusses key points and other issues that were raised during ADEC's review of the Shell Offshore, Inc.'s Exploration Plan and responds to comments raised during the review.

Division of Spill Prevention and Response
Industry Preparedness Program Findings

The Department of Environmental Conservation Spill Prevention and Response Division has reviewed Shell Offshore, Inc.'s Exploration Plan, as well as the Shell Offshore, Inc.'s Oil Discharge Prevention and Contingency Plan (ODPCP) or C-Plan. The Spill Prevention and Response Division finds the Shell Offshore, Inc. Exploration Plan and

C-plan to be consistent with Alaska statutes and regulations if certain conditions are adopted by Shell. The following is a summary of the basis for the decision to find the Shell Offshore, Inc. Exploration Plan and Oil Discharge Prevention and Contingency Plan consistent with ADEC's portion of the Alaska Coastal Management Project (ACMP) review process. Our consistency findings are also based on a review of the portions of the Alaska Clean Seas (ACS) Technical Manual, revised May 2008 and/or Shell's Beaufort and Chukchi Seas Regional Tactics Manual, revised March 2009 as referenced in the ODPCP.

Exploration Plan Summary

Shell Offshore, Inc. (SOI) has acquired numerous offshore leases in the Outer Continental Shelf (OCS) within the Beaufort Sea, Alaska and plans an offshore exploration drilling project for the summer of 2010. The exploration drilling will take place in federal waters and will consist of one drilling ship, the Frontier Discoverer. Drilling under the submitted Exploration Plan is set to commence on or about July 10, 2010 and continue until no later than October 31, 2010. The start date is dependent upon ice conditions within the exploration area and having the required permits in place. Shell will have additional vessels in the area to support drilling operations. Drilling operations support includes crew and supply transports, fuel storage, and ice management vessels. There are no portable tanks or crude oil transmission pipeline associated with this exploration project.

Response Planning Standard

The Response Planning Standard (RPS) used for Shell's Beaufort Sea Exploration Plan ODPCP is the same RPS that was used for the 2007 plan. This RPS included an emulsion recovery efficiency factor of 1.54, as well as adding 20% to the required RPS volume to account for free water being recovered along with the oil. The 1.54 multiplier was based on the 1993/94 Prince William Sound Anvil Study. This expansion factor is used in determining the overall storage tank requirements for spill response. The storage requirement then is the calculated sum of the recovered oil subject to the ADEC emulsion recovery rate and the volume of recovered water. The Anvil Study model was the closest model for an emulsification factor in Arctic conditions. This emulsification factor is larger than any other currently used in other approved North Slope ODPCPs. Utilizing the MMS standard and then adding the ADEC recovery factors produces a total response planning standard for this exploration project as follows: [(165,000 x 1.54 = 254,100) + (165,000 x .20=33,000)] = 287,100 barrels of oil. With the calculations noted here, Shell's ODPCP adequately addresses oil spill response for a well blowout during exploration.

Oil Discharge Prevention and Contingency Plan Summary

The Oil Discharge Prevention and Contingency Plan (ODPCP), also referred to as the C-Plan, is required by the Minerals Management Service regulations to accompany Shell's Exploration Plan. This C-Plan provides information on Shell's plans, policies and procedures for preventing spills and in the event of a spill, for mitigating the impact on the environment. It should be noted that while Shell's Exploration Plan is only applicable for the 2010 drilling season, Shell's Oil Discharge Prevention and Contingency Plan has been submitted as a multi-year plan. Shell acknowledges that locations for drilling have not been identified for the 2011 and 2012 drilling seasons and that information will be provided as an amendment to the current ODPCP. Any proposed amendment will be required to go through a public comment period as required by 18 AAC 75.455 and the ACMP program regulations.

Regulatory Requirements of 18 AAC 75.

<u>18 AAC 75, Article 2- Financial Responsibility for Oil Discharges</u>

Vessels traversing Alaska waters on their way to the Arctic Outer Continental Shelf will need to comply with the financial responsibility requirements found at 18 AAC 75.205 – 18 AAC 75.290, as well as non-tank vessel and tank vessel ODPCP requirements found at 18 AAC 75.400 – 496, as applicable.

SPAR Condition 1

In order to be consistent with Alaska statutes and regulations, Shell Offshore, Inc. must provide information on vessel routes towards Outer Continental Shelf drilling locations in order for ADEC to determine if the exploration project vessels will be traversing Alaska state waters. Figures 13-2 and 2.2-1in the Exploration Plan identify a transit route that is within state waters for “drilling support vessels, but does not identify specifically which vessels fall under that heading and will be subject to financial responsibility requirements. If it is determined that Shell Offshore, Inc. exploration project vessels have traversed or will traverse Alaska state waters, Shell will be required to apply for all applicable tank and non-tank vessel oil discharge prevention and contingency plans as required by AS 46.04.030 and 18 AAC 75.400. All Shell vessels transiting state waters must also comply with the financial responsibility requirements of 18 AAC 75.205 – 18 AAC 75.290, as applicable.

18 AAC 75, Article 4 – Oil Discharge Prevention and Contingency Plans

Article 4 of 18 AAC 75 covers the requirement for oil discharge prevention and contingency plans. SOI.’s plan must be consistent with the following sections:

<u>18 AAC 75.415 – Application for Amendment</u>

Once approval has been given for a C-Plan, substantial changes require an amendment as per 18 AAC 75.455. ADEC requested information regarding specific drilling locations for the 2011 and 2012 drilling seasons. Shell Offshore, Inc. has indicated that information on drilling locations for these future years was not available as the locations are unknown. Specific information on drill sites is required in the C-Plan for the department to determine if the requirements for response equipment and timely deployment are being met in light of spill trajectories. Shell’s plan will adequately meet the requirements of this section if the following condition is adopted.

<u>SPAR Condition 2</u>

Shell needs to provide DEC with information regarding specific drilling locations for the 2011 and 2012 drilling seasons. If Shell proposes to make any changes that go beyond a routine plan update as defined in 18 AAC 75.415(b), Shell must submit changes to DNR’s Division of Coastal and Ocean Management (DCOM) and ADEC at least 90 days prior to any changes taking place to allow sufficient time for DCOM and ADEC to review the changes under 18 AAC 75.455 and provide opportunities for public comment.

If drilling activities for 2011 and 2012 are found to be inconsistent with State regulations by virtue of the addition of drilling locations where weather data would yield different oil spill trajectory results, the requirements of 18 AAC 75.455 will be invoked and Shell Offshore, Inc. will be required to provide amendments to blowout scenarios to reflect those additional drilling locations. The Minerals Management Service (MMS) has advised the State of Alaska that they will provide any information necessary for the State to monitor and confirm that future drilling activities continue to be in compliance with the approved EP and applicable federal and State regulations prior to the MMS approving any Application for Permit to Drill (APD).

18 AAC 75.425. Oil Discharge prevention and contingency plan contents.
This section covers the requirements for oil discharge prevention and contingency plan contents. Shell Offshore, Inc.'s plan is analyzed below by section.

18 AAC 75.425(e)(1)(F) – Response Action Plan, Response Scenario - including site-specific strategies for protection of environmentally sensitive areas and areas of public concern identified under 18 AAC 75.425(e)(3)(J). Pursuant to 18 AAC 75.425(e)(1)(F), the C-Plan must contain a description of the discharge containment, control, and cleanup actions to be taken, which clearly demonstrates the strategies and procedures to conduct and maintain an effective response, presented in the form of a response scenario to a discharge of the response planning standard (RPS) volume.

Based on our review, the response scenario provides a logical plan of action with tactics, equipment, and personnel requirements identified in the AES Response Tactics Manual, ACS Technical Manual or maintained on site sufficient to demonstrate a response to a discharge equal to the RPS volume for a well blowout, which is the largest potential spill, in addition to smaller spills. ADEC has determined that Shell's plan will adequately meet the requirements of this section if the following condition is adopted.

SPAR Condition 3
Because the response scenarios rely on the use of response contractors for their implementation, Shell Offshore, Inc. must commit to immediately notifying the MMS and ADEC in writing of any change in the contractual relationship with the plan holder's response action contractor, and of any event, including, but not limited to any breach by either party to the response contract that may excuse a response contractor from performing, that indicates a response contractor may fail or refuse to perform, or that may otherwise affect the response, prevention, or preparedness capabilities described in the approved plan.

18 AAC 75.434 – Response planning standard for exploration or production facilities.
The ADEC response planning standard (RPS) volume for an exploration facility, as defined at 18 AAC 75.434, is 16,500 barrels of oil for the initial 72 hours of a well blowout and an additional 5,500 barrels of oil per day (bopd) for the next 12 days following the initial 72 hours period, for a total of fifteen days. This response planning standard volume would yield a total RPS volume of 82,500 barrels of oil cumulative over the fifteen day period. However, since Shell's exploration drilling will be taking place in the Outer Continental Shelf (OCS) in federal waters, the Minerals Management Service (MMS) standards require that the well blowout scenario be based on an oil well blowout scenario lasting 30 days. Using that standard, the RPS for this exploration project would

be 5,500 bopd for a duration of 30 days. This MMS standard yields a total 165,000 barrels of oil.

18 AAC 75.425(e)(1)(F)(ix) – Response scenario requirements for an exploration facility. The ADEC response scenario standards require that a plan holder plan for the storage and transfer of recovered fluids.

18 AAC 75.434(a)(1) – Response planning standards for an exploration facility. This standard requires that a plan holder can control, contain, and clean up an oil discharge within the required 15 days plus 72 hours for a spill to open water.

During the consistency review process ADEC asked several questions regarding the Arctic tanker that will be used for the storage of recovered fluids in the event of an oil spill. Shell's ODPCP states "An oil storage tanker with a planning storage capacity of 513,000 barrels will be located between 25 nautical miles (nm) and 300 nm from the drilling location to begin mobilizing immediately in the event of a spill. The tanker arrives at the blowout and is ready to accept recovered fluids within 30 hours. This timing is based on a ten knot transit speed. This ice-classed tanker has service speed of 16 knots, and an estimated 12 knots transit speed in ice. So, even during adverse weather, the conservative ten knot transit speed provides sufficient time for the tanker to transit and to arrive on-scene." In MMS's Lease Stipulations it is stated by the MMS that the Arctic tanker cannot transit at a speed of greater than nine knots in the Beaufort Sea to ensure that marine mammals are not disturbed.

SPAR Condition 4

Shell must revise the response scenarios (1 and 2) and the response strategy for varying ice conditions to ensure that a nine knot transit speed is noted in the ODPCP. Shell provided information to ADEC on December 3, 2009 that indicated that the transit time for the tanker would change from 30 hours to 33.5 hours for a nine knot transit speed. This is not a significant change in response time since the time-to-fill calculation is premised upon a 42 hour timeframe. Consequently, the change in response time due the MMS lease stipulation's nine knot transit speed limitation would not alter Shell's ability to meet the response planning standards. Shell must also ensure that all other references to transit speed of the Arctic tanker reflect a transit speed of nine knots.

18 AAC 75.425(e)(3)(G): Non-mechanical response information – if a non-mechanical options such as dispersant use or in-situ burning is proposed as a response option, the plan must include a description of the specific mechanisms in place to assess the environmental consequences of the non-mechanical response option and to provide continuous monitoring of environmental effects.

SPAR Condition 5

Since in-situ burning is proposed as a potential method of spill response, Shell Offshore, Inc. must revise the plan to include a description of the methods that will be employed to remove burn residue from the water consistent with the requirements at 18 AAC 75.445(h) and 18 AAC 75.425(e)(3)(G). This revision will invoke the requirements of 18 AAC 75.415 and 18 AAC 75.455. Any proposed amendment will be required to go through a public comment period as required by 18 AAC 75.455(b)(1) and the ACMP program regulations.

Water Division Findings

The Department of Environmental Conservation has reviewed Shell Offshore Inc.'s 2010 Exploration Plan and Shell Offshore, Inc.'s Notice of Intent (NOI) for coverage under the EPA Oil and Gas Exploration NPDES General Permit (AKG280000), which ADEC had previously certified. ADEC finds that compliance with the standards of the EPA NPDES Arctic General Permit will result in compliance with State water quality standards.

Air Quality Division Findings

The Department of Environmental Conservation Air Quality Division has reviewed Shell Offshore, Inc.'s Exploration Plan (EP) and Oil Discharge Prevention and Contingency Plan (ODPCP) regarding air quality issues. The Department of Environmental Conservation finds the Shell Offshore, Inc. exploration plan will be consistent with Alaska Air Quality Statutes and Regulations if certain conditions are adopted.

Air Quality Condition 1

In order to be consistent with Alaska statutes and regulations, specifically AS 46.14 and 18 AAC 50, the Exploration Plan and federal permit approval must contain a condition that the owner or operator will not cause or contribute to a violation of an ambient air quality standard or the standards of 18 AAC 50.110 (Air Pollution Prohibited).

Air Quality Condition 2

The EPA OCS air quality permits must maintain a binding legal certification statement for OCS permit notices and reports, as it is important for federal regulators to be able to prosecute fraudulent reporting. In order to be consistent with Alaska statutes and regulations, the federal permit approvals need to contain statements of binding legal certification for the applicant to sign. "*Based on the information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete*".

Air Quality Condition 3

Alaska statutes and regulations at 18 AAC 50.544(c)(3) contain language regarding maintenance on the stationary source's equipment meeting the manufacturer's or operator's maintenance procedure standards. In order to be consistent with Alaska Statutes and Regulations, AS 46.14 and 18 AAC 50, the Exploration Plan and federal approvals need to include the conditions required by 18 AAC 50.544(c)(3).

Air Quality Condition 4

Alaska Statutes require that fuel-burning equipment are subject to 18 AAC 50.055(a) for visible emissions, 18 AAC 50.055(b) for particulate matter emitted from an industrial or fuel burning equipment, and 18 AAC 50.055(c) for sulfur emissions. It is not clear from the information provided in Shell's Exploration plan if the modeling or demonstrations were performed at worst case conditions. In order to be consistent with Alaska Statutes and Regulations, AS 46.14 and 18 AAC 50, the applicant must demonstrate to the permitting authority that all the requested fuel burning equipment will meet the above noted standards for worst case operating conditions.

CONCLUSION
Based on a review of Shell Offshore, Inc.'s Exploration Plan, and Shell Offshore, Inc.'s Oil Discharge Prevention and Contingency Plan (ODPCP), supporting materials, clarifications and comments received, ADEC final findings are that the project will be consistent with Alaska statutes and regulations if the conditions as noted are adopted by Shell Offshore, Inc. as part of their Exploration Plan and Oil Discharge Prevention and Contingency Plan.

PUBLIC REVIEW COMMENTS
This section contains the Department's response to written and oral comments submitted during the ACMP consistency review period. All written and oral comments have been carefully considered by the Department. This document does not attempt to respond to each specific comment, but does provide a summary response to key issues raised during the public comment process.

I. ODPCP Issue 1: Non-tank Vessel C-Plan and Financial Responsibility.

Comment: Tank, and Non-tank Vessel Plans and Financial Responsibility: *The commenter asserted that Shell has not provided data on either the tank- nor the non-tank vessels supporting this exploration plan, demonstrating that Shell, and/or its contractors, have proven adequate financial responsibility to operate in the Beaufort Sea. Further, the commenter has not seen that Shell and/or its contractors have approved ODPCPs in place for these tank- and non-tank support vessels.*
ADEC Response: SPAR Condition 1 addresses the requirements to ensure that tank vessel and non-tank vessel ODPCP's and financial responsibility are met prior to any vessels entering state waters.

Comment: Fuel Spill Volume is Underestimated: *The commenter noted that the worst case fuel spill is estimated at 2,000 gallons based on a fuel transfer spill. However, the EP shows that the Frontier Discoverer has a fuel storage capacity of 6,497 bbls (272,874 gallons), along with additional capacity in other upper wing tanks.*
ADEC Response: Shell's ODPCP has adequate resources and spill strategies to address a catastrophic fuel storage spill. The response planning standard for this project is 287,100 bbls of crude oil as described in the earlier part of this document. Shell has sufficient equipment and personnel on site to control, contain and clean up all other types of spills, as well as a sub-sea well blowout that is planned for in the ODPCP. Shell has included a response strategy for responding to a fuel transfer spill in which the volume is 3,132 gallons. This volume is 2,000 gallons of fuel entering open water, and a 1.54 emulsification factor as well as 20% for free water. Tactics for responding to fuel spills and other operational types of spills can be found in the ACS Technical Manual, which is incorporated by reference into the ODPCP.

Comment: Vessels Discharges Pose Significant Environmental Risks to Subsistence Activities and Marine Habitats: *The commenter was concerned that support vessels proposed by Shell present a spill risk both during oil transfer operations and in transit.*

<u>ADEC Response:</u> Oil exploration drill rigs and support vessels present a spill risk, which is why Shell is required to submit an Oil Discharge Prevention and Contingency Plan (ODPCP). Shell's ODPCP will adequately address prevention and spill response if ADEC's conditions are adopted.

II. ODPCP Issue 2: Response Planning Standards

<u>Comment: Realistic Maximum Oil Discharge Rate is Technically Unsupported</u>: *The commenter was concerned that Shell has not provided data to substantiate that the 5,500 bbl/day blowout rate is representative of the historical Sivulliq and Torpedo prospect. The commenter also questioned the use of 5,500 barrels of oil per day (bopd) as the conservative worst case discharge for an exploration well in the Beaufort Sea.*
<u>ADEC Response:</u> The response scenario that Shell has included in the plan meets the state's requirements for response planning standards. ADEC regulations at 18 AAC 75.434(d) address the requirements if the actual flow rate of an exploration well exceeds 5,500 barrels per day. It should be noted that according to records released for the Kuvlum #1 exploratory well drilled in 1992 by ARCO (located 20 miles away from the proposed Sivulliq prospect) the flow rate for that well was 3,400 bopd.

<u>Comment: Fall Oil Recovery Estimates Are Unsubstantiated</u>: *The commenter asserted that Shell's ODPCP recovery factor assumptions far exceed field test data results. Year 2000 Beaufort Sea field trials demonstrated that the maximum operating limit for the barge-based mechanical recovery system in ice-infested waters was 0-1% in fall ice. Shell's recovery estimates are in direct conflict with a 1998 MMS study that assessed spill response tactics and clean up capabilities for large blowouts in broken ice, a report MMS still relies on.*
<u>ADEC Response:</u> The recovery rates in Shell's plan meet the requirements of 18 AAC 75.434 and 18 AAC 75.425(e)(1)(F). Additionally, Shell provided a response scenario for typical summer conditions that shows containment of all discharged oil within the required 15 days plus 72 hour timeframe. Alaska regulations at 18 AAC 75.425(e)(3)(D) require the plan to describe realistic maximum response operating limitations and a description of response measures that will be taken to reduce the environmental consequences of a discharge, as well as an analysis of the frequency and duration of limitations that would render mechanical response methods ineffective. The environmental conditions listed include the presence of ice. Shell's ODPCP Response Strategy 1 addresses a sub-sea blowout in varying ice conditions.

<u>Comment: Options for Oil Spill Recovery in Fall Freeze-up Conditions:</u> *The commenter expressed concern and questioned what would happen if mechanical response and in situ burning are both ineffective.*
<u>ADEC Response:</u> 18 AAC 75.425(e)(3)(G) requires Shell to provide "*a description of the specific mechanisms in place to assess the environmental consequences of the non-mechanical response option and to provide continuous monitoring of the environmental effects.*" While recovery of all oil is the goal, it may not be realistic to assume that all the oil can be cleaned up before freeze-up. Shell has also demonstrated that any oil left in the

environment can be tracked, and tactics to remove oil from ice (such as ice mining) have been proven effective on the North Slope.

<u>Comment: Meeting the Response Planning Standard under 18 AAC 75.430 – 442</u>*:* *The commenter expressed concern that Shell's ODPCP does not meet the State of Alaska standards under AS 46.04.030 and 18 AAC 75.430-442.*
<u>ADEC Response:</u> Shell has demonstrated that the response planning standard (RPS) volume from a sub-sea well blowout can be controlled, contained, and cleaned up within the required time frame as per 18 AAC 75.434(a)(1). Shell has also gone beyond ADEC requirements by adding in an emulsification factor of 1.54 and a 20% factor for free water recovery to their response planning standard. ADEC evaluated the ODPCP using the standards set out in AS 46.40.030 and 18 AAC 75.425. The 30 day response scenario identifies appropriate response equipment and tactics to respond to a sub-sea well blowout. ADEC also asked for a 15 day well control scenario so that the ODPCP was complaint with 18 AAC 75.425(e)(1)(F)&(I). The response planning standard (RPS) for this particular ODPCP is 287,100 barrels. The RPS for this plan exceeds the standards set forth in 18 AAC 75.434.

<u>Comment: Meeting the Response Planning Standard under 18 AAC 75.445</u>: *The commenter expressed concern that Shell's ODPCP does not meet the State of Alaska standards under 18 AAC 75.445 and that Shell's ODPCP does not demonstrate it can clean up oil trapped in or under ice within 72 hours as required by AS 46.04.030 and 18 AAC 75.445.*
<u>ADEC Response:</u> Shell has incorporated the ACS Technical Manual into the ODPCP by reference. Within the manual are several tactics that are proven method for removing oil from under ice and tracking oil under ice. Additionally, Shell has provided two response scenarios for typical summer conditions (on 30 day and one 15 day) and a response strategy for varying ice conditions that show the RPS can be controlled, contained, and cleaned up with the required timeframes found in 18 AAC 75.434(a)(1) and AS 46.04.030.

<u>Comment: There is No Proven Oil Spill Clean-up Technology in Icy Waters</u>: *The commenter was concerned that Shell has proposed oil spill response tactics that have not all been demonstrated to be effective in summer and fall Beaufort Sea ice conditions The commenter also expressed a concern that there is no proven technology to clean up an oil spill in icy conditions, especially in fall-freeze up conditions with the currents and wave conditions found in the Arctic Ocean. The commenter also asserts that Shell's ODPCP does not meet the standard of AS 46.04.030, which requires an operator to demonstrate it has the personnel and resources to contain or control, and clean up, the realistic maximum oil discharge within 72 hours from an exploration facility.*
<u>ADEC Response:</u> The response tactics listed in the ODPCP show that the entire response planning standard can be cleaned up in the required timeframe as per 18 AAC 75.434(a)(1). ADEC acknowledges that recovering oil in broken ice would be a difficult task. There are several tactics that can be used to recover oil from broken ice. In the event of a spill, the Unified Command would dictate whether mechanical or non-mechanical response efforts would be appropriate.

III. ODPCP Issue 3: Relief Well Drilling Capabilities

Comment: Time to Drill a Relief Well is Technically Unsupported: *The commenter noted that Shell estimated that the Worst Case Discharge (WCD) occurs when a well blowout continues for a period of 30 days uncontrolled, until a relief well is drilled. Shell assumes that the Frontier Discoverer will not be damaged during the blowout and will be able to move away and drill its own relief well.*
ADEC Response: ADEC regulations require that Shell have a well blowout contingency plan. 18 AAC 75.425(e)(1)(I) also requires a scenario which addresses control of a well blowout within 15 days. Information was provided to ADEC with the concurrence of MMS and AOGCC that the relief well could be drilled by the same drill ship and within the specified timeframe.

Comment: Relief Well Plan is Inconsistent with Industry, Federal and State Safety and Professional Standards: *The commenter did not agree with Shell's BAT analysis for well control. Shell proposes use of the Frontier Discoverer to drill its own relief well as Best Available Technology (BAT). The BAT analysis is flawed because it assumes that in all cases the Frontier Discoverer will not be damaged and will be "available," "effective," and "feasible" to drill its own relief well.*
ADEC Response: Information was provided to ADEC with the concurrence of MMS and AOGCC that the relief well could be drilled by the same drill ship; hence the inclusion of relief well drilling using the same ship is a viable alternative method for well blowout source control, as described in Section 4.2.

Comment: Relief Well Drilling Capability: *The commenter questioned what Shell plans to do if the Discover drill rig is damaged during a blowout and the effect that would have on oil spill response. The commenter also expressed concern about the possibility of Shell drilling until October 31st and suffering a well blowout late in the month.*
ADEC Response: Based on information provided to ADEC, the drillship would be able to provide well source control capabilities in a blowout. MMS does not require detail relief well drilling information from Shell until the Application for Permit to Drill (APD) stage of the process; this comment involves an issue that is outside the scope of ADEC's consistency review and is more appropriately addressed by the MMS. Shell updated the ODPCP to reflect the fact that there will be no drilling activity after October 31, 2010. The blowout response scenario, supplemented by the response strategy for varying ice conditions, adequately addresses mechanical response to a late-season blowout. Additionally, information included on in situ burning addresses spill response should mechanical methods be rendered ineffective by varying ice conditions.

Comment: Declining Light Impacts Recovery Operations and Relief Well Timing: *The commenter was concerned that recovery computations in the ODPCP do not take into account the declining light available in fall.*
ADEC Response: The information provided in sections 2.4.5 and 3.4.4 meets the requirements of 18 AAC 75.425(e)(2)(D) and 18 AAC 75.425(e)(3)(D)(iv).

IV. ODPCP Issue 4: Winter Response Operations.

<u>Comment: Leaving Oil in the Environment Over Winter is Not an Acceptable Cleanup Strategy and is Not Consistent with State Law</u>: *The commenter strongly disagreed with Shell's position that a winter response scenario is not needed for wells drilled up to October 31, 2010. The commenter is also concerned that Shell's ODPCP proposes to leave spilled oil in the Beaufort Sea over winter, and attempt to clean it up during the spring thaw. Leaving oil in the environment is not an acceptable cleanup strategy and inconsistent with state standards.*
<u>ADEC Response:</u> Shell has shown in their Oil Discharge Prevention and Contingency Plan (ODPCP) that they can respond to a discharge past October 31, 2010 by including a response strategy in varying ice conditions. ADEC acknowledges that recovering oil in winter conditions would be a difficult task. ADEC concurs with the commenter that leaving oil under the ice until the spring thaw is less than desirable; however it is a spill response limitation that must be addressed. See 18 AAC 75.425(e)(3)(D) (realistic maximum response limitations). Shell's plan has addressed how to remove oil from under the ice, as well as tracking oil in the ice using Alaska Clean Seas tactics. Shell has addressed tracking oil in ice on page 1-27 of the plan and has shown that they can meet the 72 hour cleanup requirements in 18 AAC 75.434(a)(1) by adding a 15-day response scenario to the ODPCP, which shows that Shell can control, contain, and clean up from a well blowout within the required timeframe. Shell has also demonstrated in the ODPCP that any oil left in the environment can be tracked, and tactics to remove oil from ice (such as ice mining) have been proven effective on the North Slope.

V. ODPCP Issue 5: In Situ Burning

Comments: In Situ Burning (ISB): *Comments on in situ burning as a spill response technique dealt with burn residues, public health concerns from ISB, effects on marine life, the efficiency of ISB, damage to eco-system that ISB would cause, and several questions were raised about ISB's use in Arctic sub-sea well blowouts.*
ADEC Response: All State approved oil discharge prevention and contingency plans are prepared and normally approved with mechanical recovery of oil as the primary means of recovering spilled oil. However, 18 AAC 75.445(h) states that when a non-mechanical method such as in situ burning or dispersant use is proposed for a response option, then it's efficiency, effectiveness and possible environmental consequences must be evaluated. Shell's response to a sub-sea well blowout relies solely on mechanical response options to control, contain and clean up the response planning standard (RPS) volume associated with this plan. The efficiency and effectiveness of in situ burning is discussed in great detail in Section 3.4.3 of the ODPCP. Alaska Clean Seas (ACS) in situ burning tactics were incorporated into Section 1.7 of the plan during the request for additional information (RFAI) process. Emulsification of the oil will affect the decision of the incident management team on whether in situ burning is the appropriate response. Recent efforts to test in situ burning by SINTEF off the northern coast of Norway have addressed the effectiveness of in situ burning in Arctic conditions.

The decision to employ in situ burning as a spill response tactic will be made by the Federal On Scene Coordinator (FOSC) in consultation with the rest of the incident management team which includes other federal agencies, including the Environmental Protection Agency and NOAA. The decision to use in situ burning requires consideration of whether it can be done in a way that is protective of the environment and protective of human health. SPAR Condition 5 requires Shell to have an acceptable plan in place to remove in situ burn residue from the water. Additionally, the toxicity of in situ burning residue is discussed in Section 3.4.3 of the ODPCP.

VI. ODPCP Issue 6: Alaska Clean Seas Capabilities

Comment: Alaska Clean Seas Personnel and Equipment Availability for Incremental Shell Project: *The commenter asserted that Shell has not provided any information on how Alaska Clean Seas (ACS) will respond to the incremental personnel and equipment demands for the Shell Offshore Program, in addition to its existing obligations for all North Slope projects.*
ADEC Response: AS 46.04.030(k) provides that a plan holder may meet the response planning standards by maintaining or having under contract "singly or in conjunction with other operators" sufficient equipment and other resources. In other words, each plan holder need not have a unique set of equipment. In the event of a large spill that requires activation of a spill cooperative's resources, there is a process in which spill resources are brought into region, if needed, to backfill resources being utilized in a spill response. (18 AAC 75.470; 18 AAC 75.475). ADEC and MMS verify oil spill response organization's on-going readiness through inspections and spill drills.

VII. ODPCP Issue 7: Protection of Environmentally Sensitive Areas

Comment: Impacts to Wildlife and Environmentally Sensitive Areas: *Comments expressed concern that oil and gas exploration can impact wildlife several ways, from the acute and highly visible effects of a large spill to the less obvious, longer-term impacts of ingestion or uptake of toxic substances. Comments stated that oil spill trajectories will likely follow currents and routes that coincide with migratory paths used by Beluga and Bowhead whales. The commenter was concerned that unrecovered oil could persist in the marine environment, with the potential to pollute the water column, shoreline, and sea bottom, and contaminate whale feeding grounds. A commenter was concerned that Shell's ODPCP does not address the toxicity of an oil spill to the Arctic Ocean and its impact on environmentally sensitive areas and endangered species. A commenter was also concerned that spill impacts to endangered species are not evaluated for the blowout scenario. Other comments stated that the use of icebreakers to keep the ice open during spill response activities destroys habitat needed by endangered polar bears to reach offshore ice.*
ADEC Response: Shell's ODPCP discusses the protection of sensitive areas throughout the plan. Specifically, it lists all of the priority protection sites by number and by location (latitude and longitude). It also lists the ACS Map sheet number that coincides with each specific location and what specific tactics will be used to protect each location from oil contamination. The ODPCP also includes a reference to NOAA's Sensitivity of Coastal

Environments and Wildlife to Spilled Oil, North Slope Alaska, as well as how priority protection sites would be assessed and ranked in the event of a spill. Shell's ODPCP also identifies how wildlife is hazed, and or treated, rehabilitated, and released. Specifically, Section 1.6.11 and Appendix E address this issue specifically. Shell's ODPCP addresses the potential for spilled oil to follow trajectories potentially used by Beluga and Bowhead whales depending upon timing of a spill in Sections 1.6.11 and 3.1.10. The ODPCP also addresses how Shell will remove the response planning standard volume using mechanical means given these currents and migratory paths in the response scenarios in section 1.6.13. Finally, Shell has addressed how marine mammal impacts would be minimized during spill response in Section 1.6.11 and Appendix E of the ODPCP.

VIII. ODPCP Issue 8: Other Comments.

Comment: Frontier Discoverer Ice-Class Status is not Confirmed: *The commenter was concerned about the use of the Frontier Discoverer's maiden voyage in ice to drill a Beaufort Sea exploration well. The ODPCP at p. 2-23 describes the vessel as ice capable, but does not provide information on American Bureau of Shipping (ABS) or USCG ice class certification. Shell has not confirmed that the drillship is certified as suitable for drilling in arctic conditions.*
ADEC Response: This comment is outside the scope of ADEC's consistency review and is more appropriately addressed by the U.S. Coast Guard or Shell.

Comment: A Zero Percent Chance of a Crude Oil Spill Is Unrealistic*: The commenter disagreed with Shell's statement that an oil spill from an OCS exploration well is not a "reasonably foreseeable event." and also suggested that Shell concludes there is a 0% risk of a crude oil spill, with which the commenter disagreed.*
ADEC Response: Each ODPCP response scenario is reviewed using the standards outlined in 18 AAC 75.425(e)(1)(F)& (I). Additionally, ADEC does not use a risk based system to evaluate an oil spill response scenario. The ODPCP does not state that there is a 0% chance of an oil spill. Shell's original statement can be found in Section 4.1.19 of the Exploration Plan. ADEC's regulations do not discount the risk of an occurrence of a spill but rather require that a spill response scenario be addressed premised upon the realistic maximum oil discharge established under AS 46.04.030 and 18 AAC 75.434(a).

Comment: Potential Water Quality Impacts Are Unacceptable: *The commenter was concerned that a large crude oil or fuel oil spills into the Beaufort Sea will exceed state water quality standards at AS 46.03 and place a hazardous substance in the water causing "imminent and substantial danger" to the public health and welfare, wildlife (including endangered species) and the environment (AS 46.09).*
ADEC Response: ADEC acknowledges that placing a hazardous substance such as oil in the water would cause danger to the public health and the environment. That is why AS 46.03.710 and AS 46.03.740 specifically prohibit pollution and oil spills.

Comment: Oil Discharge Prevention and Contingency Plan Duration: *The commenter questioned whether the ODPCP would be amended to address the multiple future drilling locations that appear in the Exploration Plan.*

ADEC Response: ADEC has also requested Shell to address future drilling locations in the ODPCP in SPAR Condition 2.

Comment: ODPCP Flawed
The commenter identified several areas where they felt that the ODPCP was deficient as well as where they thought the review process was deficient, specifically that spill response equipment had not been properly evaluated for arctic conditions, the ODPCP did not meet federal standards, and the RPS calculations were without merit.
ADEC Response: ADEC evaluated the ODPCP using the standards set out in AS 46.40.030 and 18 AAC 75.425. The 30 day response scenario identifies appropriate response equipment and tactics to respond to a sub-sea well blowout. ADEC also asked for a 15 day well control scenario so that the ODPCP was complaint with 18 AAC 75.425(e)(1)(F)&(I). The response planning standard (RPS) for this particular ODPCP is 287,100 barrels. The RPS for this plan exceeds the standards set forth in 18 AAC 75.434.

Water Quality Comments:

I. Water Quality Issue 1: Water Quality Standards.

Comment: State Water Quality Requirements: *The commenter expressed concern that the project was inconsistent with state water quality requirements and the state's 2007 instructions to Shell to reduce water pollution.*
ADEC Response: The Alaska Department of Environmental Conservation (ADEC) has reviewed the State's 2007 advisory to Shell to reduce water pollution into the Beaufort Sea. It should be noted that Page 7 of Attachment 1 to the Final Consistency Response specifically states that the State of Alaska cannot require Shell to take specific actions, but "*strongly advises that SOI develop strategies and processes for minimizing or eliminating the discharge of drilling cuttings, drilling muds, sanitary waste, domestic and other wastes into the Beaufort Sea*."

Comment: Shell's Discharges Noncompliant: *As part of these ACMP review comments, the commenter requested that ADEC review Shell's EP and NOI and determine if Shell's proposed discharge of toxic materials meets state water quality standards. If ADEC finds the discharges noncompliant, its findings should request that Shell revise its EP and NOI to eliminate discharges (zero discharge) or select environmentally safe, non-toxic materials.*
ADEC Response: ADEC has reviewed Shell's Exploration Plan (EP) and Notices of Intent (NOIs) and did not find the discharges noncompliant.

Comment: Water Quality Standards: *The commenter was concerned that Shell's Exploration Plan disregards the reduced mixing associated with the strongly stratified layer conditions in the Beaufort Sea during the summer and in the vicinity of the proposed exploration sites. The commenter was also concerned that Shell's Environmental Impact Assessment does not provide an environmental assessment of the actual ambient Beaufort Sea conditions including stratification and other identified estuarine conditions. In addition, there was concern expressed that discharges would be*

trapped in stratified upper layers of the Beaufort Sea where bowhead whales swim during migration as well as during feeding.
ADEC Response: This comment appears to be a dispute with the EPA NPDES Arctic General Permit and the Ocean Discharge Criteria Evaluation rather than Shell's Exploration Plan. The EPA NPDES Arctic General Permit was issued in 2006 and ADEC certified at that time that the NPDES Arctic General Permit was consistent with Alaska standards. The bowhead whale portion of the comment addresses wildlife issues that are outside the scope of ADEC's consistency review.

Comment: Trace Metals: *The commenter was concerned that Shell's trace metals discharges violate the requirements of 40 C.F.R. 125.120 Subpart M.*
ADEC Response: According to the EPA's Ocean Discharge Criteria Evaluation for the NPDES Arctic General Permit, trace metals are not expected to exceed marine water quality criteria. The EPA has also noted that more information should be obtained to show partitioning of metals from the discharge of drilling cuttings for future analysis.

II. Water Quality Issue 2: NPDES Arctic General Permit

Comment: NPDES Arctic General Permit: *The commenter expressed concern that Shell's project would be inconsistent unless an individual NPDES permit is issued by EPA, and the state reviews that permit to determine consistency with ACMP standards, because the proposed project exceeds the discharge volumes allowed by the NPDES Arctic General Permit. The commenter also requested that ADEC address each of the following points in its consistency findings:*

- *There are demonstrated technologies and practices now available for control or abatement of the pollutants from Shell's exploration activities*
- *Shell's proposed discharges are outside the scope of the discharge categories and limits allowed by the GP*
- *Shell's discharges are proposed to occur in Camden Bay nearby the community of Kaktovik, and hunting grounds for other NSB communities, and home to an abundance of marine species, yet Shell's application does not demonstrate that subsistence resources will be protected and remain a healthy food source for our residents*
- *The quantity and nature of the waste proposed for discharge into the Camden Bay area is potentially harmful to endangered species such as the bowhead whale and to public health*
- *There is a significant difference in the nature of effluents contemplated by the general permit and the threat of disproportionate impact to the Inupiat Native Population of the North Slope*
- *Toxic and bioaccumulating chemicals proposed to be discharged by Shell, were not considered or studied in EPA's Ocean Discharge Criteria analysis supporting the GP*

- *The NOIs are inaccurate and incomplete and do not comply with the requirements of 40 CFR 122.28(b)(2)(ii) and the GP*
- *The reported duration and discharge rates of exploration drilling in the NOIs are impossible in light of the actual time available for the 2010 exploration activities.*
- *There are errors in discharge type water depths*
- *The required facility information and waste load quantities were omitted from the NOIs*
- *The required reports relied upon by Shell were omitted from the NOIs*

ADEC Response: The Alaska Department of Environmental Conservation has reviewed Shell's Notices of Intent (NOIs) for coverage under the Environmental Protection Agency's (EPA) NPDES Arctic General Permit, but do not find that the commenter's claims of exceeding the volumes allowed in the General Permit has merit. The specific discharges that the commenter claims are exceeding permit volumes, specifically discharges of non-contact cooling water, do not have any volume limitations in the permit. The only discussions of discharge volumes for non-contact cooling water are in the Ocean Discharge Criteria Evaluation (ODCE) which provides estimates of non-contact cooling water volumes for illustrative purposes. Providing estimates or examples of discharge volumes in a reference document does not mean that those volumes become specific limitations in the general permit. Therefore, ADEC respectfully declines to conclude that this project is inconsistent.

It should be noted that the EPA NPDES Arctic General Permit (GP) was deemed consistent with Alaska standards in 2006 per 15 C.F.R. 930.41(a). Comments regarding subsistence resources and endangered species are outside the regulatory authority of ADEC. The commenter has not identified specific information that demonstrates the discharges proposed by Shell fall outside the limits of the EPA's NPDES Arctic General Permit. As of the date of this findings document the EPA has not issued an authorization for Shell to operate under the NPDES Arctic General Permit in the Beaufort Sea. If the EPA decides on its own accord that Shell needs to apply for individual wastewater permits, then Shell's Exploration Plan would need to be amended and the individual wastewater permits would need to undergo a consistency review per the requirements of 11 AAC 110.800-830.

The Notice of Intent Information Sheets require Shell to provide the range of water depths below mean lower low water (MLLW) in the lease block on page 1 one of the NOI Information Sheet. This water depth is also required on page 2 of the NOI Information Sheet. The NOI also has a blank where the applicant must fill out the depth of the discharge port or diffuser (measured at MLLW), but the depth of the discharge port is only required if the applicant is requesting a mixing zone or zone of deposit from ADEC. It appears that the commenter is referring to the depth of the discharge port, but that measurement is not required on this form because Shell is proposing activities in federal waters, so a mixing zone or zone of deposit request from ADEC would not be required. The comment regarding disproportionate impact to the Inupiat Native population of the North Slope appears to be an environmental justice issue which is outside the scope of ADEC's consistency review and would be more appropriately addressed by the federal agencies (MMS and EPA).

Comment: NPDES Arctic General Permit Notices of Intent: *The commenter requested that ADEC's review comments submitted on the NOIs for Shell's Chukchi Sea Exploration Plan in the context of the Beaufort Sea Exploration Plan review and requested that ADEC's AS 46.40.040(b)(2) findings conclude the project is inconsistent with state water quality standards.*
ADEC Response: ADEC has reviewed Shell's NOIs in the context of Shell's Camden Bay Exploration Plan and respectfully declines to find the discharges inconsistent with state water quality standards.

Comment: Aggregate Toxic Effects Not Addressed in General Permit: *The commenter was concerned that the potential for aggregate toxic effects from Shell's wastewater discharges are not addressed in the EPA's NPDES Arctic General Permit. The commenter was also concerned that the Exploration Plan proposes discharges including biocides that are not anticipated or examined in the EPA's NPDES Arctic General Permit.*
ADEC Response: Shell's proposed discharges are subject to regulation under the EPA NPDES Arctic General Permit. ADEC reviewed the Ocean Discharge Criteria Evaluation (ODCE) for the NPDES Arctic General Permit and relied upon those findings to evaluate whether unreasonable degradation to the marine environment would occur.

Comment: Pollution by Non-Contact Cooling Water: *The commenter asserted that Shell's Non-Contact Cooling Water discharges violates the requirements at 30 C.F.R. 250.217 and 40 C.F.R. 125.122. The commenter was also concerned that neither the MMS, nor the EPA has "ensured current permit limitations and requirements are protective of water quality" because no assessment has been made of the "annual inventory of the type and quantity of biocides."*
ADEC Response: The cooling water volumes provided in the ODCE were only examples and not permit limitations. The Environmental Protection Agency has jurisdiction over whether Shell's Notices of Intent violate the federal requirements at 30 C.F.R. 250.217 and 40 C.F.R. 125.122. It appears that this commenter would like to have the requirements of the EPA NPDES Arctic General Permit changed, so the comment should be directed to the EPA.

Proposed Alternative Measures- Water Quality
One commenter proposed a number of alternative measures in their comments to the Alaska Department of Environmental Conservation. Responses to each follow.

> **Proposed Water Quality Alternative Measure 1 – Discharge of drill cuttings, drilling muds and other wastes:** *Drilling cuttings, drilling muds, cement, sanitary waste, domestic and other wastes shall be collected and disposed of by*
> *(a) annular injection of waste streams into the same well while drilling,*
> *(b)temporary storage of waste and disposal into the exploration well prior to abandonment,*
> *(c) transportation of waste to the nearest onshore treatment facility, or*
> *(d) a combination of these alternatives.*

ADEC Response: This alternative measure is not necessary to meet state water quality standards. ADEC has previously determined that discharges that comply with the EPA's NPDES Arctic General Permit will be consistent with state water quality standards.

Proposed Water Quality Alternative Measure 2 – Ballast Water Exchanges: *Complete ballast water exchanges must take place, without exception, for all vessels prior to entering U.S. waters, to avoid introduction of non-indigenous species into the Chukchi and Beaufort Sea. The single allowable exception to this measure would be in emergency cases where there is a possibility of human life endangerment.*
ADEC Response: This alternative measure falls outside of the scope of the ADEC consistency review as set out in AS 46.40.040(b).

Proposed Water Quality Alternative Measure 3 – Cooling Water System Design: *The cooling water system must be designed and operated to ensure the effluent termperature does not exceed the maximum acceptable temperature increase allowed by EPA's Quality Criteria for Water.*
ADEC Response: This alternative measure is not necessary to meet state water quality standards. ADEC has previously determined that discharges that comply with the EPA's NPDES Arctic General Permit will be consistent with state water quality standards.

Proposed Water Quality Alternative Measure 4– Discharge of Toxic Bioaccumulating Chemicals: *Without exception, the use and discharge of toxic, bioaccumulating chemicals, those with low biodegradability and/or potential and detrimental mutagenic or reproduction effects, and combinations of pollutants with aggregate toxic affects is prohibited. Where there is no technical alternative toxic chemicals can be used as long as they are collected, stored and hauled back for disposal at an existing onshore facility. In the latter case where collection and onshore disposal is practiced we ask Shell and its contractors to make every effort to select green/biodegradable chemicals.*
ADEC Response: Use, storage and transport of hazardous substances falls outside of the scope of the ADEC consistency review as set out in AS 46.40.040(b). ADEC has previously determined that discharges that comply with the EPA's NPDES Arctic General Permit will be consistent with state water quality standards.

Proposed Water Quality Alternative Measure 5 – Limit chemical use to "green" chemicals: *Limit chemical use to "green" chemicals listed on the Oslo-Paris Convention (OSPAR) PLONOR list of environmentally friendly chemicals (chemicals consider to **P**ose **L**ittle **O**r **N**o **R**isk to the marine environment).*
ADEC Response: Chemical selection and use generally falls outside the scope of the ADEC consistency review as set out in AS 46.40.040(b). ADEC has previously determined that discharges that comply with the EPA's NPDES Arctic General Permit will be consistent with state water quality standards.

Proposed Water Quality Alternative Measure 6 – Design and Operation of Seawater Thermal Intake: *Design and operate seawater thermal intake and discharge according to NOAA fisheries criteria for minimizing intake flow velocities to maximize survival of Arctic aquatic organisms.*
ADEC Response: This alternative measure falls outside the scope of the ADEC consistency review as set out in AS 46.40.040(b).

Air Quality Comments

I. Air Quality Issue 1: Air Quality Impacts

Comment: Air Quality Impacts: *The commenter was concerned that Shell's application for an EPA air permit does not satisfy the MMS's air quality regulations or MMS requirements to address air emissions under the Outer Continental Shelf Land Act.*
ADEC Response: This concern has been addressed by the MMS's request for Shell to provide information that specifically addresses the requirements of the MMS air emissions regulations.

Comment: Cumulative Impacts to Air Quality: *The commenter was concerned that Environmental Assessment of Shell's activities should include an analysis of cumulative impacts to air quality. The commenter was also concerned that Shell's proposed activities will result in substantial pollution concentrations that could affect the North Slope communities of Kaktovik and Nuiqsut.*
ADEC Response: Concerns about the scope of the environmental assessment should be directed to the Minerals Management Service. The EPA's Clean Air Act is designed to be protective of human health and the EPA's PSD permit will address whether Shell's proposed activities will affect air quality in those communities.

Comment: Particulate Matter: *Particulate matter (PM2.5): The commenter was concerned that predicted concentrations of PM10 and PM2.5 could be significantly higher than what is presented in Appendix H of Shell's Exploration Plan and requests that the MMS that the emissions inventory is correct and assesses potential air impacts correctly.*
ADEC Response: It should be noted that the State of Alaska has yet to complete the final adoption of a state implementation plan for PM2.5. Although we anticipate this state implementation plan and PM2.5 standards to be in place in early 2010 this issue would fall outside of the consistency review discussion.

Comment: Secondary PM2.5 Analysis: *The commenter was concerned that the formation of secondary PM2.5 in the atmosphere is not adequately addressed.*
ADEC Response: ADEC has not yet incorporated the PM2.5 standards into the state implementation plan, so the consistency review findings will not address this particular standard.

Comment: Additional Air Quality Impacts- Arctic Haze: *The commenter was concerned that Arctic Haze is discussed in Shell's Exploration Plan, but there is no analysis of the contribution from the proposed activities to this resident haze.*
ADEC Response: EPA's Regional Haze rule only affects Class 1 national parks and wilderness areas. The closest Class 1 area to Shell's proposed activity is Denali National Park, which is located a considerable distance from the Beaufort Sea.

Proposed Alternative Measures-Air Quality

One commenter proposed a number of alternative measures in their comments to the Alaska Department of Environmental Conservation. Responses to each follow.

Proposed Air Quality Alternative Measure 1 – Ambient Air Modeling: *Ambient air quality modeling must be completed using an EPA approved ambient monitoring baseline dataset representative of the Camden Bay Area. Modeling must include conservative emissions estimates for all emission sources including ice management activities and emission estimates based on source test data and maximum case operating and activity assumptions evaluated over the averaging times of the standards for which compliance is being assessed. The modeling analysis must be based on at least one year of quality-assured, on-site, representative meteorological data or, if no on-site data is available, five years of meteorological data from the closest meteorological station representative of the area. Modeling must demonstrate compliance with the NAAQS and PSD Class II increments.*
ADEC Response: The scope of the ADEC review under AS 46.40.040(b) is generally one of whether activities will comply with state environmental standards and other environmental laws. Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

Proposed Air Quality Alternative Measure 2 – Best Available Technology: *The very best air emission pollution control technologies commercially available must be installed on all of the vessels and equipment associated with the Shell Camden Bay Exploration Plan. Including, but not limited to retooling, repowering, SCR Controls, Hydrocarbon SCR or Lean De-NO_x Catalysts, NO_x Absorbers/NO_x traps, diesel particulate filters, flares or other hydrocarbon vapor control devices. All equipment must operate at the lowest attainable emission rates.*
ADEC Response: The scope of the ADEC review under AS 46.40.040(b) is generally one of whether activities will comply with state environmental standards and other environmental laws. Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

Proposed Air Quality Alternative Measure 3 – Ultra-Low Sulfur Fuel: *Ultra-low sulfur fuel must be used on <u>all</u> of the vessels and equipment associated with the Shell Camden Bay Exploration Plan.*
ADEC Response: Fuel sulfur content is specified by federal law and generally falls outside of the scope of the ADEC consistency review as set out in AS 46.40.040(b).

Proposed Air Quality Alternative Measure 4 – Emissions Source Testing: *Each emission source must be source tested prior to use [over the entire range of operating loads planned] to verify actual emissions are consistent with modeling assumptions used to demonstrate NAAQS and PSD increment compliance. Any source test that exceeds modeling assumptions will trigger revised modeling [to ensure NAAQS and PSD increment compliance can be achieved] prior to operating that source.*
ADEC Response: Source testing is a matter inherent in an EPA air emission permit. Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

Proposed Air Quality Alternative Measure 5 – Greenhouse Gas Emissions: *A greenhouse gas (GHG) assessment must be completed, and based on this assessment the very best emission pollution control technologies commercially available must be installed on <u>all</u> vessels and*

equipment associated with the Shell Camden Bay Exploration Plan, to reduce GHG emissions to the lowest possible level.
ADEC Response: Regulation of greenhouse gases falls outside the scope of the ADEC consistency review as set out in AS 46.40.040(b). There are no applicable state standards or other rules.

Proposed Air Quality Alternative Measure 6 – Regional Ozone Analysis and Evaluation of Health Impacts from Hazardous Air Pollutants (HAPs): *A regional ozone impact analysis, evaluation of PM 2.5 formation and evaluation of HAPS emissions and associated health impacts from HAP exposure must be completed. An assessment of cumulative impacts must be completed, considering all existing and reasonably foreseeable sources of air emissions that could impact the same areas impacted by the Exploration Plan activities. Any adverse human health impacts must be mitigated prior to equipment use.*
ADEC Response: Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

Proposed Air Quality Alternative Measure 7 – Analysis of Cumulative Impacts: *An analysis of cumulative impacts to air quality related values in nearby areas set aside as wilderness and refuge lands must be completed. Any adverse impacts must be mitigated prior to the commencement of exploration plan activities.*
ADEC Response: Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

Proposed Air Quality Alternative Measure 8 – Review of a complete PSD permit application: *A complete PSD permit application must be submitted for EPA and coastal district review. The coastal district must have an opportunity to review it and provide comments. EPA must fairly consider the coastal district's input.*
ADEC Response: Federal air quality regulations require that OCS sources within 25 miles of a state's seaward boundary comply with the air quality standards of the corresponding onshore area (COA). Therefore OCS air emissions and impacts that comply with federal rules and the ADEC conditions outlined earlier in this document will be consistent with State air quality standards.

II. Air Quality Issue 2: EPA's PSD Permit

Comment: ACMP Review: *The commenter requested that the State of Alaska suspend the ACMP review until a complete Prevention of Significant Deterioration (PSD) Air Permit application is accepted by EPA and available for public review.*
ADEC Response: The authority to suspend the ACMP review is outside the authority of ADEC's consistency review. That authority rests with DNR's Division of Coastal and Ocean Management or with the applicant.

Comment: Chukchi PSD Air Permit: *The commenter requested that ADEC read in detail October 20, 2009 comments to EPA on Shell's Chukchi PSD permit and then include these deficiencies in its AS 46.40.040(b)(2) findings. Shell will need to correct*

these deficiencies in both the Chukchi Sea and Camden Bay air pollution control plans to ensure ACMP consistency.
ADEC Response: ADEC has read the comments to the EPA regarding air emissions in detail and finds that the issues raised should more appropriately be raised with the Environmental Protection Agency and Shell. ADEC respectfully declines to include the commenter's identified deficiencies in ADEC's AS 46.40.040(b)(2) findings.

Comment: Emission Reduction Measures: *The commenter was concerned that the technical basis for Shell's air emissions modeling is not included in the Exploration Plan and worst case scenario conditions do not appear to be addressed.*
ADEC Response: The technical basis for Shell's air emissions modeling will be addressed in the Environmental Protection Agency's (EPA) Prevention of Significant Deterioration (PSD) permit. The Minerals Management Service (MMS) regulations at 30 C.F.R. 250.218 were promulgated under the authority of 42 U.S.C. §7627 to ensure that air pollution from OCS sources attain and maintain ambient air quality standards. These MMS regulations serve to filter out those proposed OCS activities that do not require further review and do not purport to substitute for the stringent air quality standards required by the EPA. As noted elsewhere ADEC's review was based on the information contained in the MMS Exploration Plan and accompanying Oil Discharge Prevention and Contingency Plan.

Alaska statutes require that fuel burning equipment are subject to 18 AAC 50.055(a) for visible emissions, 18 AAC 50.055(b) for particulate matter emitted from an industrial or fuel burning equipment, and 18 AAC 50.055(c) for sulfur emissions. In order to be consistent with Alaska statutes and regulations Shell must demonstrate to the permitting authority that all the requested fuel burning equipment will meet the above noted standards for the worst case operating conditions. It should be noted that during the consistency review of Shell's 2007 Exploration Plan, ADEC raised this same issue and the EPA requested in the permit conditions that the permittee submit updated SIP standard demonstrations using worst case conditions. The department intends to raise the same issue if the EPA's proposed PSD permit does not address emissions under worst case conditions.

Comment: Ice Breaker Emissions: *The commenter was concerned that the emissions for the icebreaker vessels are grossly underestimated.*
ADEC Response: ADEC has reviewed the information provided in Shell's Exploration Plan regarding proposed emissions and finds that Shell's Exploration Plan will be consistent with Alaska standards if Shell adopts the conditions outlined earlier in this document.

Comment: Baseline Data Gaps: *The commenter was concerned that gaps in baseline information on air quality mean that it is not possible to determine with confidence the potential contribution of the proposed activity to existing oil and gas emissions in the North Slope Borough region.*
ADEC Response: The EPA has required Shell to submit additional monitoring data before their PSD Air Permit application will be complete. ACMP regulations at 11 AAC 110.820 address the situation where a proposed modification may cause significant

additional impacts to a coastal use or resource. If Shell's Exploration Plan is amended to address changes in air emissions, the regulations at 11 AAC 110.820 will apply.

Comment: Impacts to Climate Change: *A commenter pointed out a mathematical error in the presentation of Shell's proposed emissions of Green House Gas (GHG) emissions.*
ADEC Response: CO_2 emissions are not regulated directly by either EPA or ADEC regulations at this time.

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

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Commissioner's Finding of Fact and Decision

State I.D. Number AK 0908-02OG
Shell Offshore Inc. 2010 Outer Continental Shelf Lease Exploration Plan

Elevation Request

Pursuant to 11 AAC 110.600, the North Slope Borough Coastal District (NSB) requested an elevation of the Division of Coastal and Ocean Management's (DCOM) proposed consistency response of Shell Offshore Inc.'s 2010 Outer Continental Shelf Lease Exploration Plan to the Commissioner. The elevation request was timely received and submitted in writing.

Project Description

Shell Offshore Inc. (Shell) is proposing to conduct an exploration drilling program on U.S. Department of the Interior, Minerals Management Service (MMS) Alaska Outer Continental Shelf (OCS) leases located north of Point Thomson near Camden Bay in the Beaufort Sea during the 2010 drilling season (Camden Bay 2010 Exploration Plan, hereinafter, "EP"). Shell plans to drill two wells, one each on the Torpedo prospect (NR06-04 Flaxman Island lease block 6610, OCS-Y-1941 [Flaxman Island 6610]) and the Sivulliq prospect (NR06- 04 Flaxman Island lease block 6658, OCS-Y 1805 [Flaxman Island 6658]).

Shell plans to drill the Torpedo H drill site first, followed by Sivulliq N, unless adverse surface conditions or other factors dictate a reversal of drilling sequence. In that case, Shell would mobilize to the Sivulliq N drill site and drill this well first.

The ice-reinforced drillship Motor Vessel (M/V) Frontier Discoverer (Discoverer) would be used to drill the wells. While on location at the drill sites, the Discoverer would be affixed to the seafloor using eight 7-ton Stevpris anchors arranged in a radial array.

During the 2010 drilling season, the Discoverer would be attended by a minimum of six vessels that would be used for ice management, anchor handling, oil spill response (OSR), refueling, resupply, and servicing of the drilling operations. The ice management vessels would consist of an icebreaker and an anchor handler.

Resupply would be from West Dock to the drill sites and would use a coastwise qualified vessel. An ice-capable OSR barge (OSRB), with an associated tug would be located nearby during the planned drilling program. The OSRB would be supported by a berthing vessel for the OSR crew. An OSR tanker also would be nearby to store recovered liquids. A vessel would support the Marine Mammal Monitoring and Mitigation Plan (4MP) activities associated with the drilling program.

The Discoverer and associated support vessels would transit through the Bering Strait into the Chukchi Sea on or about July 1, arriving on location near Camden Bay approximately July 10. Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run through October 31, 2010, with a suspension of all drilling operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The Discoverer and support vessels would either leave the Camden Bay project area and return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude or would leave the Beaufort Sea entirely. Activities would extend through October 31, depending on ice and weather. At the end of the drilling season, the Discoverer and associated support vessels would transit west into and through the Chukchi Sea.

Helicopters are planned to provide support for crew change, provision resupply, and search-and-rescue operations during the drilling season. The aircraft operations would principally be based in Deadhorse, Alaska.

The scope of the ACMP review applies to those portions of Shell's proposed OCS exploration activities that require issuance of a MMS license or permit for activities described in detail in the OCS EP. Pursuant to 15 CFR 930.71, MMS has determined that activities described in detail in the EP are the proposed exploratory wells that require an MMS Application Permit to Drill (APD).

Shell's proposed OCS EP also requires review by the Alaska Department of Environmental Conservation (DEC) for compliance with state Air, Land and Water Quality statutes and regulations. For activities on the OCS, the DCOM has coordinated with the DEC and has issued that department's preliminary finding under AS 46.40.040(b)(2) and 11 AAC 110.010(e) on whether the relevant aspects of the activities satisfy the requirements of AS 46.03, AS 46.04, AS 46.09, or AS 46.14 and the regulations adopted under those statutes, as applicable.

Authorizations subject to ACMP review:

US Minerals Management Service – OCS Exploration Plan (includes Oil Spill Contingency Plan)

- Exploration Plan – Conditional Approval October 16, 2009
- Oil Discharge Prevention & Contingency Plan – Conditional Approval October 21, 2009

Elevation Issues

The DCOM issued its proposed consistency response concurring with Shell Offshore Inc.'s consistency determination without any alternative measures on December 4, 2009. The NSB contends that the Shell Offshore Inc. EP is not consistent with the following state standards:

1. Energy Facilities standard (11 AAC 112.230)
2. Subsistence standard (11 AAC 112.270)
3. Air, Land, and Water Quality standard (11 AAC 112.310)

The NSB states that they are primarily concerned about the effects of the project not only because of the potentially significant impacts on human health and the environment, but also because the ACMP program itself is undergoing programmatic changes. The NSB viewed the elevation process as an opportunity for cooperative dialogue with DNR.

In the NSB elevation request and the NSB representatives' comments at the elevation meeting, the NSB proposed the inclusion of a single alternative measure to address consistency with the Energy Facilities standard, a single alternative measure to address the Subsistence standard, and sixteen (16) alternative measures to address the Air, Land, and Water Quality standard. These proposals and my response are discussed below.

1. **NSB proposed alternative measure addressing the Energy Facilities standard** – *"Shell could modify its Camden Bay OCS Exploration Plan such that OCS drilling would occur at a time of year when biologic vulnerability and productivity are at a minimum and when bowhead whales are not present in the drilling area, such as during the winter months. The NSB notes that, historically, successful OCS exploratory drilling has occurred in both Alaskan and Canadian Beaufort seas during winter months using bottom-founded drilling structures. One of these structures, the Molikpaq offshore platform was first used in the Canadian Arctic OCS. In 1998, the Molikpaq was towed from the Beaufort Sea across the Pacific Ocean to Korea where it was upgraded for the Sakhalin II Project. It was then towed from Korea to Russia where it was modified so that it could be used in the deeper water offshore Sakhalin Island. The structure was specifically built to operate in severe ice conditions. A steel spacer allows for the deeper water in the Sea of Okhotsk, and the completed substructure was filled with sand permanently anchoring it to the seabed."* The NSB suggests that this alternative measure would significantly reduce the potential adverse impacts to biologically vulnerable habitats and other provisions of the Energy Facilities standard as applicable. Per the NSB, the adoption of this alternative measure would achieve full consistency with the Energy Facilities standard.

   DNR Commissioner's response to proposed alternative measure addressing the Energy Facilities standard – An ACMP alternative measure is defined at 11 AAC 110.990(a)(3) to mean "*a modification to a proposed project that, if adopted by the applicant, would achieve consistency with the enforceable policies of the program.*" I do not find the alternative measure proposed by the NSB to be appropriate. It is not a modification to the project that would allow the proposed project to move forward. Rather, it represents a substantial change to the project that would require new federal authorizations and state approvals rendering this consistency review invalid. Further, though the NSB states that winter drilling would significantly reduce potential adverse impacts and achieve consistency with the energy facilities standard, the NSB has not demonstrated how the winter drilling alternative measure would achieve consistency with the energy facilities standard, other than to state that biologic vulnerability and productivity are at a minimum during winter months. Merely citing examples of previous winter OCS drilling that has occurred in the Beaufort Sea does not adequately demonstrate how winter drilling is consistent with the energy facilities standard.

2. **NSB proposed alternative measure addressing the Subsistence standard** – *"Shell shall modify its Camden Bay OCS Exploration Plan such that OCS drilling would occur at a time of year when biologic vulnerability and productivity are at a minimum and when bowhead whales are not present in the drilling area, such as during the winter months. The NSB notes that, historically, successful OCS exploratory drilling has occurred in both the Alaskan and Canadian Beaufort seas during winter months."* The NSB suggests that this alternative measure would significantly reduce the potential adverse impacts to subsistence uses as specified in the Subsistence standard. As stated within the NSB comments, the Inupiat residents acknowledge

and greatly appreciate Shells attempts to minimize adverse effects to the bowhead harvests by Kaktovik and Nuiqsut whaling crews. Per the NSB, the adoption of this alternative measure would achieve full consistency with the Subsistence standard.

DNR Commissioner's response to proposed alternative measure addressing the Subsistence standard – An ACMP alternative measure is defined at 11 AAC 110.990(a)(3) to mean "*a modification to a proposed project that, if adopted by the applicant, would achieve consistency with the enforceable policies of the program.*" I do not find the alternative measure proposed by the NSB to be appropriate. It is not a modification to the project that would allow the proposed project to move forward. Rather, it represents a substantial change to the project that would require new federal authorizations and state approvals rendering this consistency review invalid. Further, though the NSB states that winter drilling would significantly reduce potential adverse impacts and achieve consistency with the subsistence standard, the NSB has not demonstrated how the winter drilling alternative measure would achieve consistency with the subsistence standard, other than to state that biologic vulnerability and productivity are at a minimum during winter months. Merely citing examples of previous winter OCS drilling that has occurred in the Beaufort Sea does not adequately demonstrate how winter drilling is consistent with the subsistence standard.

3. **NSB proposed alternative measures addressing air pollution emissions and water pollution discharges (generally the Air, Land, and Water Quality standard)** – The NSB submitted three sets of comments to DEC providing the NSB's coastal consistency analyses and finding on the individual topics of (a) air quality; (b) water quality; and (c) Shell's Oil Discharge Prevention and Contingency Plan. In addition, the NSB compiled those proposed alternative measures in their November 9, 2009 comments to DCOM addressing consistency with the ACMP enforceable policies. The alternative measures, as compiled by the NSB, can be found on pages 14-16 of the NSB comment letter, and are not reproduced within this document.

   DNR Commissioner's response to the proposed alternative measures addressing air pollution emissions and water pollution discharges – I appreciate that the NSB has proposed alternative measures to minimize the potential impacts from the air pollution emissions and water pollution discharges from the EP. However, it is important to recognize that the proposed alternative measures address aspects of the proposed project that are not subject to the ACMP consistency review process as those activities are not within the scope of the ACMP consistency review.

   AS 46.40.040 addresses the DEC participation and review process within an ACMP consistency review. For this consistency review, (b)(2) of that section is controlling, and reads:

   > *"for a consistency review of an activity that does not require a Department of Environmental Conservation permit, certification, approval, or authorization because the activity is ... located on federal land or the federal outer continental shelf, consistency with AS 46.03, AS 46.04, AS 46.09, and AS 46.14 and the regulations adopted under those statutes shall be established on the basis of whether the Department of Environmental Conservation finds that the activity satisfies the requirements of those statutes and regulations."*

AS 46.40.096(g) also addresses the exclusion of activities subject to DEC review, and reads, in part:

> *"(g) The reviewing entity shall exclude from the consistency review and determination process for a project*
> *(1) an activity that ...*
> *(B) is subject to authorization by the Department of Environmental Conservation under the requirements described in AS 46.40.040(b)... "*

The DEC, through the ACMP (11 AAC 110.010(e)) is required to review specific aspects of Shell's proposed activities that would otherwise be subject to DEC authorization but are not because the activity is located in the outer continental shelf. The DEC shall nonetheless review those aspects for compliance with AS 46.03, AS 46.04, AS 46.09, AS 46.14, and the regulations adopted under those statutes, as applicable, and provide that department's findings under AS 46.40.040(b)(2) to the DCOM by day 50 of the current review per 11 AAC 110.445(d). The ADEC draft findings, provided to DCOM on December 4, 2009, evaluated: 1) oil spill prevention and response, 2) water quality, and 3) air quality, and found those aspects of the proposed activities described in detail in the Exploration Plan consistent with the ACMP provided Shell adhere to conditions specified in the draft findings. The DEC draft findings were provided as a courtesy based on a request by the NSB following the 2007 Shell Exploration Plan elevation process. The DEC final findings will be included in the ACMP final consistency response.

The scope of the ACMP consistency review, including the DEC "carve-out," is significant to the NSB's elevation request in that many of the issues cited are outside the scope of the ACMP consistency review. In addition to the above citations, the scope of the ACMP consistency review for Shell's proposed project was determined by applying ACMP regulation 11 AAC 110.020, which defines those activities subject to review, as well as the application of federal regulations at 30 CFR 250 and 15 CFR 930 which define the scope of the review.

The ACMP regulations include a list of federal authorizations that require (or initiate) a consistency review, and exclude activities from the scope of review that are authorized under General or Nationwide permits. The federal authorization triggering the current review is the MMS OCS Plan. The ACMP regulations provide that the review will be conducted under two sets of rules: 11 AAC 110.400 and 15 CFR 930 Subpart E: CONSISTENCY FOR OUTER CONTINENTAL SHELF (OCS) EXPLORATION, DEVELOPMENT AND PRODUCTION ACTIVITIES. ACMP regulation 11 AAC 110.020 provides that the scope of review for activities in the OCS be determined by the federal regulations for OCS activities at 15 CFR 930 Subpart E.

15 CFR 930.71 requires that activities "described in detail" in an OCS Plan be evaluated for consistency with the ACMP. The process to arrive at those activities "described in detail" is a two part test; 1) any activity requiring a federal license or permit, as defined in § 930.51, and 2) that which the Secretary of the Interior determines must be described in detail within an OCS plan. For ACMP reviews of OCS activities, MMS (under the Secretary of the Interior) has determined the activity "described in detail" to be the MMS Exploration Plan and accompanying Oil Discharge Prevention and Contingency Plan. Therefore, the federal regulations limit the

scope of the ACMP review to the activity authorized under the MMS Exploration Plan and accompanying Oil Discharge Prevention and Contingency Plan.

Shell activities related to the proposed exploration drilling project outside the scope of the review are as follows:

- EPA Prevention of Significant Deterioration (PSD) Air Quality Permit(s) – Application Pending. The permit is not listed under 11 AAC 110.400 as an activity requiring a federal authorization subject to ACMP consistency review.

ACMP regulations require that activities authorized under General Permit and Nationwide Permit must be excluded from the scope of the consistency review (11 AAC 110.700(a)). Activities requiring the following GP and NWP are therefore excluded from the review:

- EPA NPDES Arctic General Permit No. AKG-28-0000 for waste discharge into federal waters – Effective June 26, 2006.
- US Army Corps of Engineers Nationwide Permit 8 for Oil and Gas Structures on the Outer Continental Shelf.

In the elevation request and during the elevation, the NSB questioned whether or not DCOM had accurately described the scope of the consistency review with respect to the Energy Facilities standard and the Subsistence standard, and further questioned whether NSB could address air and water quality issues through these standards. While the scope of the consistency review is not subject to elevation, the DNR Commissioner's delegate said at the elevation meeting that the DNR Commissioner's Finding of Fact would respond to the NSB's questions.

The Air, Land and Water Quality standard located at 11 AAC 112.310 reads:

"Notwithstanding any other provision of this chapter, the statutes and regulations of the Department of Environmental Conservation with respect to the protection of air, land and water quality identified in AS 46.40.040(b) are incorporated into the program and, as administered by that department, constitute the exclusive components of the program with respect to those purposes."

The answer to the NSB's questions are included within that regulatory citation – the consistency review, including proposed alternative measures, may not re-define or address DEC's air, land or water quality authorities through the other statewide standards. Expanding the scope of the consistency review to include air or water quality, or applying the Energy Facilities or Subsistence standards to further address air and water quality issues is not legally permissible.

Other Issues Not Subject to the Elevation

While not subject to the elevation process, the NSB raised a procedural issue that warrants discussion. The ACMP regulations at 11 AAC 255 provide for a consensus and consultation process, as follows:

"(b) Based on the comments received and other available information, the coordinating agency shall determine whether a consensus exists among the review participants regarding
(1) a project's consistency with the enforceable policies of the program; and

(2) any alternative measures that would achieve consistency with the enforceable policies of the program.

(c) If the comments indicate that a consensus does not exist among the review participants, the coordinating agency shall facilitate a discussion among the review participants to attempt to reach a consensus. If the review participants cannot reach consensus, the coordinating agency shall develop a proposed consistency determination that is based on the comments and positions of the resource agencies and affected coastal resource districts.

(d) If the coordinating agency substantially modifies or rejects an alternative measure requested by a commenting review participant within that participant's respective expertise or area of responsibility, the coordinating agency shall consult with the review participant and provide a brief written explanation stating the reasons for rejecting or modifying the alternative measure before issuing the proposed consistency determination." (Emphasis added).

The NSB raised the concern that "...DCOM developed its consistency response in concurrence with Shell's consistency certification without the benefit of a dialogue with NSB ..." DCOM acknowledged this oversight in its December 18, 2009 response letter to NSB Mayor Itta. I understand that DCOM attempted to coordinate a meeting with NSB staff as soon as they learned of the oversight, but NSB staff was unavailable prior to the elevation meeting. I also understand that DCOM staff, NSB staff, DEC staff, as well as Shell Offshore Inc. representatives met immediately following the elevation for several hours and again after the elevation meeting to discuss the project and specifically the alternative measures addressing the air and water quality issues. I am encouraged by those discussions, and appreciate that all parties are willing to engage in meaningful dialogue on the project.

Recognizing that DCOM did not precisely follow the consensus process described in the regulations cited above, I have directed DCOM Director Randy Bates to ensure that his staff are aware of this provision and are properly trained so that DCOM and DNR are fully compliant with the regulations. In addition, I have asked Director Bates to consider whether regulatory changes are necessary to this section that would result in a better coordinated review process. I am aware that DCOM is currently engaged in the drafting of regulatory revisions to 11 AAC 110, so this request is both appropriate and timely.

Conclusion

In evaluating the NSB's request for elevation and the issues raised, I have considered, among other things, whether the NSB's comments were appropriately considered under the ACMP enforceable policies, whether the DCOM erred in finding the proposed Shell Offshore Inc. 2010 Outer Continental Shelf Lease Exploration Plan consistent despite the NSB's objection, and whether the proposed alternative measures addressing the Energy Facilities standard and the Subsistence standard could minimize possible adverse impacts. As commissioner of the DNR, I take this elevation seriously and I regard the issues raised by the NSB as important issues.

Even though I have not approved the proposed alternative measures, I believe that the ongoing discussion between the NSB, MMS, DNR, and project proponents will begin to address many of the outstanding issues and challenges. I am committed to working with the NSB to make sure that OCS exploration, development, and production can occur in a manner that recognizes the economic importance of these activities while respecting and understanding the resources and activities that NSB residents depend on.

Commissioner's Decision

I find that the December 4, 2009 ACMP proposed consistency response is accurate and appropriate, and find that DCOM should render the final consistency response that reflects this decision.

Thomas E. Irwin, Commissioner

January 22, 2010
Date

USCG Approval Letter

-PLACEHOLDER-

PART 1 RESPONSE ACTION PLAN [18 AAC 75.425(e)(1)]

The environment for drilling activities lies outside Alaska state waters in the Beaufort Sea. For planning purposes, a hypothetical blowout involves oil that travels upwards from the well at the ocean floor to the water surface. The resulting plume of oil is driven by ocean currents and wind. Stochastic spill modeling based on current and wind information suggests that spilled oil is not likely to reach land in less than 24 to 48 hours, even if no containment and recovery operations take place.

These timelines have been used to plan the mobilization of ACS equipment and response personnel to protect sensitive environmental sites along the shoreline (see Section 1.6.12).

1.1 EMERGENCY ACTION CHECKLIST [18 AAC 75.425(e)(1)(A)]

The person reporting an oil spill to the immediate supervisor or Qualified Individual (QI) may be required to supply minimum spill assessment information to provide as complete an understanding of the incident as possible. Some initial spill response actions and information that may be reported are included in Table 1-1 and Table 1-2.

TABLE 1-1
EMERGENCY ACTION CHECKLIST

EMERGENCY ACTION CHECKLIST	
INITIAL SPILL RESPONSE ACTIONS 1. Protect people: Safety is first priority. • Sound alarm. • Shut off ignition sources. • Restrict access. • Evaluate as necessary and initiate rescue and response actions. 2. Notify your supervisor. 3. Stop the spill at source, if safe to do so. 4. Assess possible hazards: • Fire and explosion potential of vapors at or near the source, • Potential toxic effects of the discharge, • Damage to facility affecting safety, and • Recovery of the spilled product. 5. For a blowout, implement well control and evacuation procedures and activate Tier Ill Incident Command System (ICS).	**WHAT TO REPORT TO YOUR SUPERVISOR** 1. Was anyone hurt? 2. Where is the spill? 3. What time did it happen? 4. What was spilled? 5. How much was spilled? 6. What is the rate of release? 7. What is the source? 8. What are the weather conditions? 9. What actions have you taken? 10. What equipment do you need? 11. Are there any immediate environmental impacts? 12. Who did you notify?

The emergency action and notification sequence varies depending on the size of the spill and required response. The spill classifications described below apply only to the emergency phases of containment and initial recovery of a spill.

Spill Classification Guidelines

Tier I Spill: Local spill that the affected asset can respond to effectively with equipment and personnel on board (such as deploying absorbent containment and recovery materials). No immediate off-site assistance is needed (Table 1-2).

TABLE 1-2
INITIAL SPILL RESPONSE AND
NOTIFICATION PROCESS – TIER I SPILL

TIER I SPILL	
PERSONNEL	**ACTION TO BE TAKEN**
FIRST PERSON TO SEE THE SPILL	Assess safety of situation, determine whether source can be stopped, and stop the source of spill if possible. Immediately notify your supervisor. If your supervisor is not available, notify the Drilling Foreman.
INITIAL ON-SCENE INCIDENT COMMANDER **(Drilling Foreman)**	From a safe distance, determine whether the spill is stopped or contained. Start agency and corporate notifications. Call the Incident Commander. Call the Drilling Superintendent (if not available, call the Wells Manager). Complete applicable spill report form (Figure 1-3). Respond as directed by the Incident Commander to contain and recover the spill.
INCIDENT COMMANDER/QI **(Asset Manager or designee)**	Activate appropriate components of Incident Management Team (IMT). Determine if Tier I, Tier II, or Tier III spill actions must be taken. Ensure the National Response Center (NRC) has been notified (1–800–424–8802).

Tier II Spill: Large spill that would require mobilization of the IMT and/or all dedicated response resources identified in this Oil Discharge Prevention and Contingency Plan (C-Plan), using ASRC Energy Services (AES) equipment offshore, under the direction and supervision of Alaska Clean Seas (ACS).

Tier III Spill: Large spill with potential to require mobilization of all resources listed above for Tier II, plus additional national or international resources not specified in this C-Plan.

If the Initial On-Scene Incident Commander or the Incident Commander (IC) determines that the spill is a Tier II or Tier III event (Figure 1-2), ~~the following~~ additional responses and notifications should take place, as described in ~~(~~Table 1-3~~)~~. The names, positions, and telephone numbers of facility personnel responsible for spill notification are listed in Table 3-2. A summary of the emergency actions described in this C-Plan is available for field personnel.

TABLE 1-3
INITIAL SPILL RESPONSE AND
NOTIFICATION PROCESS – TIER II OR TIER III SPILL

TIER II OR TIER III SPILL	
PERSONNEL	**ACTION TO BE TAKEN**
INCIDENT COMMANDER/QI	Gather information; assess magnitude/severity of the spill; and notify ACS, AES, and Shell management. Ensure internal and external notifications. Verify notification of the NRC (1–800–424–8802). Establish objectives and response strategies. Monitor status of incident, facility, and personnel. Work closely with Safety Officer to: • assess any and all risks of accidental ignition of the blowout hot zone and safe operating distances for all operations; and • need and practicality of safely and deliberately igniting the vapors over the surfacing oil plume. Mobilize resources (in addition to on-site equipment and personnel), if necessary.
LIAISON OFFICER	Confirm that all state and federal agencies and appropriate Native corporations and villages have been notified. Request safety zones for air and water. Request Notice to Mariners (U.S. Coast Guard [USCG]). Obtain approval to decant USCG. Prepare written reports to agencies.
PUBLIC INFORMATION OFFICER	Establish Joint Information Center. Activate Mutual Aid. Prepare for media interest. Keep the public informed. Coordinate media efforts through the Joint Information Center. Identify community concerns.
SAFETY OFFICER	Evaluate and monitor hazards. Notify off-site operators. Obtain material safety data sheets (MSDS) and prepare initial Site Safety Plan. Establish first aid posts. Coordinate post-incident debriefing. Conduct air monitoring as needed. Ensure hazardous waste operations and emergency response (HAZWOPER) compliance. Investigate safety-related accidents and report to IC. Conduct safety inspections.
OPERATIONS SECTION CHIEF	Mobilize and direct on-scene response equipment and personnel. Coordinate all operations with AES, ACS, Shell's on-site response personnel, and village response teams. Coordinate search and rescue operations. Ensure Shell representation at site/staging areas. Consider pre-cleaning the shoreline prior to impact. Contact wildlife specialists and refuge managers for information. Oversee preparation of Air Operations Plan.
PLANNING SECTION CHIEF	Collect, process, and display incident information. Provide basic environmental support. Supervise development of Incident Action Plan (IAP).

FIGURE 1-1
TIER II AND TIER III INCIDENT RESPONSE
ORGANIZATION CHART

ON-SCENE IC / BRANCH DIRECTOR (BD) *
Deputy IC / BD

NOTIFICATIONS

- Alaska IC
- NRC
- Federal On-Scene Coordinator (FOSC)
- Drilling Superintendent

ICS SUPPORT

- Scribe (on-scene Command Post)
- If needed:
  - Logistics from Deadhorse/Anchorage (ANC)
  - Planning/IAP Support (ANC)
  - Information Officer (ANC)

SAFETY OFFICER

- Floating Health, Safety, and Environment (HSE) Technician (Primary)
- Rig/Oil Spill Response Vessel HSE Technicians (Deputies coordinated by Safety Officer but assigned to respective group)

ON-WATER RESPONSE GROUP

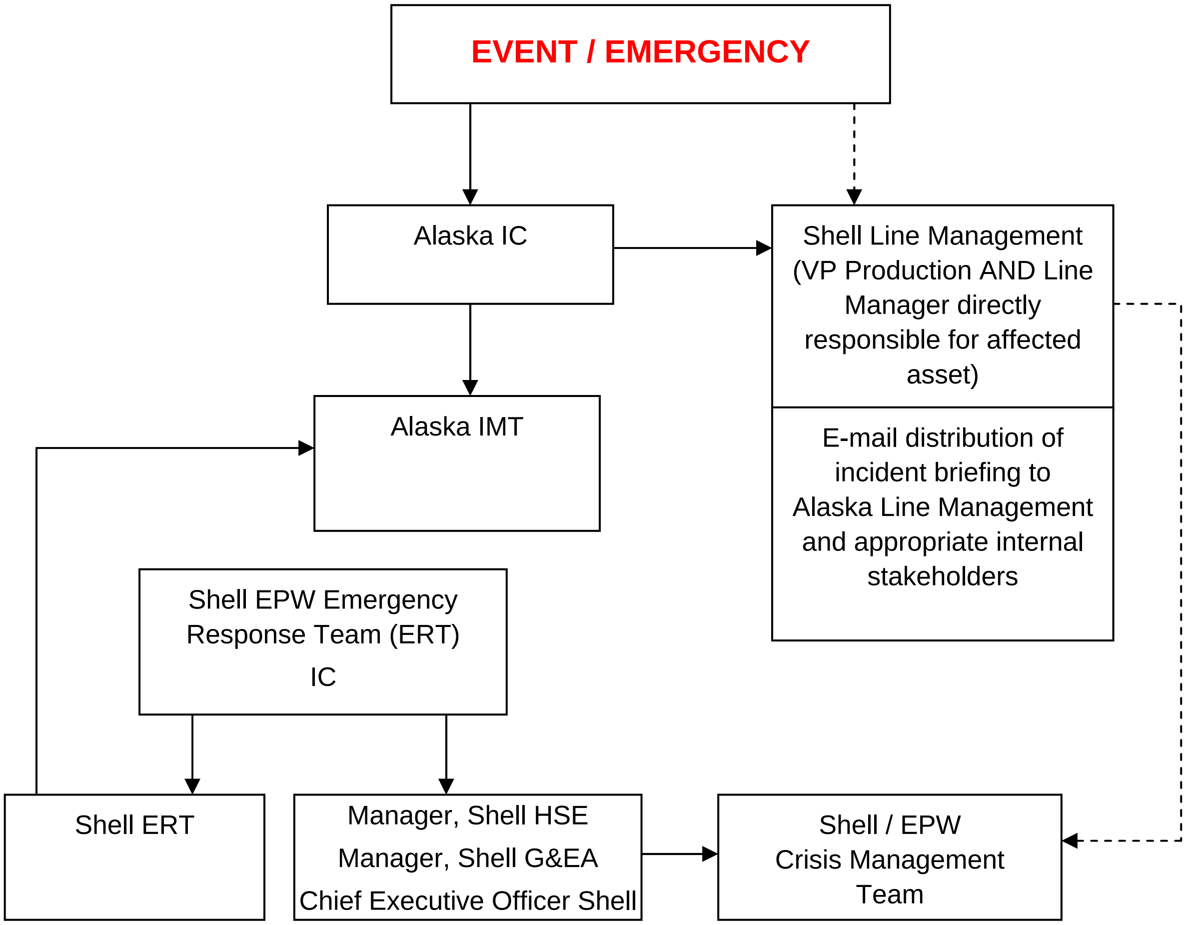
- Oil Spill Response Operations Specialist (Group Leader)
- ACS Superintendent (Deputy Group Leader)
- Response Crews

SOURCE CONTROL GROUP – ~~*FRONTIER*~~ *NOBLE DISCOVERER*

- Drilling Foreman (Group Leader)
- Rig Manager
- Rig Marine Coordinator
- Support Vessels

* On-Scene IC starts response and is responsible for developing and implementing an initial Incident Action Plan (ICS 201 series). Once the full Unified Command is assembled, the On-Scene IC is relieved by the IC and becomes Branch Director in the Operations Section.

FIGURE 1-2
INTERNAL EMERGENCY NOTIFICATION PROCESS DIAGRAM



1.2 REPORTING AND NOTIFICATION [18 AAC 75.425(e)(1)(B)]

1.2.1 Initial Reporting

Any Shell contractor or employee is required to report a spill to their immediate supervisor. The person in charge receiving the initial spill report will assess the situation and then make appropriate agency and corporate notification as established in onboard procedures.

The Initial Response IC will then continue the internal and external reporting sequence to ensure proper notification of response personnel, appropriate company management and government agencies. Emergency contact telephone numbers for Shell, response action contractors, and Mutual Aid (if required) are included in Table 1-4. Table 3-2 lists names, positions, and telephone numbers of facility personnel responsible for spill notification. Agency and external notification information (including Native corporations and villages) are included in Table 1-5.

The Shell spill report form (Figure 1-3) must be completed for any reportable spills.

TABLE 1-4
EMERGENCY CONTACT LIST

SHELL OFFSHORE INC. CONTACT LIST		
Shell Offshore Inc.		
Security	(907) 273-2420	
Alaska Emergency Response Coordinator	(907) 771-7221	
Wells Manager	(907) 771-7219	
Regulatory Affairs Manager	(907) 771-7243	
HSE Environmental Manager	(907) 646-7121	
Environmental / SD Advisor	(907) 646-7116	
	Kulluk	***Noble Discoverer***
Drilling Superintendent	(907) 646-7122	(907) 646-7176 Cell (504) 874-4697
Drilling Engineer	A (713) 546-6674 Cell (713) 898-7104	A (713) 546-6675 Cell (281) 507-6963
	B (713) 546-6632 Cell (713) 806-9667	B (713) 948-1169 Cell (713) 382-6434
Oil Spill Response Centers		
Deadhorse Facility	(907) 382-4130	
Anchorage	(907) 770-3700	
Shell Headquarters	(504) 728-4369	
OIL SPILL RESPONSE ORGANIZATIONS		
Alaska Clean Seas (ACS), Address: Pouch 340022, Prudhoe Bay, Alaska 99734		
Main Number Prudhoe Bay	(907) 659-2405	
ACS Operations Manager	(907) 659-3202	
North Slope Mutual Aid (if applicable) handled through ACS	(907) 659-2405	
ASRC Energy Services (AES),		
Address: 3900 C Street, Anchorage, Alaska 99503		
Main Number Anchorage	(907) 339-6200	
AES Operations Manager	(907) 339-6200	

Note: Please refer to Table 1-5 agency and external notification information for further emergency contact numbers.

* The primary operations center for a Tier II or III spill event will be located at Shell's Anchorage offices.

TABLE 1-5
AGENCY AND EXTERNAL NOTIFICATION INFORMATION

AGENCY	PHONE	FAX
National Response Center (NRC)	(800) 424-8802	
U.S. Environmental Protection Agency (EPA) (NRC will call)	(907) 271-5083	(907) 271-3424
ADEC - business hours ADEC - after hours and on weekends call Alaska State Troopers ADEC - sewage spills only (Abigail Ogbe)	(907) 451-2121 (800) 478-9300 (907) 451-2130	(907) 451-2362 (907) 451-2187
Alaska Department of Natural Resources (ADNR) – Oil Spill Hotline Recording	(907) 451-2678	(907) 451-2751
Department of Interior Office of Environmental Policy and Compliance (DOI-OEPC) (Pamela Bergmann)	(907) 271-5011	(907) 271-4102
North Slope Borough (NSB) NSB Waska Williams (Office) NSB Waska Williams (Cell Phone) NSB Permitting and Zoning Division NSB Risk Management NSB Disaster Coordinator (Pat Patterson)	(907) 561-5144 (907) 852-0440 (907) 367-3930 (907) 852-0320 (907) 852-0248 (907) 852-2822, (907) 852-6111 (24 hours on call)	(907) 562-1940 (907) 852-5991 (907) 852-5991 (907) 852-0356 (907) 852-2475
U.S. Coast Guard	(907) 271-6700	(907) 271-6765
U.S. Fish and Wildlife Service (USFWS) (spills that may impact the Arctic National Wildlife Refuge)	(907) 456-0250	(907) 456-0248
~~Minerals Management Service~~Bureau of Ocean Energy Management Regulation and Enforcement	(907) 250 - 0546	(907) 334-5302
Alaska Department of Fish and Game (ADF&G) - Fairbanks	(907) 459-7242	(907) 452-6410
Alaska Oil and Gas Conservation Commission (AOGCC) - Anchorage AOGCC - North Slope Inspector	(907) 279-1433 (907) 659-3607 Pager, (907) 659-2714	(907) 276-7542 (907) 659-2717
Bureau of Land Management (BLM) Anchorage – National Petroleum Reserve Alaska (NPR-A) BLM Fairbanks – NPR-A (Don Meares) Report seismic spills to Fairbanks only; other spills to both Fairbanks and Anchorage	(907) 267-1210 (907) 474-2306	(907) 267-1304 (907) 474-2386
Prudhoe Bay Weather Village of Nuiqsut Village of Kaktovik City of Barrow North Slope Borough Mayor's Office	(907) 659-5888 (907) 480-6727 (907) 640-6313 (907) 852-5211 (907) 852-0200	

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FIGURE 1-3
SHELL REPORT OF OFFSHORE ENVIRONMENTAL INCIDENT FORM

(Internal SEPCo HSE use only) Incident Number

Report of Offshore Environmental Incident Form (OF-REI)

DIRECTIONS: This form is to be used to capture information that will be later entered into the IMPACT Safety database. When completing this form, please be as complete and specific as possible. When completing this form using MS Word you will only be able to enter information into the shaded portions of the form or by clicking on the check boxes. You can use the TAB key to move to the right or the DOWN ARROW key to move down on the form. You may also use your mouse to click on the cell that y ou want to complete.

Date of Incident | Time of Incident | On SEPCo Premises ☐ Y ☐ N

Incident Headline (Brief description of incident - 50 characters or less on the line below)

Incident Type and Location Information

☐ Spill ☐ Exceedance of discharge limits (Noncompliance) ☐ Produced water sheen
☐ Material lost overboard ☐ Complaint ☐ Fire ☐ Release ☐ Other(Describe)

Field Name Well No./Rig Block Platfo rm

Latitude Longitude OCS-G#

Activity at Location
☐ Drilling/W.O./Completion ☐ Exploration ☐ Production ☐ Construction ☐ Other

Sp ecific Op eratio n
☐ Drilling ☐ Construction ☐ Operations ☐ Other
☐ Workover ☐ Crane operations ☐ Well servicing
☐ Completion ☐ Equipment handling ☐ Air transport
☐ Coil tubing ☐ Maintenance ☐ Boat/Ship

Source (Check all that apply)

☐ Drip pan ☐ Flow line ☐ Other surface ☐ Sump ☐ Tank/Vessel ☐ Wellhead
☐ Flare ☐ Hoses ☐ Pipeline ☐ Rotating equipment ☐ Transfer equipment ☐ Other

Environment Affected

☐ Water ☐ Air

What was spilled or released?

Report spilled or released volume expressing liquid in gallons, dry chemicals in pounds and air emissions in Standard Cubic Feet.
Gallons (gal) Pounds (lbs) Standard Cubic Feet (SCF)

OIL SPILL INFORMATION

Sheen colors ☐ Barely Visible (spill factor = 0.000008) ☐ Silvery (spill factor = 0.000016)
☐ Slight Color (spill factor = 0.000032) ☐ Bright Color (spill factor = 0.000065)
☐ Dull (spill factor = 0.00022) ☐ Dark (spill factor = 0.00043)

Size of the sheen yards by yards Estimated volume of the spill (yards x yards x spill factor) = gallons

Was the sheen ☐ captured/cleaned up ☐ allowed to disperse naturally

How long did the sheen last before natural dispersion or cleaned up? hours

Weather Information

Est. current speed Direction (to) | Estimated wave height | Est. wind speed Direction (from)

Liquid Spill Properties (for spills larger than 6 barrels)

API Grav ity Pour Point

Visibility (nautical miles) Ceiling (feet) Ambient temp. (F.)

Source Control

Describe how and when the source of the spill or discharge was stopped

Describe what was/will be done specifically to prevent reoccurrence? (Procedures changed, equipment repaired, etc)

What was the cost of repairs/cleanup (Include equipment, repair time, transportation, etc.)

EXCEEDANCE OF DISCHARGE LIMITS (NONCOMPLIANCE)

Did a sample fail a Permit test? ☐ Y ☐ N ☐ Static sheen ☐ Produced H_2O sheen

Oil and Grease mg/l Sanitary chlorine mg/l Toxicity ppm

Full Description (How did the incident occur?)
(Attach additional sheets, if necessary, to complete event description)

FIGURE 1-3 (CONTINUED)
SHELL REPORT OF OFFSHORE ENVIRONMENTAL INCIDENT FORM

(Internal SEPCo HSE use only) Incident Number ___________

INCIDENT IMPACT (Actual)					
Actual Impact on Environment	☐ Slight Effect – Less than 1 barrel spill	☐ Minor Effect – Greater than 1 barrel spill, INC or non-compliance	☐ Localized Effect – Greater than 5 barrels spilled or chemical reportable quantity (RQ)	☐ Major Effect – Spill response initialization required	☐ Massive Effect
Actual Impact on Assets ☐ None	☐ No disruption to operation	☐ Brief disruption	☐ Partial shutdown, can be restarted	☐ Partial operational loss up to 2 weeks	☐ Substantial or total loss of operation
Actual Impact on Reputation ☐ None	☐ Slight	☐ Limited	☐ Considerable	☐ Major National	☐ Major International

Type of Complaint (☐ Check if none)

☐ Blast/Vibration ☐ Lights ☐ Odor/Fumes ☐ Debris ☐ Noise ☐ Oil Spray ☐ Smoke ☐ Flaring
☐ Other (describe)

NOTIFICATIONS

	Notified	Person's Name	Date / Time	Report number
External Notifications				
National Response Center 1-800-424-8802 (If delegated to by Incident Commander)	☐		/	
	☐		/	
Internal Notifications (all incidents)				
Incident Commander	☐		/	
Area Leader/Drilling Superintendent	☐		/	
	☐		/	

Witness(es) to the Incident

Name (Typed or Printed)	Employer	Phone

I certify that all the above information is true, accurate and complete. Under Federal law, penalties can be assessed for recording false information including fines and imprisonment.

Report submitted by

Name (Typed or Printed)	Title	Phone	Date

Approvals and/or reviewers

Name (Typed or Printed)	Title	Phone	Date

Contact the HSSE Incident Management Process Gatekeeper for your organization for submission instructions. You can also submit via e-mail address (incidents@shellus.com) or Fax to (907) 770-3636

SEPCo Offshore Report of Environmental Incident Form Page 2 of 2 Form OF-REI Rev. Jan 2002

1.2.2 External Notification Procedures

Appropriate agency verbal notifications and written reports may include:

- NRC
- Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)~~MMS~~
- U.S. Bureau of Land Management
- USFWS
- EPA
- USCG
- U.S. Department of Interior
- U.S. Department of Transportation (DOT)
- ADEC
- AOGCC
- ADF&G
- ADNR
- National Marines Fisheries
- NSB
- Village of Kaktovik
- Village of Nuiqsut
- City of ~~Village of~~ Barrow

See Table 1-5 for contact information.

1.2.3 Written Reporting Requirements

Depending on the type and amount of material spilled, individual government agencies have written reporting requirements, which are the responsibility of Shell. BOEMRE~~MMS~~, USCG, and ADEC reporting requirements will be met in the following procedures. Agency and external notification requirements, and agency reporting requirements are summarized in Tables 1-5 and 1-6, respectively.

BOEMRE~~MMS~~ regulations require all applicable federal, state, and regulatory agencies be notified.

ADEC regulation 18 AAC 75.300 requires notification of any spill on State lands or waterways. After notification of the discharge has been made to ADEC, the department will, at its discretion, require interim reports until cleanup has been completed (18 AAC 75.307). A written final report must be submitted within 15 days of the end of cleanup operations or, if no cleanup occurs, within 15 days of the discharge (18 AAC 75.307). This process is outlined in the ACS *Technical Manual*, Tactic A-2.

TABLE 1-6
AGENCY REPORTING REQUIREMENTS FOR OIL SPILLS

		ENVIRONMENTAL COMPLIANCE INITIAL AGENCY NOTIFICATION											ADMINISTRATIVE WRITTEN REPORT (fax is acceptable)			
		AS SOON AS POSSIBLE					WITHIN 48 HRS	MONTHLY		IMMEDIATE OR AS SHOWN BELOW			5 DAYS AFTER LOSS	15 DAYS AFTER LOSS	15 DAYS AFTER CLEANUP	30 DAYS AFTER EVENT
					SPECIFIC CONDITIONS											
		NRC (EPA)	ADEC ADNR	NSB	USCG[3] BOEMRE ~~MMS~~[4] ADF&G[5]	BLM[10]	ADEC NSB ADNR	ADEC NSB ADNR	FEDERAL LAND ONLY BLM[10]	DOT	SPCO FAX W/IN 48 HR	AOGCC[2] CRUDE GAS	AOGCC CRUDE GAS	EPA[6,12] BLM, BOEMRE ~~MMS~~[14]	ADEC[7] ADNR NSB	DOT[11] SPCO
OFFSHORE (DISCHARGES TO WATER)																
Sewage[8]	Any quantity	X	X											X	X	
Any oil or chemical spill	(i.e., oil, drilling fluids, glycol, produced water, or brine)	X[15]	X[15]	X	X	X			X			X	X	X	X	
Seawater	To seawater environment (no report)															
	Any amount seawater to freshwater environment	X	X	X	X	X			X					X	X	
STAGING AREA																
Chemicals	Exceeds federal reportable quantity (RQ)[1]	X	X	>55 gal		>100 bbl			X					>10 bbl	X	
	Less than RQ, or has no RQ		X	>55 gal		X[4]			X						X	
Selected Hazardous Substances[13]	>55 gallons		X	X					X						X	
	10 to 55 gallons							X	X						X	
	<10 gallons (no report)															
Seawater	To seawater environment (no report)															
	>55 gallons to freshwater environment					>100 bbl	X		X					>10 bbl	X	
	10 to 55 gallons to freshwater environment							X	X						X	
	<10 gallons to freshwater environment (no report)															
Sewage[8]	Any quantity						X[8]								X	
Oil	>55 gallons		X	X		>100 bbl or 500 mcf gas			X			X	X	>10 bbl or 50 mcf gas	X	
	10 to 55 gallons						X		X			>25 gal	X		X	
	1 to 10 gallons (<1 gallon = no report)							X	X				X		X	
IN CONTAINMENT																
Chemicals	Air release, with RQ	X	X						X						X	
	Less than RQ or has no RQ[13]															
Sewage[8]	Any quantity (no report)															
Oil, Glycol, and Select Hazardous Substance[13]	>55 gallons (less than = no report)		X			>100 bbl or 500 mcf gas			X			X	X	>10 bbl or 50 mcf gas	X	

TABLE 1-6 (CONTINUED)
AGENCY REPORTING REQUIREMENTS FOR OIL SPILLS

Notes: “Oil” includes crude, diesel, gasoline, hydraulic fluid, transmission fluid, and therminol.

1. Chemicals with federal RQs include ethylene glycol at 540 gallons (gal) and methanol (pure) at 750 gal. Chemicals without RQs include sewage, produced water, and seawater.
2. Crude oil spills >25 gal, notify AOGCC Slope Representative; Crude oil spills >10 barrels (bbl), notify AOGCC Slope Representative.
3. All oil spills to or threatening navigable waters.
4. Offshore rig spills <42 gal, call NRC. Spills >42 gal, call BOEMRE~~MMS~~ directly.
5. Any release to fish-bearing water bodies.
6. EPA letter required for oil spills >1,000 gal, all off-pad oil spills and storm water releases of oil or chemicals >RQ.
7. Sewage spills, including domestic wastewater and gray water, are reportable to ADEC Wastewater Program; written report due 7 days after event.
8. No notification is required for snow-covered tundra unless >100 bbl, or unless the spill penetrates tundra.
9. Use Form MMS-3160. Reporting required for federal lands only.
10. See Off Pad, On Pad, Ice Pad/Ice Roads, and In Containment reporting requirements to determine reporting to these agencies.
11. Glycols, brines, drilling fluids, seawater, produced water, or methanol diluted with 40% or more water.
12. Detailed report must be submitted to EPA within 60 days if oil discharge is over 1,000 gal in a single event or more than 42 gal of oil in each of two discharges within any 12-month period.
13. Field Environmentalist must evaluate available information (MSDS, test data, or process knowledge) to determine if spilled substance is a hazardous substance. Reporting is not required if a non-hazardous determination is made.
14. BOEMRE~~MMS~~ requires written report 15 days after loss for spills greater than 42 gal.
15. All oil spills to water must be immediately reported to the ADEC and NRC.

Interim and final written reporting requirements are specified in 18 AAC 75.300. The report must contain the following information:

- Date and time of discharge;
- Location of discharge;
- Name of facility or vessel;
- Name, mailing address, and telephone number of person or persons causing or responsible for the discharge and the owner and the operator of the facility or vessel;
- Type and amount of each hazardous substance discharged;
- Cause of the discharge;
- Description of any environmental damage caused by the discharge or containment to the extent the damage can be identified;
- Description of cleanup actions taken;
- Estimated amount of hazardous substance cleaned up and hazardous waste generated;
- Date, location, and method of ultimate disposal of the hazardous substance cleaned up;
- Description of actions being taken to prevent recurrence of the discharge; and
- Other information the department requires to fully assess the cause and impact of the discharge.

1.3 SAFETY [18 AAC 75.425(e)(1)(C)]

Based on applicable safety standards, a description of the steps necessary to develop an incident-specific safety plan for conducting a response are included in the following documents:

- ACS *Technical Manual* Tactics S-1 through S-6 include site entry procedures, site safety plan development, and personnel protection procedures
- Shell *Beaufort and Chukchi Seas Regional Tactics Manual*
- *Shell Contractor Safety Handbook*
- Shell's HSE Policy Statement and HSE Management System

Mandatory safety orientations are conducted for all Shell employees and contractors working at Shell-operated facilities, including additional training for employees in safety-critical positions.

The Shell well plans, prepared for each drilling operation conducted in the Beaufort Sea, are designed to ensure drilling activities are performed in a safe and environmentally sound manner. Each plan identifies the procedures, systems, and equipment employed in drilling; uses the best technical information available concerning subsurface formation characteristics and pressures; and provides information critical to the success and safety of the drilling program. The site-specific evacuation plan is maintained on the Shell-owned or Shell-contracted ~~drillship~~ drilling vessels and is posted throughout these facilities as part of the "Station Bill." Weekly drills are held to assure compliance.

The NSB Emergency Services Director, or designee, will work through the State On-Scene Coordinator (SOSC) within the command structure to represent affected communities.

In the event that conflicts arise with the above-referenced documents while developing an incident-specific safety plan, Shell procedures will take precedence as identified by the IMT Safety Officer.

1.4 COMMUNICATIONS [18 AAC 75.425(e)(1)(D)]

1.4.1 Communications Plan

Effective communication during a spill response requires that all parties understand and use the assigned radio frequencies and telephone numbers. Use of pre-programmed and designated frequencies ensures that emergency communications are established immediately for a response. As spill response efforts grow, additional frequencies and telephone numbers may be added to a complete Communications Plan that is distributed to all parties.

The Communications Unit Leader is responsible for establishing a plan that provides coverage in the field and between the field and a command post. Communication requirements are determined by many factors, the most important of which are the location and nature of the spill response activities, and the number of staff placed in the field. Specific requirements include:

- Communications systems must be self-contained, compact, highly portable, and capable of providing all on-site and off-site communication links for the duration of the response.
- Communication equipment used in the immediate vicinity of spilled or recovered product must be intrinsically safe (explosion proof).

Field teams will work in close proximity to each other, and generally require only a single tactical communication link operating over a distance of several miles. A repeater radio link would be required to bridge worst-case distances from the field to the staging area and support teams.

A description of the statewide communications plan developed by the crude oil spill cooperatives (ACS, Cook Inlet Spill Response, Inc., Ship Escort Response Vessel System) is provided in Table 1-7. The frequencies noted have been licensed for use statewide on oil spills. The plan provides for eight fixed very high frequency (VHF) repeaters in each cooperative area of responsibility, and six portable VHR repeaters. The radio plan also provides up to 20 VHF tactical channels and includes VHF marine channels. The plan has provisions for adding other area-specific channels unique to individual cooperatives or Member Companies and uses exclusively VHF channels in the 150 to 174 megahertz (MHz) band.

The Alaska Statewide Frequency Plan consists of 47 channels, designated OS-29 through OS-76. When referring to these channels, the channel number is always prefixed with the letters “OS.” This clarifies the identity of the channel under discussion and minimizes potential confusion that the channel might represent a marine channel or some other internal company channel.

1.4.2 Communications Equipment

ACS provides for an extensive communications network in the North Slope region, built on the basis of VHF radio coverage. In their inventory, ACS has a satellite earth station system. Also, ultra high frequency (UHF) radio can be linked to VHF systems via an ACS UHF-VHF link. AES will use radio channels on the ACS communication network. Descriptions of communications resources and systems are provided in the ACS *Technical Manual* (see Tactics L-5 and L-11A) and the Shell *Beaufort and Chukchi Seas Regional Tactics Manual* (Tactic LE-2).

TABLE 1-7
SUMMARY OF ALASKA STATEWIDE FREQUENCY PLAN CHANNELS

CHANNEL	TYPE	DESCRIPTION
OS-1 through OS-28		Reserved for individual and unique use by Member Companies and cooperatives.
OS-29 through OS-32	Tactical channels	Match marine radio channels.
OS-33 through OS-52	Fixed repeater channels (and associated talk-around channels)	Located on the North Slope, along the Alyeska Pipeline corridor, and in Cook Inlet or Prince William Sound. The talk-around channels are available for tactical use when operating in an area not covered by the associated repeater channel.
OS-53 through OS-76	Portable repeater channels (and associated talk-around channels)	Licensed for use statewide. The talk-around channels are available for tactical use when operating in an area not covered by the associated portable repeater channel.
OS-65 through OS-76	Marine Channels OS-72 is Marine 11 OS-75 is Marine 80A OS-76 is Marine Repeater 85	For both tactical, operations, and logistics use, as required. Note that marine channels are specifically given OS designations that do not reflect the actual marine channel number.
OS-77 through OS-100		Reserved for potential future expansion of the Plan.

The communication systems that may be employed in a given location or spill situation include:

- **Telephone Circuits.** Telephone systems at many company facilities are generally sufficient to handle the volume of phone calls associated with most spills. Sparsely populated areas, however, may have very limited phone service, or the reserve capacity of the system may be so small that temporary service to remote control centers cannot be quickly provided. Solutions to such potential telephone bottlenecks might include establishing microwave or satellite links to these areas using contracted resources.
- **Cellular Telephone Systems.** Standard cellular coverage in Alaska is limited to populated areas primarily in southcentral and southeast Alaska, but coverage continues to expand rapidly within the state. The increasing availability of satellite-based cellular coverage is expected to make cellular telephone the communications system of choice. Battery-powered cellular phones are preferred to free the user from dependence on commercial power or vehicle batteries.
- **VHF-FM Marine Radio (156-158 MHz).** On-water cleanup operations are expected to use marine VHF radio equipment for inter-vessel, ship-to-shore, or response personnel communications. Marine channel 16 is the international distress and hailing frequency. Marine VHF radios also can be used to warn other, non-response vessels about ongoing cleanup operations. Marine radios can be used for coordinating the cleanup operations, although UHF radios are also suitable for this purpose.
- **VHR-AM Aircraft Radio (118-136 MHz).** These VHF frequencies are used for ground-to-air communications, although most aircraft can also monitor VHF Marine and many UFG channels. Ground-to-air communications are very important for relaying surveillance information, as well as coordinating the transport of equipment and personnel.

- **UHF (454/459.000 MHz).** UHF radio systems are typically used for land-based operations, although they are also acceptable for marine use. UHF radios are often limited to just a few frequencies or channels that are preset into the units. Most UHF radios are 3- or 6- (but can be up to 16) channel models with the actual frequencies dependent on the license of the particular facility or company.
- **HR Single Sideband (SSB) Radio (2-20 MHz).** For communication over long distance at sea and in undeveloped areas, operators may consider obtaining high-frequency SSB voice radio equipment. Radio propagation by this mode changes widely over daily and yearly cycles, and is strongly influenced by changes in solar activity. Communications may be excellent with a station 50 kilometers (km) away at a given time, and barely audible a few hours later.
- **INMARSAT Satellite.** INMARSAT systems can be installed on vessels or at remote locations and, where approved for voice and facsimile communications to standard telephone lines, almost anywhere in the world. The associated costs are high, but these systems can be invaluable in areas where other forms of communication are unavailable or inconsistent, or when facsimile transmissions are critical.
- **MSAT.** MSAT is a satellite system based on the world's most powerful commercial mobile satellite. MSAT has extended mobile telephone, fax, and data communications to all of North America and up to 400 km offshore in coastal water.
- **Paging Systems.** Pagers are one-way radio communication systems that enable persons within range of the paging system transmitter to be alerted or to receive a brief message.
- **700 MHz.** Radio communication networks provide broadband wireless connectivity primarily in the Prudhoe Bay area westward to Alpine, including coverage offshore in short distances (<10 miles).

Rig Communication

The communications equipment maintained on site at the ~~drillship~~ drilling vessel is listed below. Radio coverage at both the *Kulluk* and *Noble~~Frontier~~ Discoverer* will be with VHF Marine and Land Mobile Radio.

The oil spill response vessel will be equipped with radio subscriber units that are both handhelds and dash mounts programmed with the frequencies of ACS's and Shell-licensed land mobile VHF radio networks that includes a repeater at Badami. Base station radios will also be installed on the *Kulluk* and *Noble~~Frontier~~ Discoverer* for communications with spill response vessels in the area. ~~The drillship~~Both drilling vessels will have VSAT voice and data service in excess of 512 kilobytes per second (kbps) to facilitate as primary communication with on shore resources. Voice telephone calls are the primary means of direct communications with the spill response center in Deadhorse; however, the Shell-licensed radio frequencies are configured for communications use.

The primary means of communications between the Shell Deadhorse facility and the *Kulluk* and *Noble~~Frontier~~ Discoverer* is a satellite voice and data communications network. Standard marine VHF radio will be used to communicate with response vessels and drilling support vessels within a 30- to 50-mile radius of the ~~drillship~~drilling vessels. The exact range is dependent on topography and, to some extent, on weather. For communication with response ships and other vessels beyond this radius, the ACS radio communication network or satellite-based phones will be used. Additional repeaters may be located on the ~~drillship~~ drilling vessel or in the proposed exploration area in future years to assure that coverage is available to new drill sites within the proposed area of exploration. The on-site satellite system will also provide a communications link with off-site resources, agencies, and company contacts.

The response vessels will be equipped with radio subscriber units that will be tuned to the assigned frequencies on the ACS communications network. Also, all vessels will have standard marine radio systems. Additional ACS subscriber units are available for use in oil spill response or drills.

Once the ~~drillship~~ drilling vessel is on site, a Shell satellite communication network (supplied by Alaska Telecommunications) will be available. The ~~drillship~~ drilling vessels will have ~~a~~ Ku Band satellite communication package functioning as the primary means of communication for telephone lines, facsimile lines, and data network access lines.

In addition, the ~~drillship~~ drilling vessels will also have a back-up satellite communication network (via ~~Frontier~~ Noble Drilling) as well as Iridium Satellite telephones. There will be multiple telephone and facsimile lines for the ~~drillship~~drilling vessels. Telephone numbers will be provided prior to spud.

Intercom System, *Noble~~Frontier~~ Discoverer*

Barkway intercom system units are located in mud utility, bulk, mechanical and electrical areas, drill floor, and manager's office. The systems are equipped with priority override speed calling and two independent speech paths. The systems will be interrupted temporarily by a page or an alarm from a tone generator. Another system, Vingtor, links the rig pump room, radio room, and control room to the rig pump room, control room, and stairwell, and operates independently of all other systems. This is a hands-free, talk-back system.

Intercom System, *Kulluk*

Barkway intercom system units are located in mud utility, bulk, mechanical and electrical areas, drill floor, and manager's office. The systems are equipped with priority override speed calling and two independent speech paths. The systems will be interrupted temporarily by a page or an alarm from a tone generator. Another system, Vingtor, links the rig pump room, radio room, and control room to the rig pump, control room, and stairwell, and operates independently of all other systems. This is a hands-free talk back system.

Page and Alarm System, *Noble~~Frontier~~ Discoverer*

This system consists of a camp and alarm system. The camp page has high- and low- level volumes (low for sleeping areas); however, in the event of an alarm or emergency page, the volume is increased to full. Tone generators in the control unit of the page system will provide three distinct tones for:

- General – Vibrato – percussive 816 Hz tone
- Combustible Gas – Yeow – 1260-600 HX – downward sweep in 1.6 seconds
- Hydrogen sulfide (H_2S) Gas – Hi-Lo – 780-600 Hz, alternately – 0.52 seconds each

A console in the radio room is interfaced to the control unit with push-button control of appropriate page, alarm, and cancel functions. This console is also interfaced to fire panel and remote sensors with lamps to indicate fault conditions, as well as an auto/manual switch to allow for automatic gas alarms should the radio room be unstaffed.

All alarm tones, standard pages, and emergency pages are transmitted to the rig, camp, and ~~drillship~~ drilling vessel via mixer-amplifiers installed in the equipment room in a rack with the page control unit. The ~~drillship~~ drilling vessel mixer/amplifiers are installed in the stores room.

Page and Alarm System, *Kulluk*

This system consists of camp, MAT, and alarm system. The camp page has high- and low- level volumes (low for sleeping areas), however, in the event of an alarm or emergency page, the volume is increased to full. Tone generators in the control unit of the page system will provide three distinct tones for:

- General – Vibrato – percussive 816 Hz tone
- Combustible Gas – Yellow- 1260-600 HX – downward sweep in 1.6 seconds, and
- H2S Gas – Hi-Lo – 780-600 Hz, alternately – 0.52 seconds each.

A console in the radio room is interfaced to the control unit with push-button control of appropriate page alarm, and cancel functions. This console is also interfaced to fire panel and remote sensors with lamps to indicate fault conditions, as well as an auto/manual switch to allow for automatic gas alarms should the radio room be unstaffed.

All alarm tones, standard pages, and emergency pages are transmitted to the drilling vessel, camp, and drilling vessel via mixer-amplifiers installed in the equipment room in a rack with the page control unit. The drilling vessel mixer/amplifiers are installed in the stores room.

Communication and Navigation Equipment, *Noble~~Frontier~~ Discoverer*

The *Noble~~Frontier~~ Discoverer* has the following communication and navigation equipment installed:

- Mitel SX-20 telephone exchange with seven outgoing trucks and associated locals
- Four each, VHF, FM radio telephone, Raytheon Ray-55
- VHF air-to-ground radio, WCS300
- Nondirectional beacon, Wilcox 485
- Two each, high frequency SSB – Motorola Triton
- Radar transponder – Vega 367X
- Rapifax machine
- Satellite dish for TV c/w modulator, amplifier, intercamp wiring, VCR
- Walkie-talkies (15)
- 2182 Marine Emergency Watch receiver
- Class 1 and Class 2 EPIRB
- Lifeboat radio and VHR crash boat radio
- Weatherfax receiver – Furuno
- Telecommunications currently supplied by Alaska Telecommunications, including a Ku Band satellite system as the primary unit for phones, data and fax, and a secondary VSAT system via Frontier Drilling.
- Two each, 25 kilowatt (kW) Decca radars; one mounted on top of the camp, the other mounted on top of the derrick
- Satellite navigator – Magnavox 4102
- Three VHF radio-telephones – Raytheon Ray-78; one installed in each crane

- One Sperry SR120 gyro compass
- Pantenna/amplifier entertainment system

The *Noble~~Frontier~~ Discoverer* will have the following communication equipment installed:

- Three independent paging systems for all three cranes

Communication and Navigation Equipment, *Kulluk*

- ITT 3100 PBX
- Four each, very high frequency, FM radio telephone, Raytheon Ray-55
- VHF air-to-ground radio, WCS300
- Nondirectional beacon, Wilcox 485
- Two each, high frequency SSB – Motorola Triton
- Radar transponder – Vega 367X
- Rapifax machine
- Satellite dish for TV c/w modulator, amplifier, intercamp wiring, VCR
- Walkie-talkies (15)
- 2182 Marine Emergency Watch receiver
- Class 1 and Class 2 EPIRB
- Lifeboat radio and VHR crash boat radio
- Weatherfax receiver – Furuno
- Telecommunications currently supplied by Alaska Telecommunications with dual Ku Band stabilized systems as primary unit for phones, data, and fax
- Two each, 25 kW Decca radars; one mounted on top of the camp, the other mounted on top of the derrick
- Satellite navigator – Magnavox 4102
- Three VHF radiotelephones – Raytheon Ray-78; one installed in each crane
- One Sperry SR120 gyro compass
- Pantenna/amplifier entertainment system

The *Kulluk* will have the following communication equipment installed:

- Three independent paging systems for all three cranes

VHF Vessel Frequencies

In addition to the standard VHF Marine radio frequencies, a list of frequencies to be used by the *Noble~~Frontier~~ Discoverer* if operating in the Beaufort Sea is presented in Table 1-8.

TABLE 1-8
VESSEL FREQUENCIES FOR THE *NOBLE~~FRONTIER~~ DISCOVERER*

TRANSMIT FREQUENCY	RECEIVING FREQUENCY	USE
150.980 MHz	150.980 MHz	Main Shell-licensed calling frequency
~~159.480 MHz~~	~~159.480 MHz~~	~~*Nanuq* Task Force~~
154.585 MHz	154.585 MHz	*Arctic Endeavor* Task Force
158.445 MHz	158.445 MHz	*Affinity* Task Force
151.625 MHz	151.625 MHz	Skimmer Task Force
156.900 MHz	156.900 MHz	Marine 18A OS-76
154.585 MHz	150.980 MHz	ACS Badami Repeater OS-43

In addition to the standard VHF Marine radio frequencies the following is a list of frequencies to be used by the *Kulluk* while in the Beaufort Sea:

TABLE 1-9
VESSEL FREQUENCIES FOR THE *KULLUK*

TRANSMIT FREQUENCY	RECEIVING FREQUENCY	USE
150.980 MHz	150.980 MHz	Main Shell licensed calling frequency
154.585 MHz	154.585 MHz	Endeavor Task Force
158.445 MHz	158.445 MHz	Affinity Task Force
151.625 MHz	151.625 MHz	Skimmer Task Force
156.900 MHz	156.900 MHz	Marine 18A OS-76
154.585 MHz	150.980 MHz	Alaska Clean Seas Badami Repeater OS-43
156.475 MHz	156.475 MHz	Marine 69 Kaktovik Call Center

Patch Number 1 and Patch Number 2

High frequency radio can be patched to any world-wide telephone. When using these systems, explain to the other party that they have to wait for the sender to stop transmitting before they try to talk, or their conversation will be blocked.

1.4.3 Equipment Maintenance

Communications equipment will be periodically tested and maintained according to the following schedule:

- Monthly:
  - All rechargeable batteries will be tested and recharged.
  - All radio and electronic equipment will receive an operational test to ensure that the equipment is working.

- After Use:
    - All communications equipment used in actual spill response operations will be inspected, cleaned, and tested before being returned to storage.

1.5 DEPLOYMENT STRATEGIES [18 AAC 75.425(e)(1)(E)]

The response will be supervised by ACS utilizing ~~AES~~ Shell's on-site response vessels and oil spill personnel. The Oil Spill Response Barge (OSRB) (*Arctic Endeavor* or similar) has sufficiently trained personnel to provide containment and recovery for the initial operation period. These personnel are available to respond rapidly to an on-site emergency. The succeeding operation period may be manned by transporting trained response personnel via helicopter or small vessel from a land- or vessel-based staging area.

The oil spill personnel designated to the OSRB will be accommodated on the ~~drillship~~ drilling vessel or its support fleet in the immediate surrounding area. These personnel may be transported via helicopter from the heli-deck located on the ~~drillship~~ drilling vessel or its supporting vessels, or may utilize small vessels or workboats for transport. ~~Whereas earlier versions of this C-Plan contained both an OSRV and an OSRB, due to reductions in program scope to one drillship, the OSRB alone is now capable of meeting response planning standards. The OSRB contains the same oil recovery capacity as the previously referenced OSRV with the added benefit of approximately 33 percent more recovered oil storage.~~ The OSRB will be accompanied at all times by a dedicated tug; typically a Crowley Marine Services point class tug, as described in Appendix A. Vessels of Opportunity providing support services to the drilling vessel will augment the OSRB. Combined, they provide the primary response effort as outlined elsewhere in this plan.

If necessary, an additional Oil Spill Response Barge (*Klamath* or similar) will mobilize from the Chukchi Sea, arriving on site within 42 hours to be ready to provide secondary clean up response.

The remaining mobilization of staff to support the oil spill response effort (as indicated in Table 1-19~~18~~), will be progressively mobilized as follows:

- From existing call-out arrangements under ACS, for North Slope Spill Response Teams (72-hour duration), from ACS Auxiliary Contract Response Teams, and from the North Slope Village Response Team (with members from Barrow, Atkasuk, Nuiqsut, and Kaktovik); and
- Other qualified staff mobilized from within the Royal/Dutch Shell Group in the U.S. and abroad.

1.5.1 Transport Procedures [18 AAC 75.425(e)(1)(E)(i)]

Actual response and mobilization times will vary depending on a variety of factors, such as weather, personnel safety, and wildlife considerations. During adverse weather conditions that prohibit the transport of equipment, personnel, and other resources to the spill site, spill response will be conducted solely by on-site personnel and equipment. Sufficient response personnel resources are available at the site to sustain the response around the clock (i.e., two work shifts). Access to shoreline protection and nearshore response equipment is provided by ACS vessels.

The estimated response time from discovery of a spill at the drill site to the deployment of equipment varies depending on the incident causing the spill, the size of the spill, time of year, logistical support, and available information.

TABLE 1-10~~9~~
TRANSPORTATION OPTIONS

MODES OF TRANSPORTATION	SEASON		
	DRILLING	BREAK-UP/FREEZE-UP	WINTER
Helicopters	X[1]	X[1]	X[1]
Fixed-Wing Aircraft	X[1]	X[1]	X[1]
Vessels	X	Conditional[2]	--
Vehicles/Heavy Equipment	--	--	Conditional[2]
Heavy All-Terrain Vehicle (ATV)	--	--	Conditional[2]

[1] Weather dependent
[2] Dependent upon ice conditions

Pre-staged Equipment

Access to pre-staged equipment and supplies to handle minor operational spills will be kept in a state of readiness on the ~~drillship~~drilling vessel. ~~The drillship~~ It will be accompanied by the ~~OSRB~~primary oil spill response vessels on standby, on location, ~~which will be~~and ready to assist with any overboard release. Pre-staged equipment will be inspected monthly. Inspections of Shell equipment, whether located on oil spill response vessels or pre-staged on ~~the drillship~~drilling vessels, will be performed periodically, and the inspection records will be maintained at ACS' or Shell's offices.

Shell and ACS will determine whether additional equipment should be pre-staged along the shoreline to support shoreline response as described in Section 1.6.12. If necessary, connexes packed with containment and recovery equipment will be pre-staged at strategic locations along the shoreline between Prudhoe Bay and Barter Island, and would be routinely inspected to ensure they are secure and ready for deployment in the event of an emergency.

Air Access

The ~~drillship~~ drilling vessels can accommodate helicopter operations. Air operations can be limited by weather conditions, as discussed in Section 3.4.

Fixed-wing aircraft can transport personnel and equipment to gravel airstrips located at Badami (5,100 feet) and Kaktovik (4,800 feet). These airstrips provide coastal access and can serve as logistical hubs for shoreline protection or cleanup efforts. The Badami airstrip location can be viewed on ACS *Technical Manual* Map Atlas Sheet 91.

1.5.2 Notification and Mobilization of Response Action Contractor [18 AAC 75.425(e)(1)(E)(ii)]

Section 1.1 of this C-Plan describes immediate response and notification actions, including notification of ACS. While ACS is mobilizing personnel and equipment to provide spill response support, Shell personnel will determine safety procedures, notify government agencies and other Shell personnel, proceed with source control measures, and establish an oil trajectory. If safe to do so, ACS response personnel will deploy on-site spill containment equipment. Once the trajectory and oil movement direction is determined, ACS will be notified to start equipment deployment in order to intercept escaping oil in the nearshore area and protect prioritized areas onshore.

1.6 RESPONSE STRATEGIES [18 AAC 75.425(e)(1)(F)]

The following subsections provide information about response to potential oil spill and related incidents arising from Shell's exploration drilling program.

The narratives provided in these sections complement the information found in Section 1.6.13, Spill Response Scenarios. Where practicable, project-specific details, including oil trajectories, have been incorporated based on the actual prospects to be drilled. ~~during the 2010 season.~~

1.6.1 Procedures to Stop Discharge [18 AAC 75.425(e)(1)(F)(i)]

Procedures to stop the discharge are discussed in Section 1.6.3, Blowout Control/Relief Well Plan; Section 2.1.7, Blowout Prevention and Emergency Shutdown; Section 4.2, Source Control; Table 4-1, Best Available Technology (BAT) Analysis Well Blowout Source Control; and in the Spill Response Scenarios listed in Section 1.6.13. Shell certifies that it currently has, and continually maintains, a separate blowout contingency plan.

1.6.2 Fire Prevention and Control [18 AAC 75.425(e)(1)(F)(ii)]

In the event of a spill, all sources of ignition will be eliminated, if safe to do so. A standard Site Safety Plan will be used in the event of a major oil spill. This includes assessing and establishing exposure control zones into which appropriately trained and equipped personnel may enter.

If a fire occurs, it will be controlled as much as possible with fire monitors on ~~drillship~~ drilling vessels and support vessels.

The *Noble~~Frontier~~ Discoverer* contains fire and lifeboat alarms, firefighting and washdown systems:

- Alarm systems include vessel-mounted gas detectors located on the ~~drillship~~ drilling vessel floor, upper shale shaker, mud pit room, and mud pump room, with a monitoring panel mounted in the radio room.
- An emergency shutdown system for the ship is located on the ~~drillship~~ drilling vessel floor. The main engine emergency shutdowns are located on the bridge and in the Emergency Response Room.
- Fire and washdown systems include two centrifugal, 300-gallon per minute (gpm) fire pumps, one centrifugal 300 gpm emergency fire pump, and a number of fire hydrants located throughout the ~~drillship~~drilling vessel.
- The vessel is equipped with fixed carbon dioxide (CO_2) fire extinguishing systems to cover the propulsion room, generator room, control room, paint locker and emergency generator room.
- Firefighting foam systems comprise two monitors, foam tank and separate pump for Heli-Port protection.

1.6.3 Blowout Control/Relief Well Plan

Shell has taken significant precautions to minimize the potential for a loss of well control. Section 2.1.8 describes the four layers of preventive and recovery measures used to minimize spill potential during drilling operations.

In the unlikely event that well control is lost despite these precautions, Shell will immediately mobilize emergency response personnel and equipment. Shell will also consult a well control specialist such as Wild Well Control for the intervention and resolution of a well control emergency.

Surface Control Options

If well control is lost, every effort will be made to regain well control using dynamic surface control measures. Historically, these measures of regaining control have been rapid and effective.

However, uncontrolled flow at the surface presents a safety hazard. Safety procedures are employed to protect personnel, the environment, and equipment. A site assessment is conducted, safe access and work plans are created, and uncontrolled fluids are diverted for collection to create a safe working environment and to minimize pollution.

Although the specific surface control methods used will depend on the situation, potential mechanical surface control methods include the following:

- Natural bridging;
- Pumping mud, plugging material, and/or cement down the well to kill it; and
- Replacing the failed equipment if control was lost due to equipment failure.

Subsurface Control Options

Containment capability in the unlikely event of a loss of well control is provided by a combination of subsea capping, subsea containment and surface separation equipment installed on a containment vessel.

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

A set of subsea devices are assembled 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 (commonly called “capping and killing”)
- Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (commonly called “capping and diverting”)

These devices form what is generally known as a capping stack. The devices include: ram-type BOP bodies equipped with blind and/or pipe 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. This equipment will be stored aboard a designated vessel in Alaska and ready for use. It is anticipated that surface intervention efforts will successfully stop the flow from a blowout in less time than is required to drill a relief well.

Should capping fail to completely stop oil leaking from the well, one or more subsea devices will be deployed to capture low-flow rate leaks. Oil and associated gas collected from these devices would be piped to separation equipment on the containment vessel. The separation equipment includes a series of gas/water and oil/water separators, knock-out drums pumps and pre-heaters. Gas would be diverted to a flare and the oil would be disposed of either by storing and shipping from the scene or incinerating in a flare. By capturing the oil below the water surface, interference by surface environmental conditions, including inclement weather or ice, is avoided and surface oil spill recovery efforts are simplified. Surface oil spill response equipment will remain on station in the immediate area to capture any fugitive oil that escapes the subsea collection dome(s).

All of the separation equipment on the containment vessel are designed for conditions found in the Arctic including ice and cold temperatures. This equipment is designed for reliability, ease of operation, flexibility and robustness so it can be used for a variety of emergency situations. Capping stacks, subsea collection devices, separation equipment and the containment vessel will be made available prior to the drilling season. The capping system, containment system and the associated processing equipment is designed and assembled to accommodate the worst case discharge oil and gas volumes expected from wells in this region.

Relief Well

As described in Section 2.1.8, Shell does not rely on relief well drilling as the primary method of surface well control, but rather applies a rigorous multi-layer well control management system that has proven successful in preventing escalation of a well control incident to a blowout situation. These layers include planning and risk identification, early kick detection and kick response procedures, and installing mechanical barriers. These measures result in an extremely low probability of an uncontrolled well release, but in the event this did occur, the drilling of a relief well is the final tool for regaining well control.

In the scenario developed for this C-Plan, the ~~drillship~~ drilling vessel on site attempts to stop (or slow) the blowout by pumping mud and/or concrete downhole. Should these efforts fail, the ~~drillship~~ drilling vessel pulls away from the blowout location in order to support safe recovery operations from a relief well site. As a precautionary measure, relief well preparation operations are initiated in parallel with the implementation of surface control methods. Unless it is damaged, this same ~~drillship~~ drilling vessel will then commence relief well drilling. Where the original on site rig is damaged, Shell's second rig will be used to drill the relief well.

The general strategy for drilling a relief well is to drill a well to intersect the blowout well. Then, drilling fluid or cement is circulated from the relief well to the original wellbore at sufficient rates and weight to stop formation fluid from flowing into the original wellbore, bringing the well under control. Finally, both wells are properly plugged and abandoned.

A relief well in this situation would have the following general characteristics:

- No mud line cellar.
- No formation evaluation at the casing points.
- Kill fluid as well as an additional wellhead and additional surface casing and other casing, drill pipe, mud materials, and cement would be in place onboard the Shell-operated ~~drillship~~drilling vessel.
- A detailed Relief Well Design is submitted to BOEMRE~~MMS~~ as part of the Application for Permit to Drill.

Relief Well Locations

The optimum location for a relief well depends on several factors, including the depth and direction of the wellbore, personnel safety, and weather conditions. The location of the relief well is selected so that it can be drilled in the most efficient manner practicable.

Relief Well Drilling Rig and Equipment

~~Given the relatively benign anticipated well conditions and subsurface well control at the Beaufort Sea locations covered by this plan, and given the risk reduction actions in place (see Section 2.1.8), Shell believes that a prudent operator could conduct a Beaufort drilling campaign using a single drillship.~~

~~It is important to note when considering potential relief well operations, that based on past seasonal ice conditions and active ice management experience, it is very likely that the drilling season could be extended into November.~~

As mentioned above, the relief well could be drilled by the on-site rig, or if necessary, by the second Shell-operated drilling vessel. It is Shell's expectation that this second rig will be in Alaska while exploratory drilling is underway in previously un-penetrated hydrocarbon formations below the surface casing point.

In the event of a blowout, the second drilling vessel would immediately begin deploying to the blowout site to be available, if required. It is important to note when considering potential relief well operations, that based on past seasonal ice conditions and active ice management experience, it is very likely that the drilling season could be extended into November. This is particularly relevant in the case of relief well operations and when considering the use of the proven ice-tolerant *Kulluk* drilling vessel.

While each drilling vessel will carry surface casing and wellhead equipment for a relief well, contingency plans have been established to augment existing drilling equipment (drill pipe, additional casing, cement, and mud materials) and services, which will be drawn from Shell's operations support base in Deadhorse, Greater Prudhoe Bay, or Dutch Harbor.

Relief Well Timing

The estimated total duration, from the start of a blowout to well killing by drilling a relief well, would be approximately ~~16~~ 20 days for ~~a relief well for an 8,000-foot total vertical depth (TVD) well~~the Sivulliq prospect and would be approximately ~~34~~ 25 days for ~~a relief well for a 14,000-foot TVD well~~the Torpedo prospect.

Blowout Well Ignition

The decision to ignite a blowout will be made only after assessing the probability of implementing successful surface control, reviewing potential safety hazards, addressing pertinent environmental considerations, and obtaining necessary agency approvals. In order to save time, a risk/benefit analysis will be completed by Shell, considering the full range of conditions where deliberate ignition could take place. Placing human safety as the highest priority, Shell will consider the feasibility and benefits of igniting the blowout after all personnel, equipment, and vessels have been located at a safe distance from the surfacing oil and gas. Ignition equipment and procedures such as Heli-torch, hand-held igniters, and flares, will be located on-scene and ready for use. The Shell risk/benefit analysis will provide a checklist to facilitate a rapid assessment of the potential risks of exposure for personnel, equipment, and wildlife to the initial flash of combustible vapors, as well as the heat and combustion products from a sustained burn. Ignition and sustained combustion of vapors from the surfacing gas and oil could potentially result in a safer working environment for relief well operators and for responders attempting to contain and recover oil downstream of the blowout. A controlled burn would help eliminate dangerous vapors in the working vicinity.

Permits

In the event of a discharge due to the loss of well control, a series of federal, state, and local permits would be required to support the response effort. Permits will be needed to authorize construction of onshore support facilities if necessary (e.g., staging pads, temporary storage areas, and temporary water uses).

Federal approval would be required in the form of a Section 404/10 permit from the U.S. Army Corps of Engineers (COE) for placement of gravel in nearshore coastal waters. The COE has issued Nationwide Permit No. 20, which authorizes placement of fill needed for cleanup of spilled oil. A request for this authorization would require approval from the Alaska Regional Response Team (ARRT), and would be typically approved very rapidly, assuming the team is in agreement with the overall cleanup strategy for the spill event.

In addition to this federal permit, BOEMRE~~MMS~~, State of Alaska, and NSB permits would also be required. If all other surface control measures fail, and it becomes necessary to drill a relief well, Shell will obtain a permit to drill from BOEMRE~~MMS~~ prior to drilling. As part of the overall North Slope oil spill preparedness program, ACS holds a series of permits authorizing a variety of cleanup-related activities, including bird and mammal hazing and mammal stabilization.

1.6.4 Discharge Tracking [18 AAC 75.425(e)(1)(F)(iv)]

Discharge tracking is discussed in the response scenarios in Section 1.6.13.

Oil movement is tracked using a combination of visual observations and remote sensing techniques. Upon initial notification of the blowout, a ~~Sikorsky S-61~~ helicopter with forward looking infrared radar (FLIR), or alternative aircraft with Synthetic Aperture Radar (SAR), would be deployed depending on availability and weather conditions. See ACS *Technical Manual,* Tactics T-4 through T-7 and Shell *Beaufort and Chukchi Seas Regional Tactics Manual,* Tactic TS-1.

Response vessels also deploy buoys with transmitters. Both systems are capable of real-time tracking of the leading edge of the oil. The tracking buoys are equipped with a transmitter that can be monitored by Incident Management personnel at the Incident Command Center. Oil location information is digitized and transferred to the IMT for response planning and trajectory modeling.

In the event of a spill, trajectory models will be based on observed and modeled currents, wind speed, and direction. Vector addition and trajectory modeling are used to forecast oil movement.

1.6.5 Protection of Sensitive Areas [18 AAC 75.425(e)(1)(F)(v)]

Environmentally sensitive areas and areas of public concern include cultural resource sites, public use areas, Native allotments, and bird nesting areas. See Section 3.2 for discussion of the local environment.

The National Oceanic and Atmospheric Administration (NOAA) Environmental Sensitivity Index (ESI) Maps, ACS *Technical Manual* Atlas Maps, and the *North Slope Subarea Contingency Plan* are used to identify areas of major concern. See ACS *Technical Manual* Map Atlas Sheets 80, 83, 85-87, 89-91, 93, 100-104, and 184-188. A shoreline cleanup plan is prepared for approval by the Unified Command and the State Historic Preservation Officer.

Based on trajectory calculations and oil tracking, barrier islands are identified as the first landforms that may be impacted by oil, followed by the salt marshes and inlets adjacent to the Kadleroshilik River. Protection sites identified in these areas are provided protection with exclusion or deflection booming when little or no ice is present. If drifting ice is present, and the use of booms is not feasible, oil collecting naturally among the ice will be monitored. Recovery efforts for these natural collection sites include the use of small skimming systems, using shallow-draft boats. Accumulations may also present an opportunity for limited burns at or near the shore. In the case where land-fast ice conditions are present, sensitive shoreline resources may be afforded protection from the natural ice barrier.

As oil spill response progresses, priorities for protection may change based as weather, sea state, oil condition, hours of daylight, and other factors.

A new Shoreline Cleanup Plan will be developed and submitted to the Unified Command. Oil and oiled ice will be monitored to the extent possible throughout the spill, and for as long as oil is believed to be present. Should oil persist near the shoreline, after winter recovery operations are complete, these areas will be marked and monitored as the ice begins to melt during break-up. Shoreline specialists and cleanup teams will use the monitoring data to plan and implement removal (and possibly, combustion) tactics within those regions with oil.

1.6.6 Containment and Control Strategies [18 AAC 75.425(e)(1)(F)(vi)]

Containment and control strategies are discussed in the scenarios. Shell will use or otherwise follow ACS *Technical Manual* Tactics C-13 and C-17, R-~~17~~ 16 through R-20, and Shell *Beaufort and Chukchi Seas Regional Tactics Manual* Tactics OR-1 (series), OR-4 (series), and OR-5. ACS is responsible for initial on-site personnel and equipment described in the scenarios. An OSRB is staged with the Shell ~~drillship~~ drilling vessel employed for this exploration program. The OSRB is outfitted with sufficient workboats, boom, skimmers, and other necessary response equipment to respond to an uncontrolled well blowout. Containment boom and equipment can be deployed from the OSRB. Specific tactics are described in the scenario in Section 1.6.13. See ACS *Technical Manual* and Shell *Beaufort and Chukchi Seas Regional Tactics Manual* for detailed information.

ACS has the capabilities to mount an effective, immediate response for the containment and recovery of oil in threatened nearshore waters and to prepare for the protection and cleanup of impacted shorelines. ACS will also provide personnel and equipment for the primary offshore response operations and will use tactics identified in both the ACS *Technical Manual* and the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*. ACS will lead the containment and control efforts in the nearshore and shoreline environments. They will use personnel and equipment identified in the ACS *Technical Manual,* as well as oil spill equipment possibly stored at pre-staged shoreline locations.

As described in the scenario, ACS Shoreline Protection Task Forces mobilize to deploy exclusion booms, if needed, at protection sites on Cross Island, at protection sites south of Tigvariak Island, and at protection sites adjacent to the Kadleroshilik River. These sites are prioritized and boomed in order of proximity to the spill. ACS dispatches additional Shoreline Protection Task Forces to Barter Island to assist Village Response Team personnel in deploying vessels, boom, and other equipment. The protection sites located in Camden Bay are prioritized by aerial observers on site and through trajectory analyses performed by NOAA and The Response Group.

Four teams, traveling by workboats and/or airboats from the Prudhoe Bay area, each place boom in the quantities described in the ACS *Technical Manual* Map Atlas.

The summer scenario described in Section 1.6.13 addresses Shell's plans to respond to a blowout during open-water conditions (August 1–30). It is recognized that ice incursions can occur at any time during the open-water season, and that a period of unexpected cold-air temperatures can result in the formation of new ice (typically grease ice and the formation of thin continuous layers of ice). Any continuous layers of ice, and even low concentrations of individual ice cakes or floes (such as, 1/10 to 2/10 concentrations), can fill containment or deflection booms, prevent oil from accumulating in large pools, and block the flow of oil toward a recovery device. As these conditions develop, the efficiency of physical containment and recovery tactics will be reduced.

As indicated in Response Strategy 1 in Section 1.6.13 (with varying ice conditions), response strategies and specific tactics will be modified to accommodate the challenges of working with a variety of potential ice conditions. If ice concentrations threaten the structural integrity of equipment or prevent oil from being deflected or effectively contained, the offshore response teams will use shorter outrigger/boom extensions in conjunction with skimmers in order to maneuver around large ice cakes while attempting to access smaller pockets of oil.

As ice conditions persist, recovery operations will continue with rope mop skimmers and other small over-the-side skimmers to access oil trapped next to or within heavier ice concentrations, until the conditions threaten the safe and effective use of vessels. At this point, all physical removal tactics will cease, and clean-up operations will turn to the elimination of oil pockets through the use of controlled burning, as feasible. ACS Tactics B-3 through B-7 and Shell *Beaufort and Chukchi Seas Regional Tactics Manual* Tactic OR-7 for open water and solid surface burning will be considered and modified as appropriate to allow for the controlled burning of oil herded against large ice floes, trapped within heavy concentrations of ice, or accumulated in thick layers against shorelines or land-fast ice. Burning can be accomplished without placing personnel and vessels at risk with the use of Heli-torches suspended from helicopters.

At the blowout site, the potential for oil elimination using combustion may continue into periods of light to moderate ice concentrations (including new, solid ice layers) as the oil and gas released from the blowout lift and crack ice layers and leave oil exposed on or between ice cakes/floes. A Heli-torch can be flown, day or night, and used to ignite the oil and vapors directly over the blowout. During early freeze-up, ice-breaking vessels or barges upstream of the blowout can enhance the efficiency of this operation by keeping large ice floes from moving in over the surfacing oil and gas where they could potentially extinguish the flames. These vessels or barges may also be positioned at a safe distance upstream of the blowout to deflect ice and create a temporary, relatively ice-free path and potentially enhancing the combustion process. Oil that escapes the burn at the surfacing plume will likely be herded by wind to one side or the other of the cleared path, allowing oil to accumulate for additional burning downstream.

Shell is also developing a sub-surface containment system. Once complete, this system will provide released oil containment at the well head, and will be unaffected by ice or weather conditions at the surface.

Any oil that avoids containment, recovery, and/or combustion during freeze-up conditions will be quickly locked up beneath and on the ice, and eventually incorporated within ice and snow. Proven techniques for the removal (or mining) of oil from within or below ice (see ACS Tactics R-5, R-13, R-14, R-29, and R-31) may be feasible where it is safe to access and work on a stable ice layer. In other ice regions, particularly in the shear zone (typically 10- to 20-meter depths), it may be impractical and unsafe to access the oiled zone because of its movement and extensive ridging and rafting of the ice.

Shell, its Alaska and International Response Teams, and its contracted support from AES and ACS, are all prepared to conduct extensive monitoring and tracking of any oil that is released to the Beaufort Sea and which is unrecoverable until spring. Such tracking of oiled ice may involve the release of five Metocean buoys (stored on the ~~drillship~~drilling vessel) and Arctic drift buoys with extended transmission capabilities, to be released at or near the spill source. Other markers may involve passive systems such as radar reflectors and brightly colored floats and flags. Together with daily weather recordings, satellite images and ice-movement modeling activities, the continued release and tracking of buoys will enable oceanographers and surveillance specialists to monitor changes in the location, speed and direction of oiled ice. While the nature and location of stable, land-fast ice can vary substantially from year to year, the seasonal pack ice zone, although mobile, can also experience long periods of little or no ice motion. During these periods oiled ice would remain relatively close to the spill source and be easier to track.

Oil released beneath a stable ice cover would soon be encapsulated as new ice forms around and beneath the oil. Depending on the concentration of the oil and the thickness of ice and snow, the monitoring of oiled ice could include Shell's Global Solutions Light Touch system (developed for methane detection from oil in or under ice), the use of Ground Penetrating Radar (showing great promise in recent tests by BOEMRE~~MMS~~, Statoil AS, and ACS), and the use of laser fluorosensors (showing considerable potential for detecting and mapping oil).

As longer periods of light occur and the ice begins to melt and weaken, the heavier deposits of oil beneath and within the ice will begin to move through brine channels and accumulate in melt pools at the surface. These pools will be easy to detect, they will contain oil that is nearly as fresh as when the pools were encapsulated, and they will likely remain concentrated enough to support combustion. Any oil released as fine droplets and widely dispersed will remain within the ice until the ice melts down to expose it. These droplets will eventually surface and be herded by wind into pockets of oil that can potentially be ignited. Aerial ignition will continue well into the break-up period, as conditions allow, until it is safe to operate small skimmers in and around ice cakes and floes. As the ice rots and breaks into smaller pieces, regions of open water will appear, allowing larger containment and recovery operations to begin. Every opportunity will be used to contain and recover oil and burn residue before it can reach shorelines and other sensitive habitats.

1.6.7 Recovery Strategies [18 AAC 75.425(e)(1)(F)(vii)]

Recovery strategies are discussed in the scenarios and reference the ACS *Technical Manual* and the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.

Due to safety concerns, operations will be restricted or limited to appropriate distances from the blowout source. This statement does not indicate or imply a complete prohibition of activities such as containment and recovery close to the blowout. Personnel safety is Shell's primary concern. The On-Scene Safety Officer provides access zone information and determines personal protective equipment (PPE) requirements. Access to the blowout site is carefully controlled. Monitoring protocol is established by the On-Scene Safety Officer to ensure personnel protection. Recent spill recovery events and information provided to ADEC show that containment, control, and recovery operations can take place in areas near a blowout, as long as conditions are safe for workers.

Primary response is provided by equipment stationed in the vicinity of ~~the drillship~~the drilling vessel. This equipment includes an OSRB equipped with two brush skimmers, ~~one 47-foot skimming vessel (with built-in brush skimmers), one vessel of opportunity (with a Transrec skimmer),~~ three 34-foot workboats, mini-barges, and open-ocean containment boom and fire boom, as well as two Transrec 150 equipped vessels of opportunity. The tactics used for the positioning of oil recovery vessels at the blowout site are described in the scenarios.

The time to fill the response vessels is dependent upon many factors. The time to fill is presented in Table 1-15 for each of the response vessels. ~~OSRB is estimated by assuming that all of the oil released can be recovered; it is emulsified through the recovery and pumping process to 35 percent water-in-oil (using an emulsification factor of 1.54 as discussed with ADEC in October 2006), with an additional 20 percent of the blowout flow rate retained (after decanting) as free water, then all fluids (emulsion and free water) will fill the OSRB at a rate of nearly 400 barrels per hour (bbl/hr). For planning purposes, the "Time-to-Fill" is based on the largest volume flow rate of oil/emulsion/water that could conceivably reach the skimming vessel (400 bbl/hr) and a planning storage capacity of 17,000 barrels; consequently, the "Time-to-Fill" for the OSRB is 42 hours.~~

~~In addition to the OSRB, a vessel of opportunity located in the vicinity of the drillship will contribute to the oil spill response. The vessel of opportunity, identified in the Section 1.6.13 scenario as TF-2, will be the anchor handling/ice management vessel, *Tor Viking*. It will be equipped with a Transrec 150 skimmer and will provide oil recovery capability while the OSRB is offloading recovered oil. The *Tor Viking* has a planning storage capacity of 3,200 barrels; consequently, the "Time-to-Fill" is approximately 8 hours. Operational planning estimates it will typically be conducting ice management operations from 1 to 10 nautical miles (nm) (3 to 15 km) away.~~

An oil storage tanker with a planning storage capacity of at least 513,000 barrels will be located between 25 nm and ~~300~~ 200 nm from the drilling location to begin mobilizing immediately in the event of a spill. The tanker will be stationed so it arrives at any spill site and is ready to accept recovered liquids within ~~33.5~~20 hours. This ice-classed tanker has service speed of 16 knots, and an estimated 12-knot transit speed in ice. ~~In the event of adverse weather~~, ~~the~~ Using a conservative ~~30~~20-hour transit time provides sufficient time for the tanker to arrive on-scene in the event of adverse weather.

Secondary response is provided by equipment stationed in the Chukchi Sea that will immediately transition and begin to mobilize to the Beaufort Sea upon notification of an event. This equipment includes an OSV and a second oil spill response barge (*Klamath* or similar) which will arrive at the spill site within 42 hours. The barge is equipped with two Transrec 150 skimmers.

For planning purposes, the scenario assumes that 10 percent of the response volume ~~5,500 barrels of oil per day (bopd) discharge~~ escapes the primary offshore recovery efforts at the blowout. The ~~remaining volume of 550 bopd~~ discharged oil continues to drift to the west, driven by prevailing winds and currents. ACS skimming vessels with mini-barges, dispatched from Prudhoe Bay, intercept the oil as described in the scenario. For the purposes of the scenario, it is assumed that half of the oil encountered in the nearshore environment is not recovered, leaving half ~~about 275 bopd~~ to migrate to the shoreline.

Shoreline recovery operations are staffed by ACS. The scenario describes the mechanics of the recovery tactics. ACS task forces set up and maintain multiple teams along the shoreline to recover oil. For planning purposes, each task force maintains five teams that deploy boom to intercept oil moving along the shoreline, a small skimmer, and Fastanks or bladders set up on the beach to hold the recovered liquids or oily waste and debris. The tactical units will have portable storage devices allowing for up to 1,180 barrels of total fluid or oily waste storage along the shoreline before the waste is ready to be transported to Prudhoe Bay infrastructure for disposal.

Shell has a procedural agreement with the Greater Prudhoe Bay Unit and Kuparuk River Unit for the processing and disposal of oil spill-recovered fluids transported to Prudhoe Bay by ACS mini-barges. Recovered oil received in Prudhoe Bay will be handled in accordance with ACS disposal tactics D-1 through D-5.

1.6.8 Lightering, Transfer, and Storage of Oil from Tanks [18 AAC 75.425(e)(1)(F)(viii)]

Lightering, transfer, and storage of oil from tanks are discussed in the ACS *Technical Manual*, Volume 1, and in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.

Liquids from the nearshore skimmer vessels are stored in mini-barges. Stored liquids on mini-barges are offloaded to the OSRBs or transported to Prudhoe Bay for processing. Liquids and oily waste and debris recovered by the shoreline recovery task forces are stored in Fastanks or bladder tanks. Decanting follows FOSC plan approval.

ACS will primarily use GT-A heavy oil transfer pumps to pump product from the mini-barges to the OSRBs. These pumps are modified, positive displacement pumps that are hydraulically driven and have been specially developed for the pumping of extremely viscous products. The mini-barges are fitted with two suction lines (one each per tank), or the pumps can be submerged in the product via hold access hatches.

Recovered liquids received by the OSRBs will be retained onboard until transferred to the oil storage tanker (refer to Section 1.6.9 below).

1.6.9 Transfer and Storage Procedures [18 AAC 75.425(e)(1)(F)(ix)]

Transfer and storage procedures are discussed in the ACS *Technical Manual,* Tactic R-22 and Shell *Beaufort and Chukchi Seas Regional Tactics Manual*, Tactics OR-3A and OR-6.

Oil transfer from the recovery vessels will be via installed cargo pumping systems or eight hydraulically driven GT-A Heavy Oil Transfer Pumps. Each pump has a maximum pumping capacity of 115 cubic meters per hour (m^3/hr) (723 bbl/hr) or a total of 920 m^3/hr (5,787 bbl/hr) total maximum pumping capacity.

Because the tanker is located at the scene, the total transport and set-up time to lighter is approximately 2 hours. Assuming the OSRB uses four of the available transfer pumps, the time to lighter when it is filled to maximum capacity is approximately 6 hours. The time to lighter for each recovery vessel is presented in Table 1-15. ~~When the OSRB has been recovering 400 barrels for 16 hours, it has not reached maximum capacity, and the time to lighter is approximately 2.2 hours. Therefore, for planning purposes, it is conservatively estimated that 6 to 8 hours would be necessary to offload the OSRB. Assuming the vessel of opportunity has a planning storage capacity of 3,200 barrels, and it uses two of the available pumps to transfer fluids, the time to lighter is approximately 2.2 hours. The recovery vessels stagger lightering operations, so that oil containment and recovery is continuous at the spill site.~~

As the recovered oily liquids are transferred to the recovered oil tanker, the liquids are gauged and manifested.

1.6.10 Temporary Storage and Disposal [18 AAC 75.425(e)(1)(F)(x)]

Temporary storage of oil, oily waste, and debris recovered during a spill cleanup may be provided by tanks or bins, as appropriate, located onshore or on one of the OSRBs. The spill location or other logistical concerns may also require storage of oil, oily waste, and debris in smaller, more portable containers that can be brought to the scene via helicopter or small boats and mini-barges. See ACS *Technical Manual,* Tactics D-1 through D-3.

Non-liquid oily wastes are classified and disposed of according to classification. Non-oily wastes are classified and disposed of accordingly.

At the time of the spill, the Operations Section Chief, in consultation with the Environment Unit Leader, determines the reuse, recycling, or disposal method best suited to the state of the oil, the degree of contamination, and the logistics involved in these operations. Application for agency approvals are completed before the determined method of disposal is implemented.

Disposal and processing of recovered fluids transported to Prudhoe Bay will be in accordance with ACS *Technical Manual* disposal tactics D1 through D5. Recovered fluids will be disposed of as per Ballot Agreements.

Recovered fluids stored onboard the Arctic tanker will be disposed of either at Shell Group refineries or other third-party processors, in accordance with Shell environmental policy, and relevant local laws and regulations.

Shell's waste management procedures are further described in Appendix D, Oil and Debris Disposal Procedures.

1.6.11 Wildlife Protection [18 AAC 75.425(e)(1)(F)(xi)]

Wildlife protection strategies are discussed in the ACS *Technical Manual*, Volume 1, Tactics W-1 through W-6. The primary objective is to protect wildlife by preventing birds and mammals from entering spill or containment areas. Containment areas will be monitored until USFWS and/or ADF&G determine that monitoring is no longer required. In general, wildlife protection strategies include, but are not limited to:

- Containment and controls to limit the spread of oil, and the area influenced by the spill and response options.

- The ~~drillship~~ drilling vessel has a marine mammal observer onboard at all times, which is considered the BAT for wildlife monitoring.
- Hazing of birds and mammals.
- Capture and relocation of wildlife in direct threat.
- Aircraft monitoring.

Refer to Appendix E, "Wildlife Capture, Treatment and Release Programs, Beaufort Sea Oil Spill Response Planning" for further details.

Shell has developed a *Bear (Polar and Grizzly) and Pacific Walrus Encounter and Interaction Plan* to support its request for a Letter of Authorization from the USFWS for Shell's proposed operations. As part of the Encounter and Interaction Plan, individual addenda have been developed for each project including drilling programs. The Letter of Authorization request is under review and a copy of the Letter of Authorization and the approved Encounter and Interaction Plan will be available on all Shell Operations facilities. Bear awareness training will be provided to all operations staff. Trained and certified bear guards will be deployed to support activities at risk of an encounter with polar bears. In the event of an accidental release that may impact shoreline resources, including Cross Island and Kaktovik, additional certified bear guards and security staff would be deployed to protect workers and polar bears. USFWS staff may also be deployed to provide additional oversight and consultation in the event of a major response.

Hazing equipment will be stored at the Deadhorse warehouse and office building.

1.6.12 Shoreline Cleanup [18 AAC 75.425(e)(1)(F)(xii)]

Nearshore and Shoreline Response Plan

Tactics in the shallow and nearshore environments of the Beaufort Sea are best carried out using relatively small response boats (typically 20 feet to 40 feet). These shallow-draft, fast-response boats are flexible platforms for conducting response activities in the changing conditions of the Beaufort Sea. The nearshore/shoreline response concept is to use smaller, more maneuverable vessels to conduct shoreline protection and cleanup operations, even in light concentrations of broken ice. The smaller vessels are better able to access pools of collected oil against an ice edge, move between ice cakes and floes, and respond more quickly to changing weather and ice conditions.

Experience has shown that small response boats also work well with relatively small, shallow-draft barges. ACS's fleet of mini-barges includes twelve 249-barrel and two 128-barrel capacity barges. Barges of this size are ideal for easy maneuvering by small boats in thin ice and around ice cakes. Another advantage of the mini-barges is that, on their return to the recovery and cleanup area, they can be used as cargo platforms to carry equipment and supplies for the ongoing nearshore and shoreline operations.

Shell's offshore spill response program involves ~~an~~ OSVs and OSRBs with high-volume recovery and storage capabilities. In addition, ACS has oil-spill-response vessels at Prudhoe Bay that can be deployed during open-water and limited broken or new-ice conditions over the broad region between Prudhoe Bay and Barter Island. Together with the mini-barges, these vessels can mount a significant response at those environmentally sensitive sites believed to be in the path of the oil's leading edge. Evaluations have been made of the likely spill trajectories that could result for a number of hypothetical spills from Shell's offshore operations. The oil spread and transport calculations suggest that shoreline exposures would not normally involve more than three or four high-priority protection sites at a time during the first 24 to 48 hours of a spill. Because ACS vessels could travel from Prudhoe Bay all the way to Kaktovik in under 24 hours, there would be time to deploy boom at sensitive sites, and to intercept the leading edge of the oil before it reaches the shoreline.

Small boats also can be pre-staged and personnel can be heli-transported out to deploy boom. In most cases, the water along the shoreline is so shallow that boom can be deployed by wading, and boats would not be needed.

Most of the tactics planned for nearshore and shoreline response are described and illustrated in the ACS *Technical Manual* shoreline tactics SH-1, SH-2, SH-3, SH-5, SH-6, SH-10, and SH-12; containment tactics C-13 through C-16; and recovery tactics R-15 through R-18 and R-20. Some of these tactics, including slight variations to meet changing conditions along the shoreline, are detailed in Figures 1-4~~5~~ through 1-9~~10~~.

Sensitive Environmental Sites

In addition to the consideration of appropriate shoreline tactics and equipment, Shell has also undertaken a preliminary assessment of coastal areas that could be impacted from a major spill at Shell's drilling locations. These areas have been identified using a series of trajectory analyses and related timelines to ensure Shell's ability to protect the areas in a timely and effective manner.

The coastal area assessments consider the following factors:

- Potential for oil impact, and the nature and magnitude of possible oil retention (substrate, grain size, beach slope, and wave and tidal energy);
- Sensitivity of biological and cultural resources at risk;
- Type and amount of resources (personnel, boats, skimmers, and booms) required for shoreline protection and cleanup; and
- Weather and environmental conditions (prevailing and extreme events) that would most influence the performance of personnel and equipment.

An important step in this assessment process is the ranking of shoreline sensitivity. Ranking involves a careful evaluation of the relationships between physical processes, the nature and amount of oil that could reach a given shoreline, the shoreline type and substrate, oil fate and effects, and sediment-transport patterns. The intensity of energy expended on a shoreline by wave action, tidal currents (though small in the Beaufort Sea), and river currents directly affects the persistence of stranded oil. The need for shoreline cleanup activities is determined, in part, by the speed at which natural processes might remove oil that is stranded on the shoreline, and the prioritization of areas where natural forces are relatively weak or absent (e.g., tidal flats and marshes). All of these processes and oil/shoreline interactions are used in the development and use of ESI values.

One of the best sources of environmental sensitivity ranking for the region of interest is the *Sensitivity of Coastal Environments and Wildlife to Spilled Oil, North Slope, Alaska, Atlas* (North Slope Atlas), supported by NOAA, Oil Spill Recovery Institute in Cordova, Alaska, CHADUX Corporation, ACS, and the BOEMRE~~MMS~~. The ESI rankings reflect the fact that areas exposed to high levels of physical energy generally have low biological activity and rank low on a scale of 1 to 10. Sheltered areas, however, commonly have high biological activity and rank the highest.

The following list (extracted from the above-referenced document) provides the ranking of shoreline habitats for the North Slope of Alaska, ordered by increasing sensitivity to spilled oil, with 1 being the lowest and 10 being the highest:

1A	Exposed Rocky Shores
1B	Exposed, Solid Man-made Structures
3A	Fine- to Medium-grained Sand Beaches
3C	Tundra Cliffs
4	Coarse-grained Sand Beaches
5	Mixed Sand and Gravel Beaches
6A	Gravel Beaches
6B	Riprap
7	Exposed Tidal Flats
8A	Sheltered Rocky Shores and Sheltered Scarps in Mud and Clay
8E	Peat Shorelines
9A	Sheltered Tidal Flats
9B	Sheltered, Vegetated Low Banks
10A	Salt- and Brackish-water Marsh
10E	Inundated Low-lying Tundra

Biological information about animal and plant species that are at risk from exposure to spilled oil or the cleanup process is also provided in the atlas. The species are divided into the following groups and subgroups:

- Birds (diving birds, gulls and terns, seabirds, shorebirds, and waterfowl);
- Fish;
- Marine Mammals (pinnipeds, polar bears, and whales);
- Terrestrial Mammals (bears, caribou, and musk ox), and
- Benthic Habitats (kelp).

The environmental sensitivity rankings, together with information about biological resources, sea ice, and human-use resources provided in the atlas, are important to the selection of areas identified as priority protection sites. The North Slope Sensitive Areas Work Group (NSSAWG), consisting of representatives from several federal, state and local government agencies and industry organizations, has worked with a wide range of experts to evaluate the environmental sensitivity rankings, and identify specific areas along the North Slope that should be recognized as priority protection sites.

Figure 1-4~~5~~ and Figure 1-5~~6~~ present graphics of shoreline containment and protection and shoreline containment and recovery operations, respectively. Figure 1-6~~7~~ shows shoreline cleanup and backwater protection.

Working closely with the NSSAWG, ACS has developed a Map Atlas in Volume 2 of their *Technical Manual*, which includes a comprehensive set of shoreline maps where Priority Protection Sites are identified (Figure 1-10~~12~~). Shell has used the ESI rankings provided in the environmental atlas, along with the Priority Protection Sites indicated in the ACS *Technical Manual*, Volume 2, to consider the nature and extent of resources (vessels, barges, booms, skimmers, response equipment, and personnel) to provide a timely and effective nearshore and shoreline response.

For decades, ACS has carried out planning efforts, field trials, and training exercises involving the islands, mainland beaches, river deltas, and inland waterways and marshes over a broad region of the North Slope area. Most of these activities, and the priority protection site analyses, have focused on the shoreline between Harrison Bay and Brownlow Point. Shell's assessment of possible spill trajectories from its planned drill sites reveal that shoreline impacts could occur east of Brownlow Point. Shell has worked with ACS and other members of NSSAWG to identify and select additional priority protection sites between Brownlow Point and Barter Island. As a result, ACS has updated its mapping inventory to include these additional sites, along with sites east of Barter Island to Demarcation Bay located near the Canadian border~~, as shown on Figures 1-4A through 1-4J of this plan~~. Figure 1-10~~11~~ provides a list of the priority protection sites currently identified in the ACS *Technical Manual*, Volume 2.

Shell has included the updated ACS maps in this C-plan for reference to ensure that all environmentally sensitive shorelines that could be exposed to spilled oil from their operations are recognized and included in the current planning of nearshore and shoreline protection activities. The updated maps include priority protection sites east of Barter Island to Demarcation Bay, an area outside of Shell's planning assessment of possible trajectories. Although this area is outside of the spill trajectory for this plan, the maps are provided for reference.

TABLE 1-11~~10~~
SHORELINE PROTECTION ASSESSMENT FOR FLAXMAN ISLAND TO BARTER ISLAND

PRIORITY PROTECTION SITES	ACS MAP ATLAS SHEET REFERENCE	LATITUDE / LONGITUDE	PROPOSED TACTICS (AS PER ACS *TECHNICAL MANUAL*)	ESTIMATED SHORELINE BOOM (IN FEET)
PS74	184	70 10’ N/145 56’ W	C-13 or C-14	3,000
PS75	184	70 08.5’ N/145 47.5’W	C-14	200
PS76	184	70 07’ N/145 41.5’ W	C-14	200
PS77	184	70 05’ N/145 31’ W	C-14	400
PS78	184	70-03.5N/145 32’ W	C-13 or C-14	2,000
PS79	185	70 01.5’ N/145 21’ W	C-13	4,000
PS80	185	70 00.7’ N/145 18’ W	C-13 or C-14	800
PS81	185	70 01.6’ N/145 13’ W	C-13	5,000
PS82	185	69 59.5’ N/145 14’ W	C-13 or C-14	2,000
PS83	185	69 59’ N/145 02’ W	C-14	150
PS84	185	69 58.6’ N/144 58.5’ W	C-14	300
PS85	186	69 57.8’ N/144 57’ W	C-14	200
PS86	186	69 58.6’ N/144 48’ W	C-14	200
PS87	186	69 58.5’ N/144 46’ W	C-14	200
PS88	186	69 58.2’ N/144 42.2’ W	C-14	200
PS89	186	69 59’ N/144 33.5’ W	C-14	150
PS90	186	70 01’ N/144 30’ W	C-14	200
PS91	186	70 02’ N/144 27’ W	C-13 or C-14	1,000
PS92	187	70 02.2’ N/144 11’ W	C-14	500
PS93	187	70 03’ N/144 06’ W	C-14	400
PS93A	187	70 03’ N/144 05’ W	C-14	400
PS94	187	70 03.5’ N/144 01.5’ W	C-13 or C-14	1,000
PS95	187	70 04.8’ N/144 00.5’ W	C-13 or C-14	3,000
PS96	188	70 06.7’ N/143 47’ W	C-13 or C-14	3,000
PS97	188	70 08’ N/143 36’ W	C-13 or C-14	2,000
PS98	188	70 07.7’ N/143 32’ W	C-13 or C-14	1,500
PS99	188	70 07.5’ N/143 22.5’ W	C-13	2,000
PS100	188	70 09’ N/143 14’ W	C-14	800
PS101	189	70 05’ N/143 00’ W	C-13 or C-14	1,000
PS102	189	70 03’ N/142 50’ W	C-14	300
PS103	190	69 58.5’ N/142 32.5’ W	C-13 or C-14	300
PS104	190	69 56.5’ N/142 24’ W	C-14 or C-14	800
PS105	190	69 55’ N/142 20’ W	C-13	1,000
PS106	191	69 52’ N/142 10’ W	C-14	200
PS107	191	69 51’ N/142 06’ W	C-14	400
PS108	191	69 49’ N/141 56’ W	C-13 or C-14	500
PS109	192	69 46’ N/141 39’ W	C-14	200
PS110	192	69 42.4’ N/141 27’ W	C-14	200
PS111	193	69 40.3’ N/141 20’ W	C-13	1,200

~~**FIGURE 1-4A**~~
~~**PRIORITY PROTECTION SITES**~~

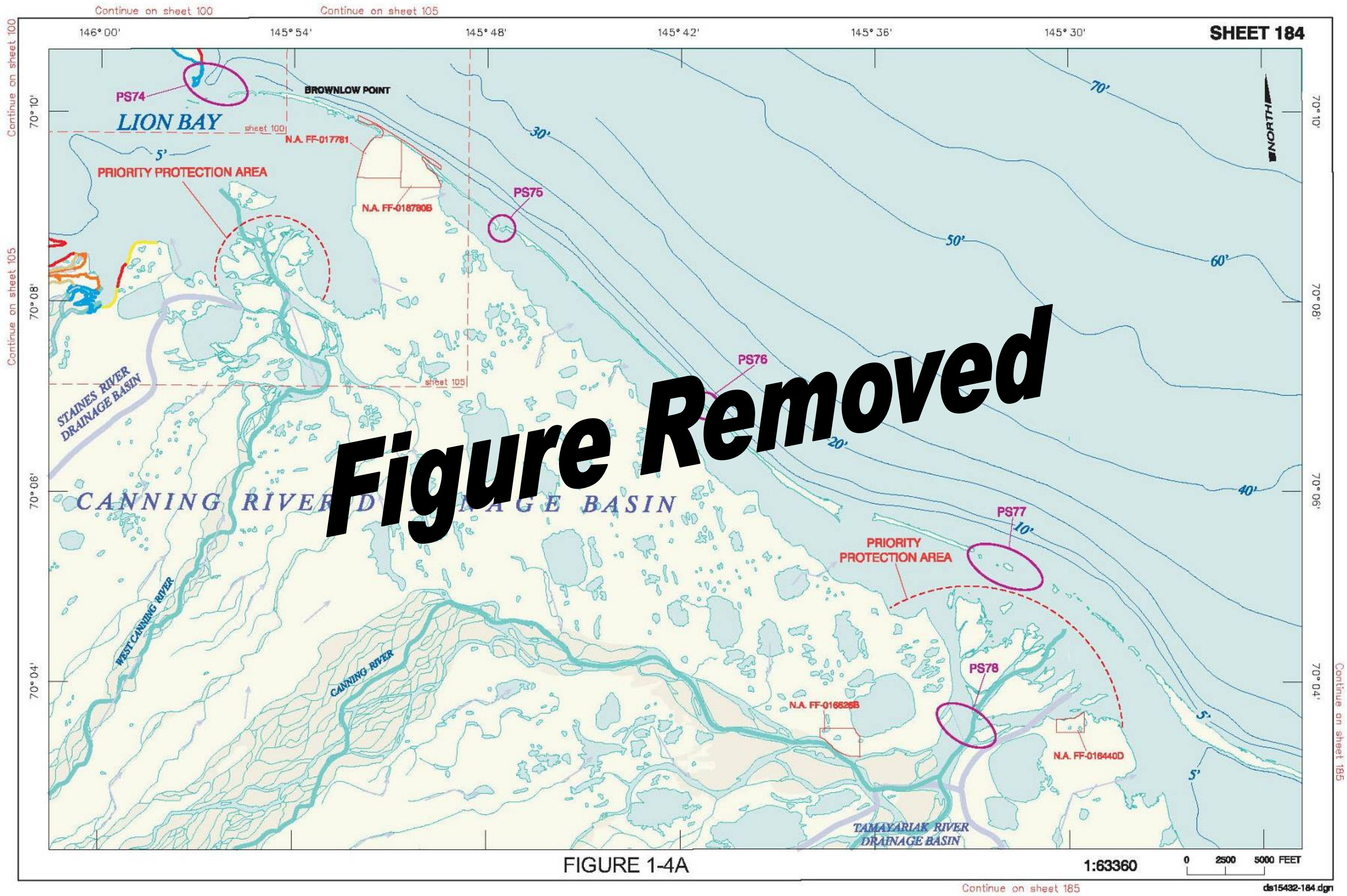
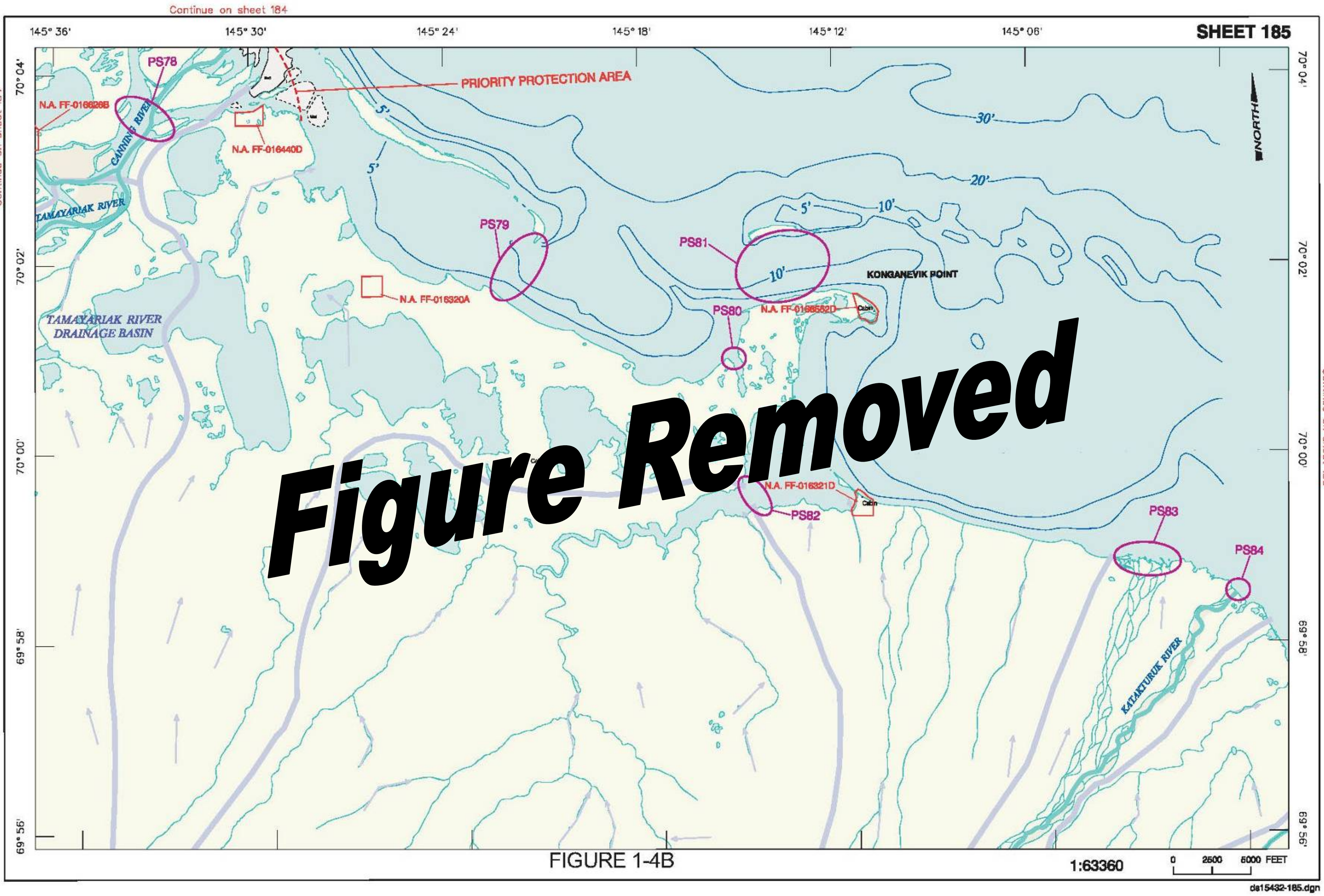


FIGURE 1-4A

~~**FIGURE 1-4B**~~
~~**PRIORITY PROTECTION SITES (CONTINUED)**~~



~~FIGURE 1-4C~~

~~PRIORITY PROTECTION SITES (CONTINUED)~~

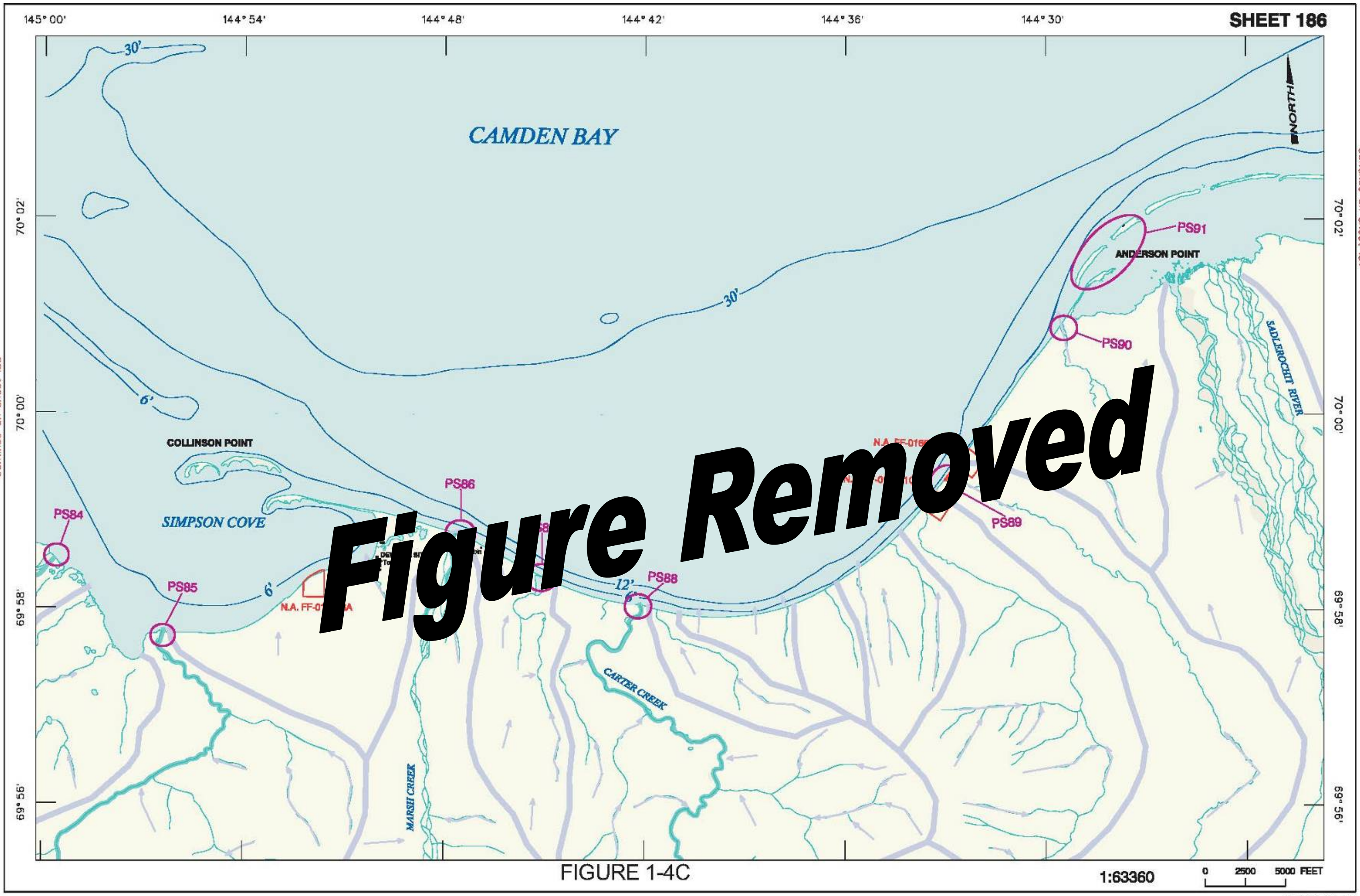
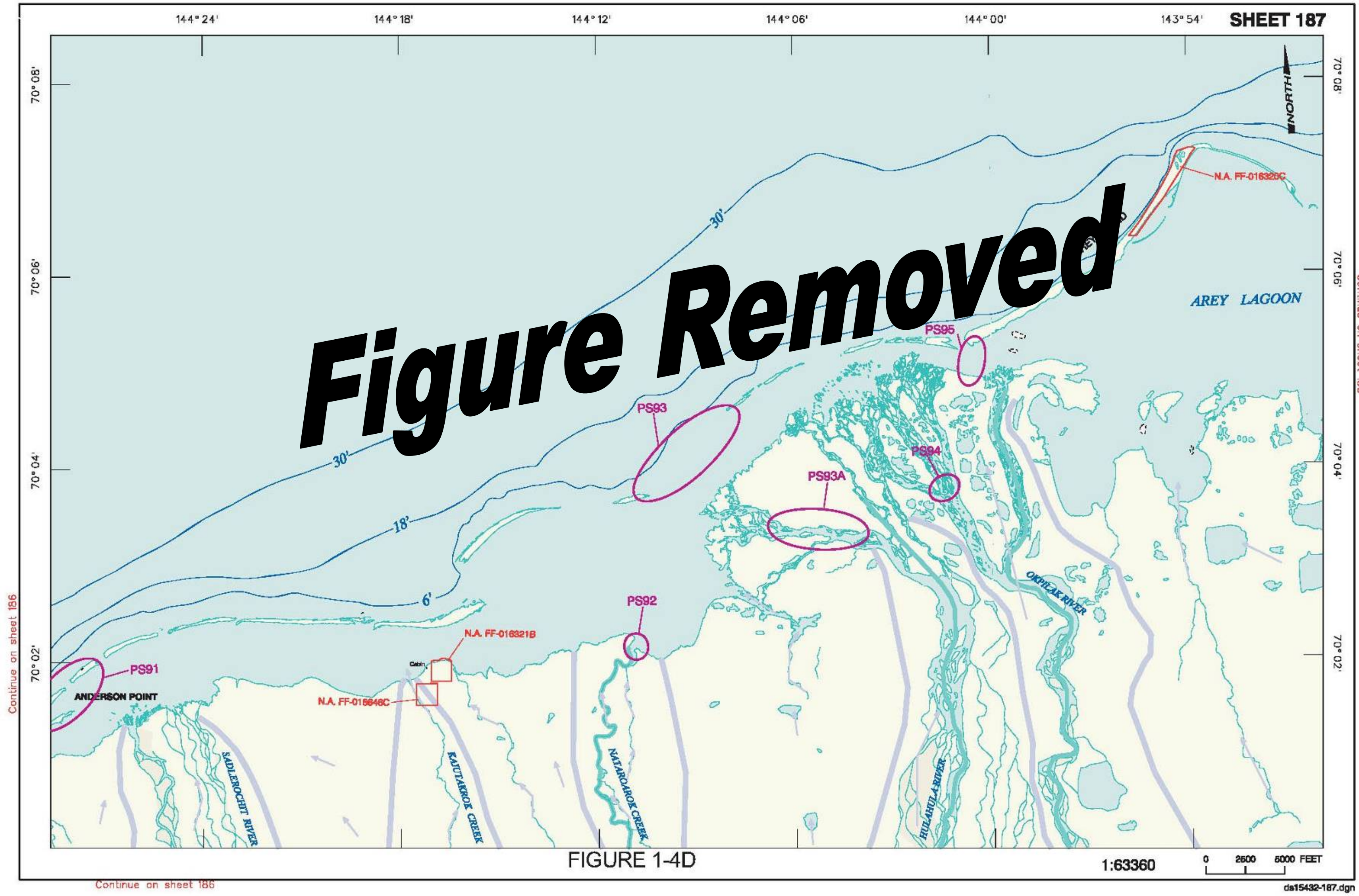


FIGURE 1-4C

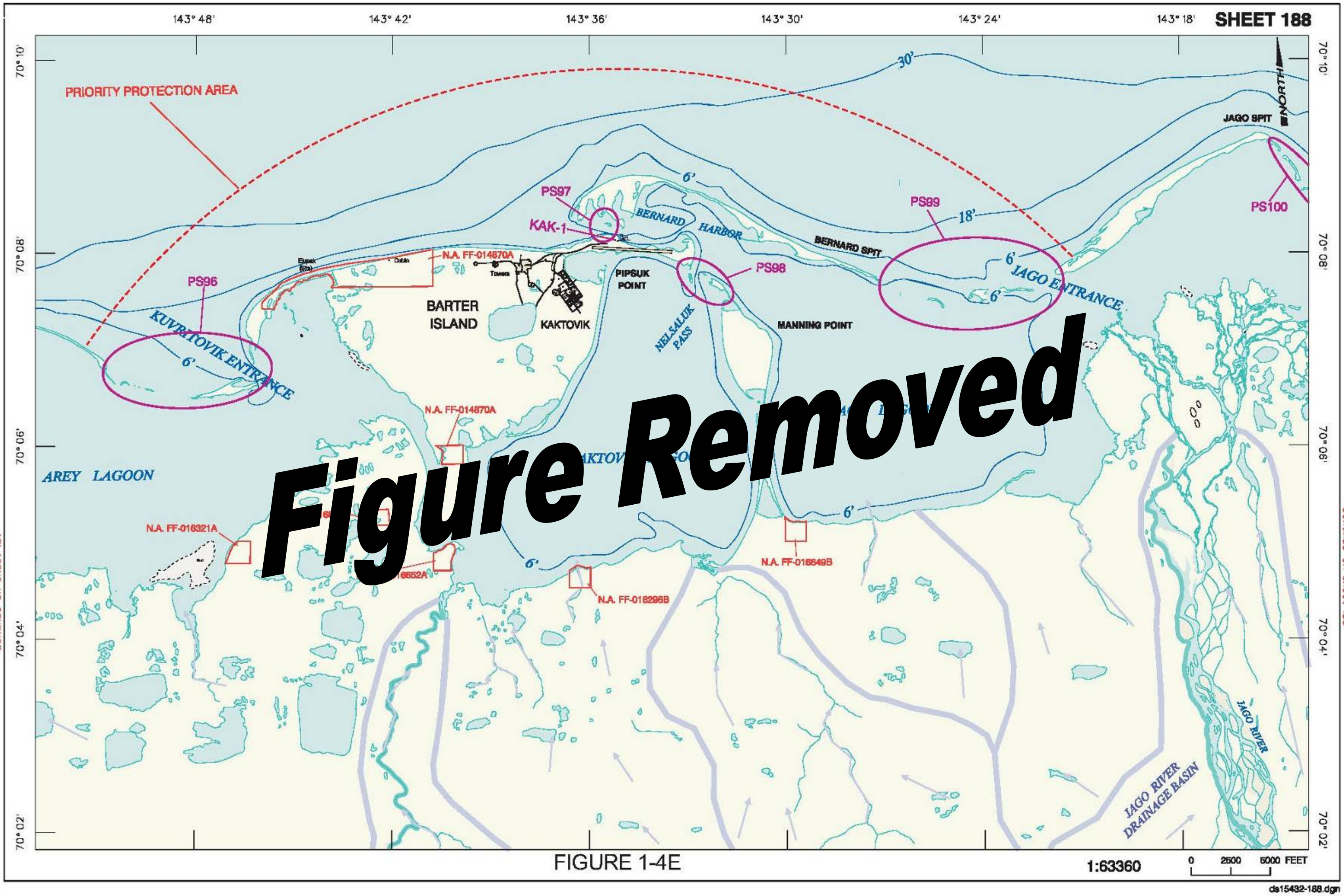
~~**FIGURE 1-4D**~~

~~**PRIORITY PROTECTION SITES (CONTINUED)**~~



~~**FIGURE 1-4E**~~

~~**PRIORITY PROTECTION SITES (CONTINUED)**~~



~~**FIGURE 1-4F**~~
~~**PRIORITY PROTECTION SITES (CONTINUED)**~~

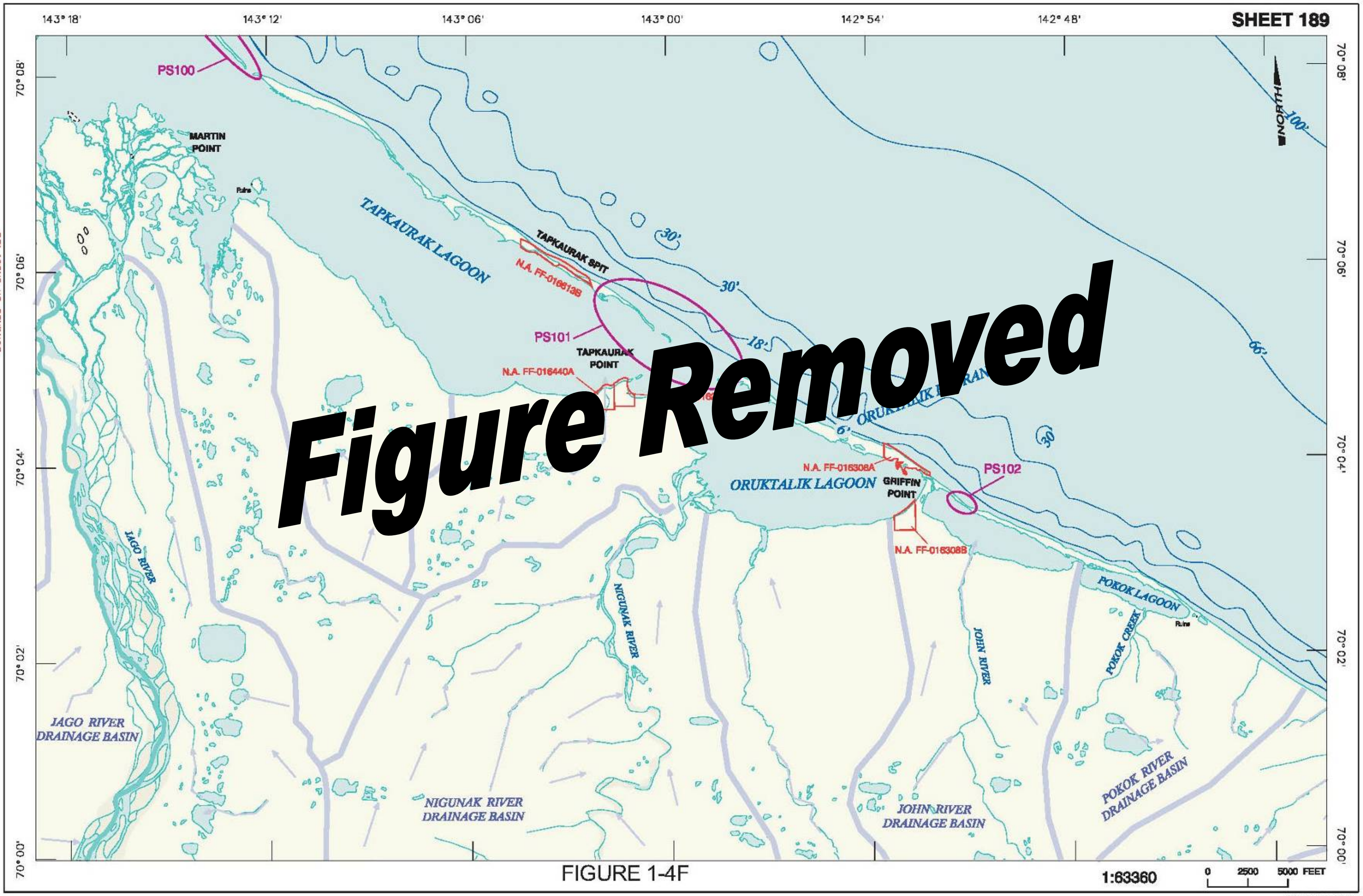
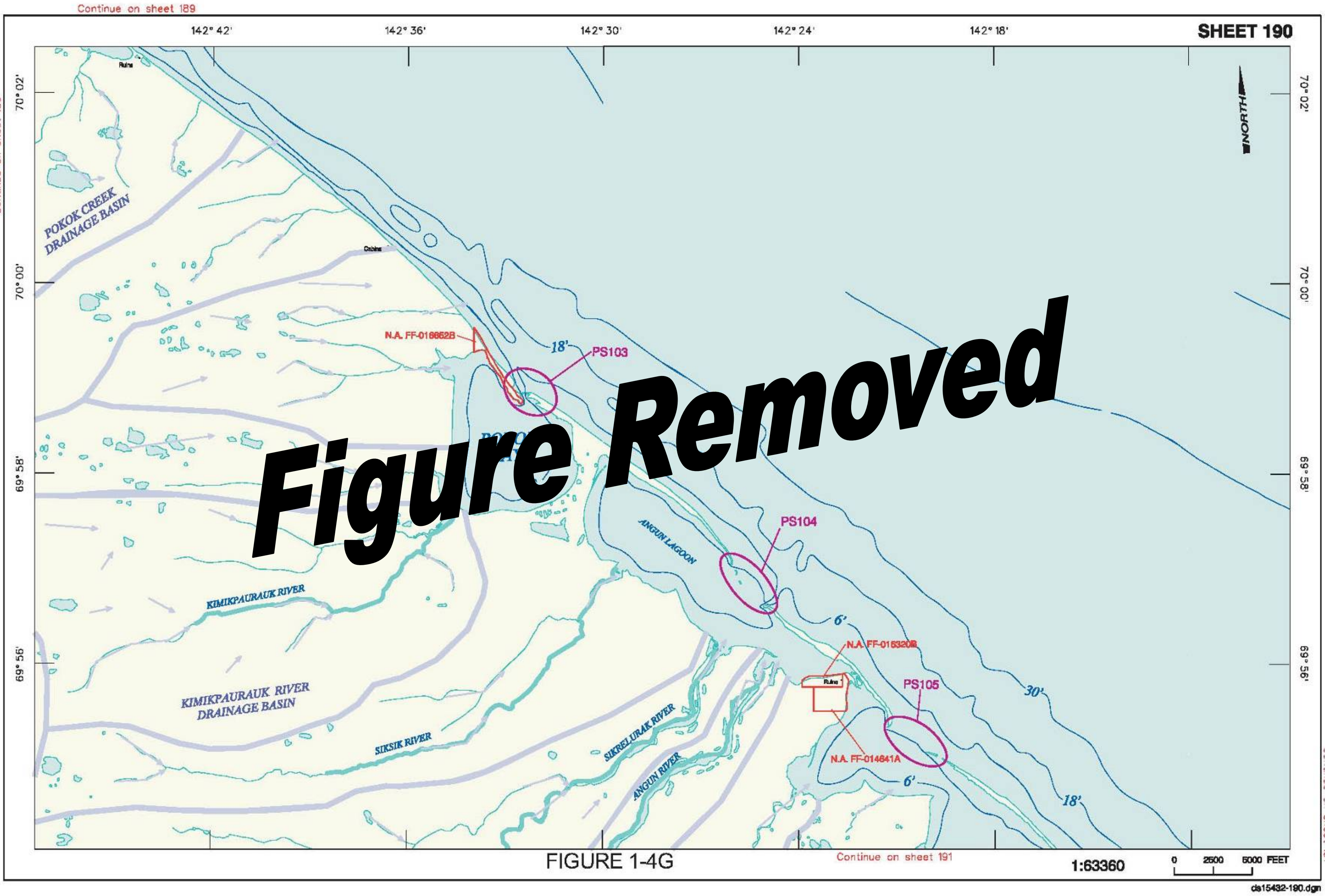


FIGURE 1-4F

~~FIGURE 1-4G~~
~~PRIORITY PROTECTION SITES (CONTINUED)~~



~~FIGURE 1-4H~~
~~PRIORITY PROTECTION SITES (CONTINUED)~~

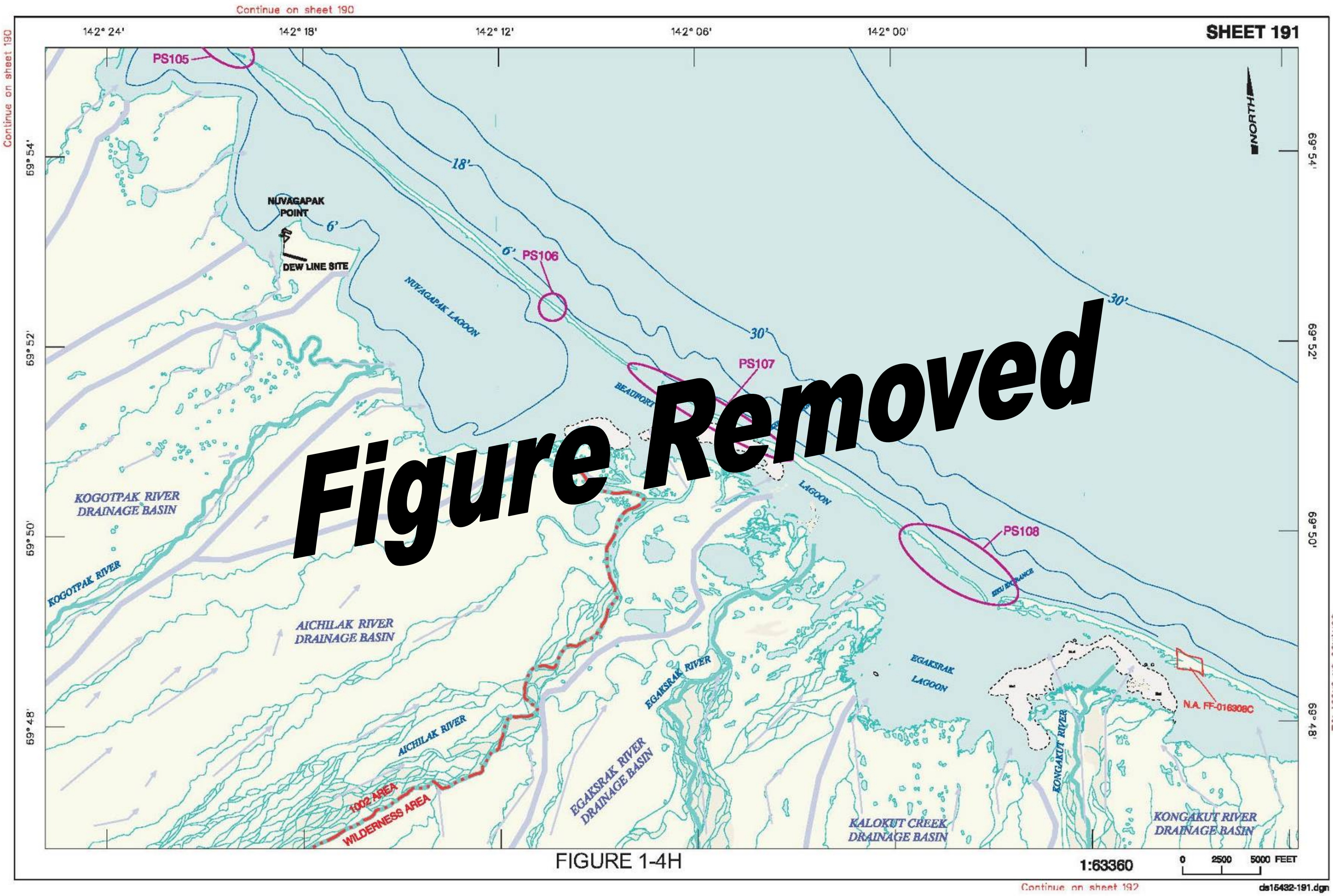
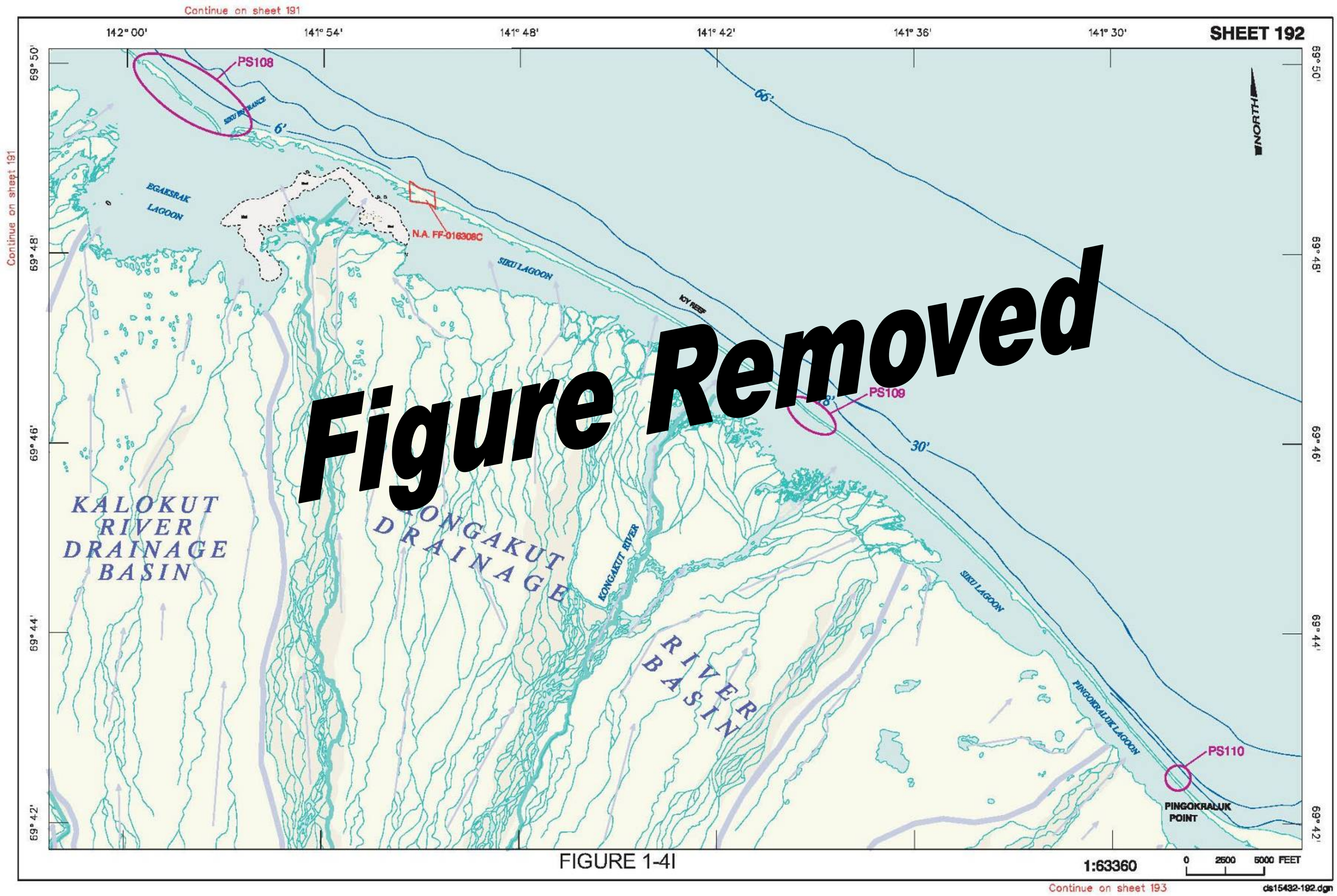


FIGURE 1-4H

~~FIGURE 1-4I~~
~~PRIORITY PROTECTION SITES (CONTINUED)~~



~~**FIGURE 1-4J**~~
~~**PRIORITY PROTECTION SITES (CONTINUED)**~~

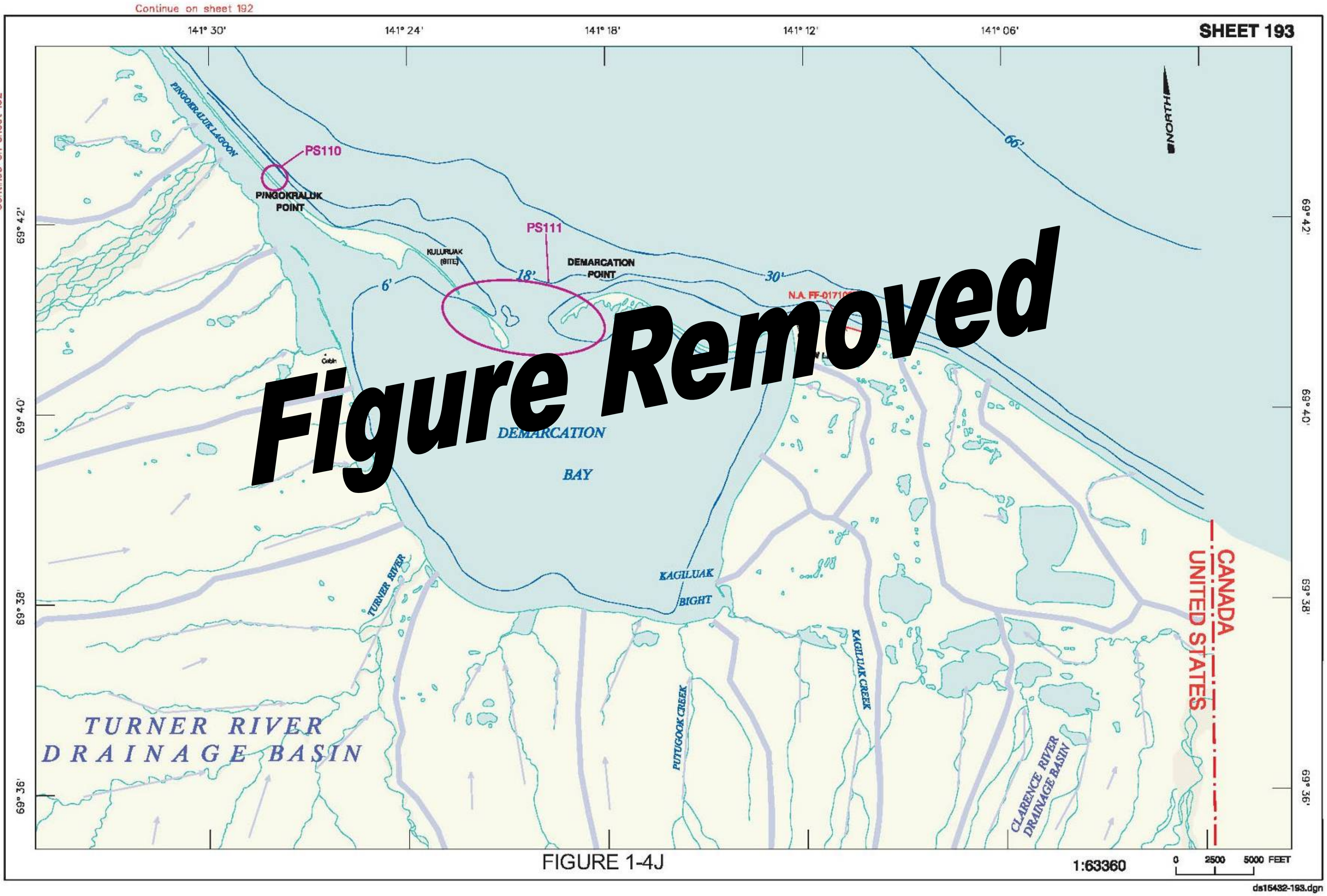
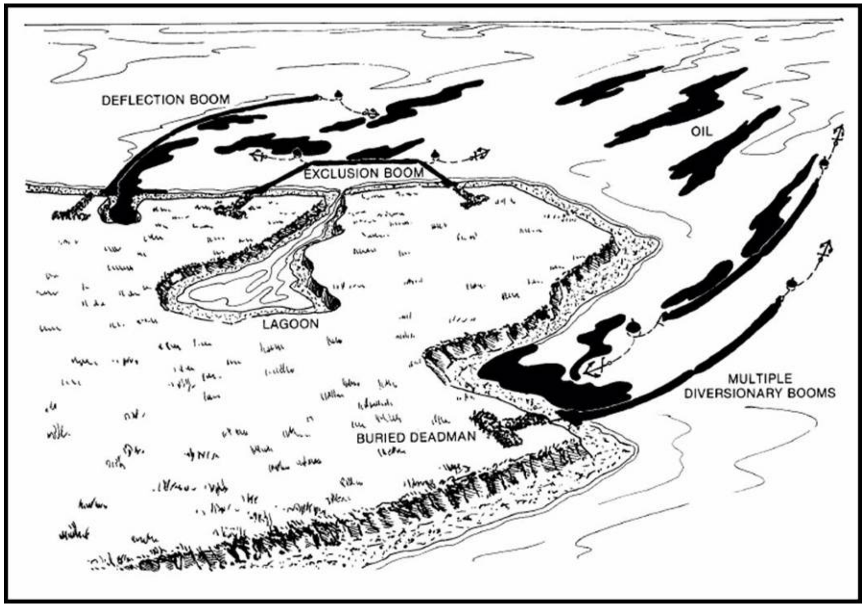


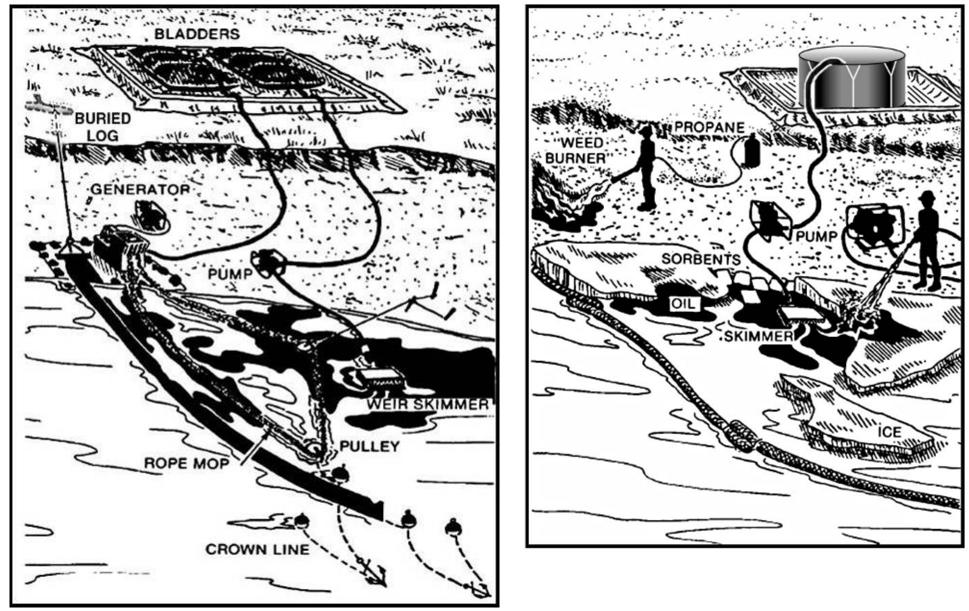
FIGURE 1-4~~5~~
SHORELINE CONTAINMENT AND PROTECTION



Concentration of oil at natural and/or man-made collection sites and diversion of oil away from priority protection sites.

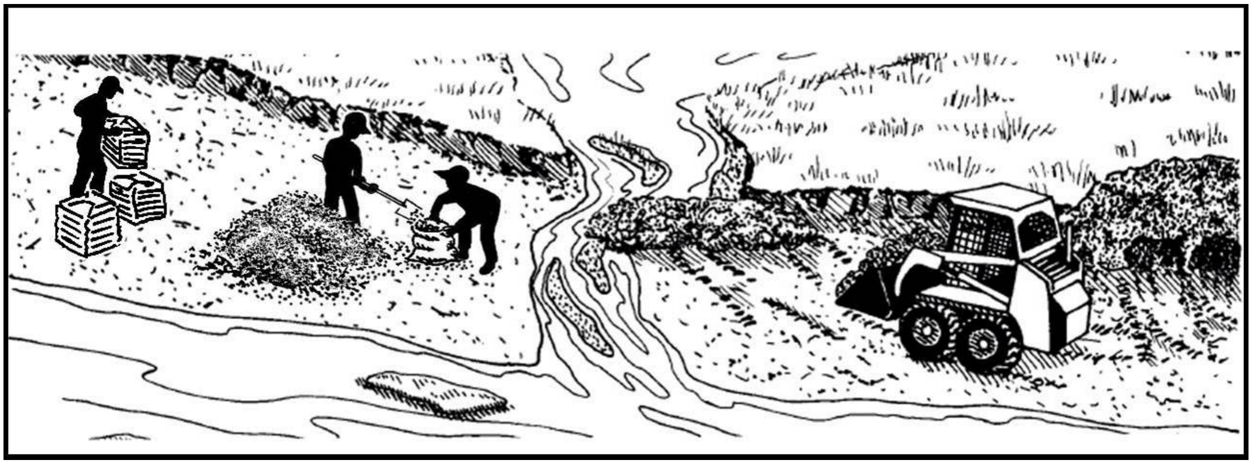
FIGURE 1-5~~6~~
SHORELINE CONTAINMENT AND RECOVERY OPERATIONS

Open Water **Broken Ice**



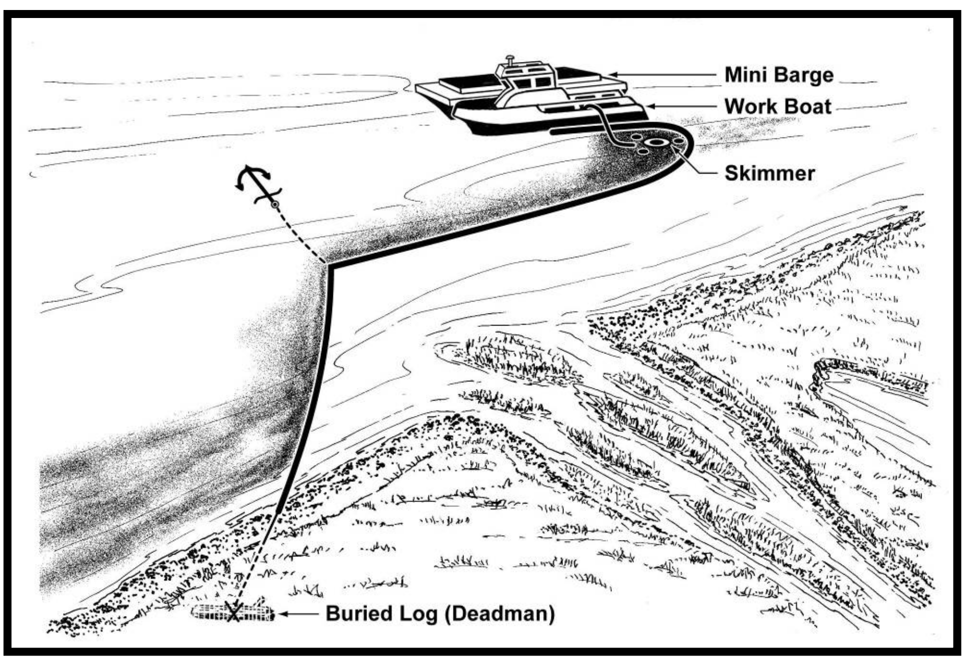
Deflection of oil toward shore for recovery with portable skimmers. Temporary storage of recovered oil in bladders or Fastanks, and burning of isolated pools of oil.

FIGURE 1-6~~7~~
SHORELINE CLEANUP AND BACKWATER PROTECTION



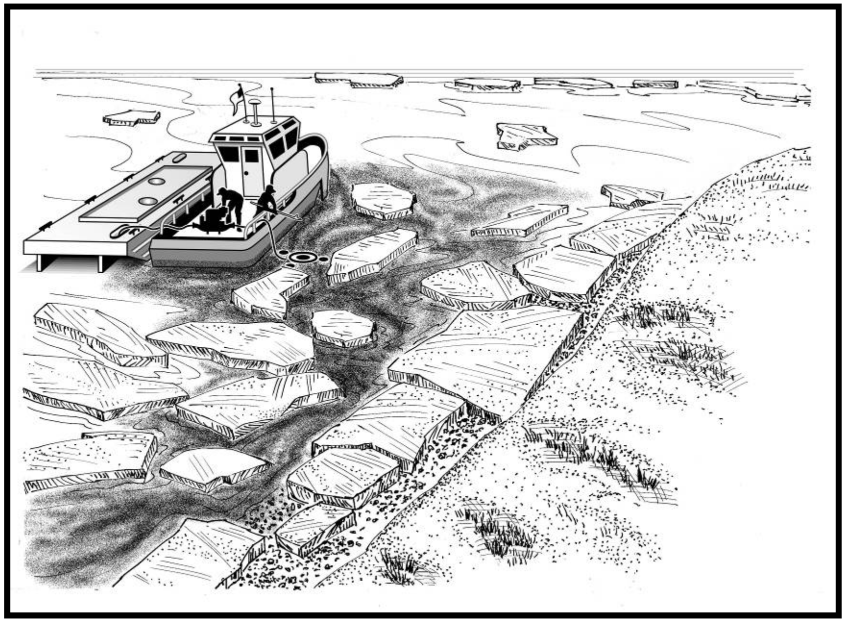
Physical removal of oil and oiled debris on beaches. Temporary blockage of marshes and other wetland areas.

FIGURE 1-7~~8~~
NEARSHORE DIVERSION AND RECOVERY OF OIL



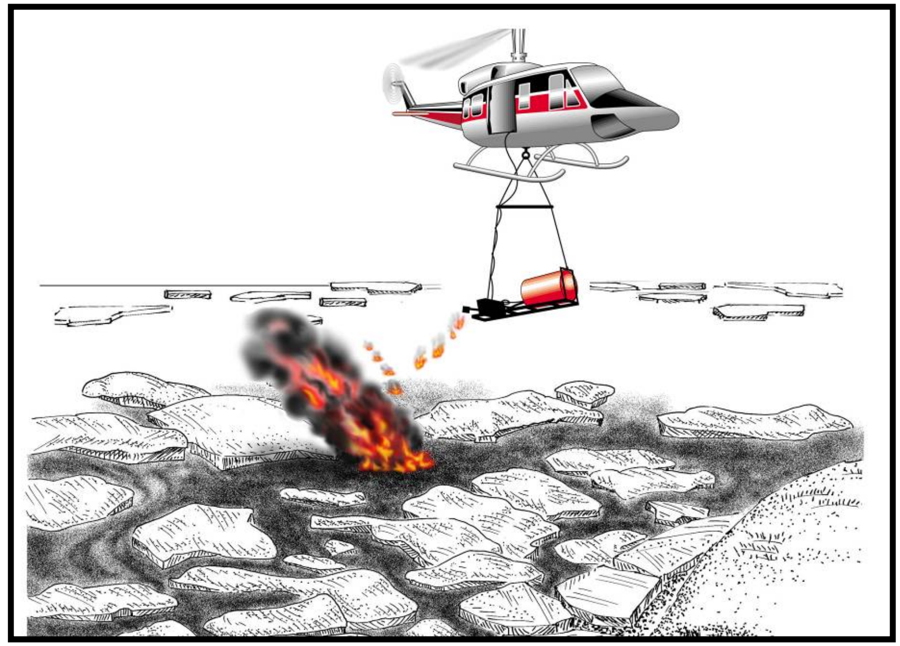
Protection of environmentally sensitive shoreline areas with recovery away from the shoreline.

FIGURE 1-8~~9~~
NEARSHORE RECOVERY IN BROKEN ICE



Recovery of oil that is wind-herded and trapped within ice cakes nearshore. Transfer of the recovered oil directly to a mini-barge.

FIGURE 1-9~~10~~
NEARSHORE IGNITION OF OIL IN ICE



Heli-torch ignition of oil that is wind-herded and trapped within ice cakes. Burning with gelled fuel igniters released upstream and allowed to drift into the oil.

FIGURE 1-10~~11~~
ACS *TECHNICAL MANUAL*, VOLUME 2

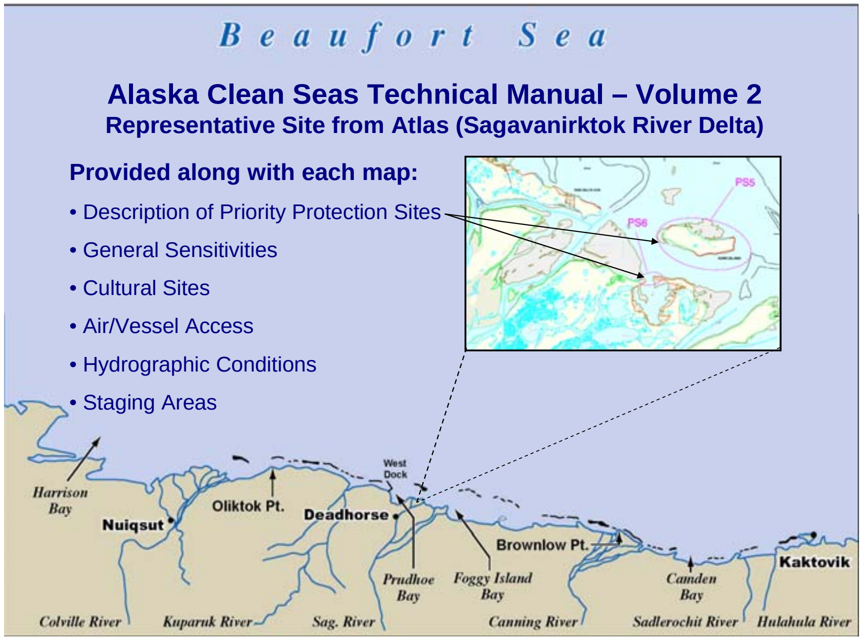


FIGURE 1-11~~12~~
REGIONAL ASSESSMENT OF PRIORITY PROTECTION SITES

While Shell's highest priorities will remain the prevention of oil discharge, and the safety of all personnel associated with the drilling program, the second highest priority will be the protection of the environment which will be achieved by containment, recovery, and/or elimination of as much oil as possible offshore before it can reach any of the sensitive resources and shorelines of the Beaufort Sea. Though unlikely, should a spill occur, Shell will have planned and implemented a nearshore and shoreline protection program with ACS, an Oil Spill Removal Organization with a proven record of performance involving dedicated personnel and best available technology. The activities of ACS will involve multiple, high-volume elimination skimmers, ice-class vessels and barges, in a constant state of readiness to support Shell's offshore drilling. The offshore and nearshore response teams will work closely with the North Slope Village Response Team to ensure that local knowledge of the environment is employed, including the possible staging of response equipment at key locations along the shoreline.

1.6.13 Spill Response Scenarios

Introduction

Scenario 1 is the ~~The ADEC Response Scenario/~~BOEMRE~~MMS~~ Worst-Case Discharge (WCD) Scenario contained herein was prepared to comply with ~~both~~ BOEMRE~~MMS~~ regulations found in 30 CFR 254.26 ~~for the discussion of the WCD scenario, and~~ Scenario 2 complies with ADEC regulations found in 18 AAC 75.425(e)(1)(F) and (I) for the response scenario that demonstrates a plan holder's ability to respond to a discharge of the response planning standard (RPS) volume.

~~The scenario is provided to show spill response capabilities for employing an effective cleanup response for a "blowout lasting 30 days," as required under MMS regulations in 30 CFR 254.26 and 30 CFR 254.44. ADEC requires the blowout to last 15 days, but to comply with the MMS requirement, Shell has extended the blowout duration to 30 days.~~

A response strategy is provided in this plan following the Response Scenario/WCD Scenario to meet both the WCD scenario requirements of the BOEMRE~~MMS~~ "in adverse weather conditions," with equipment that is "suitable, within the limits of current technology, for the range of environmental conditions" anticipated, and the ADEC requirements for a response strategy accounting for variations in receiving environments and seasonal conditions. The response strategy also illustrates additional spill response capabilities for employing an effective cleanup response using non-mechanical response options.

This section contains the following:

- Scenario 1, ~~Response Scenario/~~BOEMRE WCD Scenario, Offshore Sub-Sea Well Blowout During Summer Months
- Scenario 2, ADEC RPS ~~WCD~~ Scenario, Uncontrolled Sub-Sea Well Release During Summer Months
- Response Strategy 1, Offshore Sub-Sea Well Blowout in Varying Ice Conditions
- Response Strategy 2, Offshore Fuel Transfer Release During Summer Months

The following were developed in accordance with BOEMRE~~MMS~~ regulations in 30 CFR 254.26, ADEC 18 AAC 75.425(e)(1)(F), and 18 AAC 75.445(d). They describe equipment, personnel, and strategies that could be used to respond to an oil spill. The scenarios are for illustration only and are not performance standards or guarantees of performance. The scenarios assume conditions of the spills and responses only to display general procedures, strategies, tactics, and selected operational capabilities. See ACS *Technical Manual,* Volume 1.

In situ burning could be used in a spill response to reduce the quantity of oil, and for safety reasons, regardless of whether a scenario hypothesizes in situ burning~~ to help meet the RPS~~.

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SCENARIO 1

~~ADEC RESPONSE SCENARIO~~
~~MINERALS MANAGEMENT SERVICE~~BOEMRE
WORST-CASE DISCHARGE SCENARIO

WELL BLOWOUT DURING
OFFSHORE SUB-SEA SUMMER MONTHS

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SCENARIO 1 QUALIFICATION STATEMENT

This worst-case discharge (WCD) scenario was prepared to comply with ~~both~~ BOEMRE~~MMS~~ regulations in 30 CFR 254.26~~, and ADEC regulations in 18 AAC 75.425~~. The scenario is not a guarantee of performance. It is prepared as an illustration of the spill and response conditions that could be expected in the event of a WCD. The scenario makes certain assumptions about spill conditions and describes equipment, personnel, and strategies that would be used to respond to a WCD.

The response timelines are for illustration only. Spill response decisions depend on safety considerations, weather, and other environmental conditions. It is the discretion of the IC and persons in charge of the spill response to select any sequence or take as much time as necessary to employ an effective response without jeopardizing personnel safety. In any incident, personnel safety is considered the highest priority.

Depending on conditions, some equipment named in the scenario may be replaced by functionally similar equipment. The scenario assumes that agency permits are immediately granted by on-scene coordinators and other agency officials.

Greater responses than illustrated in the scenario can be mounted with additional in-region resources and the mobilization of out-of-region resources as needed.

How the Scenario Complies with the ~~Minerals Management Service~~Bureau of Ocean Energy Management, Regulation and Enforcement Requirement

The scenario provides a simulation of a WCD with the type of responses that could be employed, to the maximum extent practicable.

Table 1-12~~11~~ details how the scenario meets the BOEMRE~~MMS~~ regulatory requirements (30 CFR 254.26) for a WCD. Many assumptions are made about environmental conditions, oil distribution, and response capabilities. References to documents that support these assumptions are provided in the table. These documents are publicly available at BOEMRE~~MMS~~ and ADEC, along with the ACS *Technical Manual*.

The worst case discharge volume presented here is different than that presented in Shell's Exploration Plan submittal. The Exploration Plan WCD is based on proprietary reservoir characteristics and modeling which result in a "calculated" WCD, per Notice to Lessees (NTL) 10-06. The WCD presented in this scenario is a "planning" volume and exceeds the daily release rate of the calculated WCD for the 30 day duration.

TABLE 1-12~~11~~
SUMMARY OF HOW THE WORST-CASE DISCHARGE SCENARIO COMPLIES WITH BOEMRE~~MMS~~ REGULATIONS

BOEMRE~~MMS~~ REGULATION	SUMMARY	REFERENCE
30 CFR 254.26(a) and 254.47(b) Worst-Case Discharge Volume for Exploration or Development Drilling Operations	The WCD volume of oil for this regional exploration ~~plan~~ program is based on reservoir characteristics (modeled and historical). The WCD for this exploration project is 16,000 bopd, based on the characteristics of the Torpedo prospect. ~~the ADEC response planning standard daily volume for an exploration well blowout of 5,500 bopd.~~	See the Oil Pollution Act of 1990 (OPA 90) BOEMRE~~MMS~~ cross reference section at the front of this plan for descriptions of the basis for the WCD estimate. The estimates follow 30 CFR 254.47(b) regarding WCDs for exploration drilling operations. The total capacity of the oil storage tanks is the sum of permanent oil storage containers on the ~~drillship~~drilling vessel. ~~Because there are no relevant well data or other supporting technical documentation to estimate the simulated blowout rate of the exploration well, the daily rate is based on the ADEC response planning standard of 5,500 bopd.~~
30 CFR 254.26(b) Oil Trajectory	The simulation of the oil plume on water is based on a well blowout at the sea floor (or mud line) in approximately 100 feet of water. The oil rises to the surface and spreads as a function of ocean currents and wind. The oil's viscosity and emulsification tendency affects its distribution on the sea. The scenario simulates the oil footprint by trajectory modeling performed by estimating the prevailing winds and local ocean currents during a 30-day blowout. The modeling was performed by The Response Group of Houston, Texas. The speed and direction of wind and currents determine the oil trajectory on the sea. Oil on open water, unaffected by ice, is assumed to move with surface currents and at 3 percent of the wind speed (see ACS *Technical Manual*, Tactic T-5). Tactic T-4 from the ACS *Technical Manual* is used to track the oil plume on open water throughout the spill response.	Modeling of the oil plume migration was conducted by The Response Group using local wind data and ocean currents. Trajectory calculations are presented in Tactic T-5 from the ACS *Technical Manual*. Portions of the ACS *Technical Manual* cited in the scenario are incorporated by reference. Wind direction is simulated as prescribed by 18 AAC 75.425(e)(1). Wind direction and velocity data were retrieved from the Alaska Climate Research Center website for Barter Island from 1971 through 1988 for the months of August through October. The average wind velocity in August is approximately 10 miles per hour (mph). The website is: http://climate.gi.alaska.edu/climate/Wind/Direction/BarterIsland/Data_table.html
30 CFR 254.26(c) Important Resources	Resources of environmental or special economic importance that might be impacted are the marine bird and mammal populations that occupy the sea between the open water and the shoreline and the shorelines of the barrier islands that lie in the oil trajectory. The trajectory is described in the body of the scenario. The resources are described more fully in the references.	Resources of special economic or environmental importance that potentially could be impacted in the areas in the trajectory are described in the ARRT's *North Slope Subarea Contingency Plan*, "Areas of Concern," which is also printed in the ACS *Technical Manual*, Volume 2, Map Atlas, and from ESI maps published by NOAA.

TABLE 1-12~~11~~ (CONTINUED)
SUMMARY OF HOW THE WORST-CASE DISCHARGE SCENARIO COMPLIES WITH ~~MMS~~ BOEMRE REGULATIONS

BOEMRE~~MMS~~ REGULATION	SUMMARY	REFERENCE
30 CFR 254.26(d)(1) Response Equipment	The scenario identifies the types, numbers, and usage of the equipment capable of containing and removing the oil.	The equipment descriptions, locations, owners, inventory, quantity, and capabilities are described in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual* and ACS *Technical Manual,* Volume 1.
30 CFR 254.44(a) Effective Daily Recovery Capacities	The effective daily recovery capacities of the two Lamor brush skimmers (205 m^3/hr (1,289 bbl/hr) are determined using 20 percent of the manufacturer's nameplate capacity. Each brush skimmer is therefore derated to 258 bbl/hr. While twin pumps (each with 115 m^3/hr pump rate) in the skimmer's hopper actually exceed the skimmer's rate of recovery, the smaller value of 205 m^3/hr is used times 24 hours per day, as specified in the regulation. 1,289 bbl/hr x 0.20 = 258 bbl/hr (per skimmer) The effective daily recovery capacity of the Transrec 150 skimmer (400 m^3/hr or 2,516 bbl/hr) is derated to 20 percent of the manufacturer's nameplate pump rate. Therefore, each Transrec skimmer would have an effective capacity of: 0.20 X 2,516 bbl/hr = 503 bbl/hr.	~~ADEC rates most skimmers at 80 percent of the manufacturer's nameplate capacity, and assumes an oil emulsification factor of 1.54 and that skimmer operation occurs for 20 hours of each 24-hour period.~~ ~~Federal pump de-rating regulations are more conservative than the corresponding ADEC regulations. Consequently, Shell uses federal de-rating regulations~~The effective daily recovery capacity of the equipment in this plan is determined by multiplying the manufacturer's rated throughput capacity by 20 percent. (see Table 1-15~~14~~). Efficiency rates for offshore recovery equipment are listed in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.
30 CFR 254.44(b) Other Efficiency Factors	A smaller skimmer, the LORI LSC (similar to Lamor brushes) is derated to 80 percent of the effective nameplate capacity of the pumps. The resulting derated oil recovery capacity is 217 bbl/hr per skimmer. 271 bbl/hr x 0.80 = 217 bbl/hr (per skimmer) The effective manufacturer's nameplate pumping capacity of other skimmers is listed in the ACS *Technical Manual*.	See the ACS *Technical Manual*, Volume 1, Tactic L-6, for other pump rates.
30 CFR 254.26(d)(2) Deployment and Operation	The deployment of field personnel, vessels, and supplies needed to operate the oil removal and storage equipment are described in Tables 1-14 through 1-19 of the scenario.	An OSRB is assigned to the ~~drillship~~ drilling vessel during all drilling operations. A description of the OSRB and the associated oil spill response equipment, vessels, and supplies contained on each vessel is described in Section 3.6. Equipment lists, locations, and owners of the equipment, as well as key oil spill response staffing lists, are described in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual* and the ACS *Technical Manual*, Volume 1.

TABLE 1-12~~11~~ (CONTINUED)
SUMMARY OF HOW THE WORST-CASE DISCHARGE SCENARIO
COMPLIES WITH ~~MMS~~ BOEMRE REGULATIONS

BOEMRE~~MMS~~ REGULATION	SUMMARY	REFERENCE
30 CFR 254.26(d)(3) Oil Storage, Transfer, and Disposal	The oil storage, transfer equipment, and disposal options, including barges, mini-barges, and Fastanks, and transport to oil processing facilities, are described in the scenario.	The types, locations, owner, quantity, and capacity of the scenario's equipment are described in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*, the ACS *Technical Manual*, Volume 1, and Section 1.6.10, Temporary Storage and Disposal.
30 CFR 254.26(d)(4)(i) Time for Procurement of Oil Containment, Recovery, and Storage Equipment	Time for procurement, mobilization, and transit time is reflected in the scenario.	Mobilization and deployment time for offshore response equipment is specified in Tables 1-~~14~~ 15 through 1-19. Nearshore and shoreline response equipment mobilization from ACS is specified in equipment tables in the ACS *Technical Manual* tactics that the scenario incorporates by reference. In addition, Shell has the capability to mobilize out-of-region resources within 24 hours if needed. See ACS Tactics L-8, L-9, and L-10.
30 CFR 254.26(d)(4)(iii) Time for Procurement of Personnel	Procurement, mobilization, and transit time for personnel is reflected in the scenario.	Mobilization time for staff operating vessels and other equipment contained on the OSRBs is less than 1 hour. Mobilization time for other oil spill staff is specified in the *Shell Beaufort and Chukchi Seas Regional Tactics Manual* and the ACS *Technical Manual*. Equipment operators and crews mobilize with their equipment from North Slope origins through ACS contracts and Mutual Aid agreements; See ACS Tactics L-8, L-9, and L-10 for Mutual Aid agreements, master agreements, and other agreements for accessing equipment.
30 CFR 254.26(d)(4)(iv) Equipment Loadout Time	Initial response vessels and equipment are contained on the OSRBs and support fleet. ~~vessel of opportunity.~~ ~~The~~ An OSRB is stationed with the ~~drillship~~ drilling vessel and the loadout times are reflected in the scenario. The loadout times for nearshore and shoreline response equipment are included in the mobilization times listed in the ACS *Technical Manual* tactics equipment tables and are incorporated here by reference.	Equipment loadout time is included in the mobilization times specified for equipment and vessels listed in the ACS *Technical Manual* tactics that the scenario incorporates by reference.
30 CFR 254.26(d)(4)(v) Travel Time	Times to travel to the deployment site for the offshore, nearshore, and shoreline tactical units (personnel and equipment) are described in the narrative of the scenario.	Travel times to the deployment sites are included in attached tables. The ACS *Technical Manual*, Tactic L-3, lists travel rates for ACS support equipment.

TABLE 1-12~~11~~ (CONTINUED)
SUMMARY OF HOW THE WORST-CASE DISCHARGE SCENARIO COMPLIES WITH ~~MMS~~ BOEMRE REGULATIONS

BOEMRE~~MMS~~ REGULATION	SUMMARY	REFERENCE
30 CFR 254.26(d)(4)(vi) Deployment Time	Times to deploy equipment are described in the scenario narrative and incorporated by reference to particular ACS *Technical Manual* and Shell *Beaufort and Chukchi Seas Regional Tactics Manual* tactics that list deployment times.	Deployment times are specified in the attached tables. The ACS *Technical Manual* and Shell *Beaufort and Chukchi Seas Regional Tactics Manual* contain tactics equipment tables that list equipment deployment times. The current Shell leases are a maximum of 55 air miles from Deadhorse. Assuming a helicopter travel speed of 100 mph, the maximum travel time to a Shell lease is 0.55 hour.
30 CFR 254.26(e)(1) Equipment and Strategies are Suitable for Conditions	Response equipment illustrated in the scenario is designed to operate within the range of environmental conditions projected to be encountered at the exploration leases. The equipment available on the OSRBs, ~~vessel of opportunity~~support fleet, and on the North Slope, and selected for the simulated deployments in this scenario, is the BAT for responding to oil well blowouts in the offshore and nearshore Beaufort Sea. Equipment in the scenario has been tested and selected as the most suitable for mechanical oil recovery in broken ice and open-water conditions associated with the regional exploration plan. Response strategies illustrated in the scenario are also suitable, within the limits of current technology, for the range of environmental conditions anticipated. The strategy of mechanical recovery illustrated in the scenario reflects BAT for the environmental conditions. The strategy has been tested, exercised, and selected as most suitable for the conditions.	See the following analyses and reports that indicate the scenario's equipment and strategies are most suitable: • Blowout response plans, in Section 1.6 of this plan. • ACS *Technical Manual*, Volumes 1, 2, and 3.
30 CFR 254.26(e)(2) Standard Terms for Conditions and Equipment Capabilities	The scenario employs standardized terms to define environmental conditions and response equipment. The terms in the scenarios are consistent with terms used in spill response planning in general and for North Slope responses in particular.	For definitions of terms, see the following resources: • ACS *Technical Manual*, Volumes 1, and 2 • Alaska Climate Research Center website containing Barter Island data from 1971 through 1988: http://climate.gi.alaska.edu/

Simulated Weather and Sea Conditions at Spill Scene

The scenario reflects historical sea and weather conditions that are described in references cited in the last column of Table 1-12~~11~~.

On August 1, the sea is ice-free at the drilling location with daylight lasting 21 hours per day and decreasing to 16 hours per day by August 30. The average daily maximum and minimum air temperatures are 44 degrees Fahrenheit (°F) and 34°F. The average wind speed is 10 mph or 8 to 9 knots.

Characteristics of the Simulated Discharged Oil [30 CFR 254.26(a)]

Oil reaches the surface from the exploration well several hours after a kick is detected. Oil flows at the rate of ~~5,500~~16,000 bopd. Gas and oil reach the sea floor through a 6-inch orifice at the mud line. Gas releases at 5 million standard cubic feet per day (mmscf/d). The blowout discharges a total of 480,000 ~~165,000~~ barrels of crude oil over 30 days.

For the purposes of the C-Plan, the properties of the crude oil from the proposed drilling location is expected to be broadly comparable to the analysis of samples obtained previously from the Hammerhead prospect (now called Sivulliq~~ N~~) in 1985:

API gravity (60 °F):	20.2
Viscosity (60 °F):	468 cp
Water content in oil/water Emulsion (wt %):	12
Asphaltene content (wt %):	0.5
Pour point (°F):	-10

Assay comments[1]: "…Both crudes are of intermediate gravity, have low wax, asphaltene, and sulphur content, but an intermediate resins content, are acidic and fairly viscous. The crudes are unusual in that they are devoid of light ends…"

Aerial Deposition

The well blowout occurs at the mud line and the crude oil migrates to the water surface. No aerial deposition occurs.

Oil Spill Trajectory [30 CFR 254.26(b)]

August 1 through August 30

Oil on open water is assumed to move with surface currents and at 3 percent of the wind speed. If left uncontained and uncollected, the oil plume migration is driven by ocean currents and prevailing winds for the 30-day duration of this scenario. The regional ocean current used for the trajectory modeling was 0.75 knots to the west-northwest. Wind data used for the trajectory modeling were collected from the nearest National Weather Service weather station. Wind data observations from the Barter Island station tabulated from August 1 through August 30 between 1971 and 1988, were used to simulate the prevailing

[1] As reported by V.R. Kruka, SWEPI, Jan. 1986.

winds. The predominant wind directions were determined as the 16 cardinal compass directions with a frequency greater than 10 percent of the time. These four wind directions were then normalized to 100 percent resulting in the following set of prevailing winds:

- East wind = 34.3% frequency
- West Northwest (WNW) wind = 22.4% frequency
- West wind = 21.9% frequency
- East Southeast (ESE) wind = 21.3% frequency

The trajectory simulation uses these winds in two 15-day cycles for the 30-day simulation with the duration calculated from the frequency percent of each wind direction. For purposes of the scenario, the model employs an East wind at the time of the blowout. This is the most conservative trajectory model, as the wind and the ocean current are both from the East, resulting in the quickest movement of the leading edge of the oil plume from the well site. The wind pattern for the scenario is:

- Day 1 through Day 5, Hour 4: wind from the East
- Day 5, Hour 4 through Day 8, Hour 13: wind from the WNW (292.5^{o})
- Day 8, Hour 13 through Day 11 Hour 20: wind from the West
- Day 11, Hour 20 through Day 15: wind from the ESE (112.5^{o})
- Day 16 through Day 21, Hour 4: wind from the East
- Day 21, Hour 4 through Day 24, Hour 13: wind from the WNW (292.5^{o})
- Day 24, Hour 13 through Day 27 Hour 20: wind from the West
- Day 27, Hour 20 through Day 30: wind from the ESE (112.5^{o})

The Response Group trajectory (Figure 1-14~~13~~) shows a majority of the discharged oil moving offshore with lesser amounts impacting the mainland and barrier islands between Cross Island and Barrow. From Day 1 through Day 5, Hour 4, oil movement is controlled by a 0.75-knot WNW current and a 10-knot wind from the east. Left unrecovered, the oil plume travels almost due west in open water and ~~first impacts~~passes near land at Cross Island after approximately 38 ~~42~~ hours. By Day 19, the oil would have reached the shorelines of Barrow and would then move to open water north of land.

The final *Environmental Impact Statement for the Beaufort Sea Planning Area Oil and Gas Lease Sales*, prepared by the MMS (OCS EIS/ES MMS 2003-001), includes an analysis of how and where offshore spills move using a computer model called the Oil-Spill-Risk Analysis Model of the U.S. Geological Survey, developed in 1982. Working with both summer and winter conditions, thousands of trajectories were run for spill source locations that closely represent Shell's proposed drill sites in the Beaufort Sea. The trajectories were run using offshore and nearshore environmental conditions collected by governmental organizations and universities between 1982 and 1996.

The Response Group trajectories are consistent with the results presented in the MMS Environmental Impact Statement. The MMS report reveals probabilities of impact to be typically 0.5 percent to 3 percent within the region between Point Brower, Prudhoe Bay, Arey Island, and Barter Island (Land Segments 39 through 46). These probabilities are based on oil left in the environment (i.e., no cleanup response) for 30 days, from source locations (Hypothetical Launch Areas #15 and #17) that include Shell's proposed drill sites at Torpedo.

While the trajectory modeling of hypothetical oil spills for the region of concern is valuable as an indication of probable shoreline impact, Shell recognizes the need to plan for those wind and sea conditions that could conceivably drive oil directly toward shore and other sensitive resources. BAT has been used wherever possible, along with the expertise of ACS and AES, to ensure that a timely and effective response is mobilized by the end of Day 1 to protect priority sites in the event that oil reaches the shore earlier than forecasted by the trajectory simulation (see Table 1-14~~13~~).

Resources of Importance [30 CFR 254.26(c)]

Resources of special economic or environmental importance could be impacted by the spilled oil. The marine and coastal bird and mammal populations and shoreline cultural resources occupying the path of the spilled oil described in the trajectory section potentially could be affected by oiling. Many of the birds and mammals are important both ecologically and economically. Two primary documents list the marine mammal groups and the marine bird groups that may be potentially exposed to the scenario's oil. The ACS *Technical Manual*, Volume 2, contains priority protection sites and information from Demarcation Bay westward. NOAA ESI maps contained in the *Sensitivity of Coastal Environments and Wildlife to Spilled Oil, North Slope, Alaska, Atlas* were also used to identify marine mammals and marine bird groups. The ACS *Technical Manual* and the ESI maps also describe the seasonal distribution of marine mammals and birds in the spill vicinity and simulated trajectory path. Endangered and threatened species are also identified with notes describing protection strategies. Shoreline habitats potentially exposed to oil are listed by level of concern and depicted on maps of the spill area. Known cultural resource sites are listed on the ACS *Technical Manual* maps. The ACS *Technical Manual* lists are adapted from the ARRT's *North Slope Subarea Contingency Plan*.

There are two primary strategies necessary to protect resources of importance. The primary strategy is to contain and recover, and remove oil as quickly as possible where it can be safely encountered in a thick layer near the blowout site. Focusing on the release site will most effectively reduce the quantity of oil available to move away from the blowout into sensitive areas later.

The second important strategy is to contain and recover oil that has escaped the primary recovery operations near the spill site. This secondary recovery will involve the self-propelled skimming boat operated by AES and the skimming boats operated by ACS closer to shore. ACS will also deploy exclusion and deflection boom at selected shoreline sites. All of these priority protection sites are identified in the ACS *Technical Manual*, Volume 2, or in the NOAA ESI maps.

To protect shoreline sites from oncoming oil that escapes the offshore oil removal task forces, teams of workboats tow boom from Prudhoe Bay and anchor it in shallow water as far east as Brownlow Point. Exclusion booming and deflection booming tactics, including equipment lists, personnel numbers, procedures, and mobilization and deployment times, are described in ACS *Technical Manual* Tactics C-13, C-14, and C-15. The features of the vessels and boom are outlined in Tactic L-6. Response teams may also fly from Prudhoe Bay to shoreline staging areas, then use workboats to travel westward to protect environmental sensitivity sites along the shoreline between Kaktovik and Brownlow Point. To protect birds and mammals, the main strategy is removing oil from the environment. The secondary strategy for wildlife protection is hazing. By hour 24, ACS equipment and trained personnel are working near the barrier islands and shoreline. Oiled carcasses are collected to remove them as sources of injury to predators. Oiled animals are captured, stabilized, and treated by specialists using ACS equipment, including the wildlife stabilization facility at Prudhoe Bay. Animals requiring further treatment are transported to the Alaska Wildlife Rehabilitation Center in Anchorage. See ACS *Technical Manual* Tactics W-1 to W-6 for decision-making and field procedures.

Discussion of Equipment, Personnel, and Times [30 CFR 254(d)]

The following discussion illustrates a response to a WCD scenario described in conditions stated above. Descriptions of conditions are provided in the Simulated Conditions section of the scenario and in ACS *Technical Manual*, Tactic L-7, Realistic Maximum Response Operating Limitations for Mechanical Response Equipment. In addition, skimmer capacities are derated to reflect the effects of adverse weather, among other factors. Adverse weather conditions involving low temperatures and varying ice conditions are demonstrated in the ADEC Response Strategy following this Response Scenario/WCD Scenario.

The locations, owner, and capacities of response equipment, personnel, materials, oil spill response support vessels, oil storage, transfer, and disposal equipment referenced in the scenario are listed in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual* and the ACS *Technical Manual*. ACS *Technical Manual* tactics are incorporated into the scenario by reference.

Mobilization and deployment times of the scenario's containment and recovery, storage equipment, equipment transportation vessels, and personnel to load and operate the equipment are listed in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*, the ACS *Technical Manual* tactics equipment tables, and Table 1-16~~15~~ of the scenario. Equipment loadout times to transfer equipment to vessels are incorporated into the mobilization times.

TABLE 1-13~~12~~
WELL BLOWOUT IN SUMMER
SCENARIO CONDITIONS

INITIAL CONDITIONS	
Spill Location	Shell Exploration Well located in the Torpedo prospect
Date	August 1
Duration	30 days
Type of Spill	North Slope Crude Oil
Source of Spill	Uncontrolled well blowout at the mud line through an open orifice in 100 feet of water
Quantity of Oil Spilled	~~RPS~~ WCD Volume = ~~5,500~~16,000 bopd x 30 days = ~~165,000~~480,000 bbl No deductions were made to ~~the RPS~~ this volume to account for burning or evaporation.
~~**Emulsification Factor and Free Water Pickup**~~	~~1.54 x 165,000 bbl = 254,100 bbl. This is the oil emulsion volume created by skimming/pumping operations. Assuming that approximately 20 percent of the original oil volume recovered is added to this mix as free water (approximately 33,000 bbl), the total volume of fluids (emulsion + free water) could conceivably require approximately 287,100 bbl.~~
Wind Speed	10 knots
Wind Direction	Wind direction is simulated as prescribed by 18 AAC 75.425(e)(1). Wind direction data were retrieved from the Alaska Climate Research Center for Barter Island from 1971 through 1988 for the months of August through October. The website is: http://climate.gi.alaska.edu/climate/Wind/Direction/BarterIsland/Data_table.html. All wind directions with a daily persistence greater than 10 percent were selected and normalized to 100 percent. The four primary wind directions and their relative percent frequency were applied in two wind cycles of 15 days each. The wind directions and durations for the 30-day scenario are: Day 1 through Day 5, Hour 4: wind from East Day 5, Hour 4 through Day 8, hour 13: wind from WNW (292.5°) Day 8, Hour 13 through Day 11 Hour 20: wind from West Day 11, Hour 20 through Day 15: wind from ESE (112.5°) Day 16 through Day 21, Hour 4: wind from East Day 21, Hour 4 through Day 24, Hour 13: wind from WNW (292.5°) Day 24, Hour 13 through Day 27 Hour 20: wind from West Day 27, Hour 20 through Day 30: wind from ESE (112.5°)
Air Temperature	Average daily maximum and minimum temperatures were obtained from the Western Regional Climate Center website: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak0558 The average daily maximum and minimum air temperatures for August are 44°F and 34°F, respectively.
Surface Current	0.75 knots to the WNW
Visibility	Variable
Surface	The well location is a Shell ~~drillship~~drilling vessel. The prospect is located in federal waters in the Beaufort Sea, approximately 50 nm northwest of Kaktovik. Wave heights are typically 1½ to 2 feet, with no ice present.

TABLE 1-13~~12~~ (CONTINUED)
WELL BLOWOUT IN SUMMER
SCENARIO CONDITIONS

INITIAL CONDITIONS	
Trajectory	Modeling of the oil plume migration was conducted by The Response Group using local wind data and ocean currents. Portions of trajectory calculations presented in Tactics T-4 and T-5 from ACS *Technical Manual* are incorporated by reference. The trajectory model developed by The Response Group uses Applied Science Associates, Inc.'s OilMap software. Based on environmental conditions such as predominant winds and currents, the output from this model shows estimated oil concentrations and predicted shoreline impact of a potential blowout. The oil trajectory model includes algorithms for spreading, evaporation, emulsification, and entrainment, all of which are input parameters based on the properties of the crude oil. The results identify potential shoreline impact and provide graphical representation for instantaneous or continuous release spills (Figure 1-14~~13~~). Input parameters include a spill volume of ~~5,500~~16,000 bopd of North Slope crude oil, which is similar to the Hammerhead prospect, with API gravity of 20. Local wind data and ocean currents used for the model includes 10 knots wind from the east and a current of 0.75 knots to the WNW. The figure shows the model at 72 hours into the spill and identifies the amount of evaporation and oil thickness at this time. The simulated oil discharge of ~~5,500~~16,000 bopd is ejected through a 6-inch inside diameter well at the mud line, in water approximately 100 feet deep. Within minutes of the blowout, oil rises to the surface of the sea. The oil plume migrates to the west as a function of water currents and the direction of the prevailing wind. Within approximately ~~42~~ 38 hours, if the oil remained uncontained and unrecovered, the leading edge of the plume could reach north of Cross Island, approximately 50 miles west of the blowout.

TABLE 1-14~~13~~
WELL BLOWOUT IN SUMMER SCENARIO
RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / *REGIONAL* TACTIC
(i) Stopping Discharge at Source	As soon as the well kicks, subsurface well control is initiated (increasing mud weight, blowout preventer activation). Initial attempts fail and the Torpedo exploration well is now classified as an “unobstructed” blowout well (T= 00 hours). The well has a continuous flow rate that will deposit at the surface a total of ~~5,500~~16,000 bopd.	ACS Volume 3 ICS
	The On-Site Shell Drill Foreman notifies ACS and AES personnel on the OSRB collocated with the drilling ship. Notifications to appropriate state and federal agencies are performed. The NRC (1–800–424–8802) is notified, and the IMT is activated.	Regional LE-2 Table 1-1, Section 1 of this plan ACS A-1, A-2
	An oil storage tanker, located between 25 nm and ~~300~~ 200 nm from the drilling location, is also notified and immediately deployed to within a few miles of the blowout.	
	Safety analyzed the situation and initiates equipment and personnel mobilization in order to stop the blowout. Well control is discussed in Section 1.6.3 of this plan. Anchors are pulled and the ~~drillship~~ drilling vessel is moved away from the sea floor blowout when control is lost and safety is a concern.	
(ii) Preventing or Controlling Fire Hazards	Throughout the first few hours of the spill, the Site Safety Officer verifies that all sources of ignition are shut down or removed from the area. The Site Safety Officer provides access zone information and determines PPE requirements. Monitoring protocol is established for all work areas to ensure personnel protection. The monitoring protocol establishes safety zones according to applicable Occupational Safety and Health Administration (OSHA) and fire hazard standards. Consideration is given to pull anchors and move the ~~drillship~~ drilling vessel from the well blowout. Once the ~~drillship~~ drilling vessel has been moved, the FOSC approves the ignition of the blowout for safety reasons.	ACS S-1 through S-6
(iii) Well Control Plan	Well Control is detailed in Section 1.6.3 of this plan. The following briefly describes well control measures at the simulated blowout at the Torpedo exploration site: In the event of a blowout a well control specialist would be consulted for the intervention and resolution of a well control emergency.	
	T= 12 Hours. The relief well plan is implemented in the event the surface control measures fail. Personnel and equipment are mobilized. Initially, the ~~drillship~~ drilling vessel attempts to plug stop (or slow) the blowout by pumping mud and/or concrete downhole. After initial efforts fail, the ~~drillship~~ drilling vessel pulls away from the well blowout location in order to support safe recovery operations. Repairs are initiated in order to facilitate potential relief well drilling. Equipment needed for potential oil recovery and well control support is placed on standby. Helicopters in Prudhoe Bay are put on standby.	Section 1.6.3 of this plan
	T= 4 Days. Equipment and personnel required for well control arrive at the ~~drillship~~drilling vessel. Potential subsurface control measures are evaluated. Damage to the drill site and the ability to access the actual ~~drillship~~ drilling vessel and controls are determined. All options are considered (see Section 1.6.3).	
	T= 15 Days. Well begins to bridge and flow rate decreases linearly.	
	T= 30 Days. Surface control of the blowout is achieved and relief well installation is suspended.	

TABLE 1-14~~13~~ (CONTINUED)
WELL BLOWOUT IN SUMMER SCENARIO
RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / *REGIONAL* TACTIC
(iv) Surveillance and Tracking of Oil	Oil movement is tracked using a combination of visual observations and remote sensing techniques. Within the first 4 hours of initial notification of the blowout, the Kuparuk Twin Otter with FLIR is deployed. Response vessels also deploy buoys with transmitters. Both systems are capable of real-time tracking of the leading edge of the oil. Oil location information is digitized and transferred to the IMT and On-Scene Commander for response planning and trajectory modeling. NOAA and The Response Group are requested to provide trajectories based on wind speed and direction. Vector addition and trajectory modeling are used to forecast oil and movement.	ACS T-4 ACS T-5 ACS T-5
(v) Exclusion Procedures; Protection of Sensitive Resources	The Environmental Unit's Cultural Resource Specialist and State Historic Preservation Officer issue an advisory. The NOAA ESI maps, ACS Map Atlas, and the *North Slope Subarea Contingency Plan* are used to identify areas of major concern. A shoreline cleanup plan is approved by the Unified Command and the State Historic Preservation Officer. Based on trajectory calculations and oil tracking, barrier islands are identified as the first area to be potentially impacted by oil.. There are two areas near the projected trajectory with priority protection sites – Cross Island and Kadleroshilik River.	NOAA ESI Maps ESI 3-5 Map Atlas Sheets 80, 83, 85-87, 89-91, 93, 100-104, 184-188
	T= 1 Day. There are no individual priority protection sites on Cross Island; however, all of Cross Island is considered a priority protection area. ACS Shoreline Protection Task Forces are mobilized to deploy deflection and exclusion booms at selected sites on Cross Island. Two teams, traveling by small workboats from Prudhoe Bay, each place boom in the quantities described in ACS *Technical Manual* Map Atlas.	http://www.asgdc.state.ak.us/maps/cplans/subareas.html#northslope
	T= 2 Days. ACS Shoreline Protection Task Forces deploy exclusion booms at **PS3** and **PS3A** south of Tigvariak Island, and **PS-3D, PS-4, PS-4A**, and **PS-4B** adjacent to the Kadleroshilik River. ACS dispatches additional Shoreline Protection Task Forces to Barter Island to deploy exclusion boom.	ACS C-14
(vi and vii) Spill Containment, Control, and Recovery Procedures	**Task Force (TF) Descriptions:** **TF-1:** Primary response is provided by equipment stationed near the ~~drillship~~drilling vessel. ~~This~~ TF-1 equipment includes ~~an OSRB~~a 17,000 bbl OSRB with two Lamor brush skimmers, three 34-foot workboats, and containment and fire boom.	Regional OR-2A to 2D ACS R-20~~, R-17~~
	TF-2: ~~Secondary~~ Additional primary response is provided by *Hull 247* (or similar)~~a vessel of opportunity~~ equipped with a Transrec 150 skimmer. TF-2 has a planned storage capacity of 13,000 bbl.	Regional OR-1A to 1D
	TF-3: TF-3 is similarly equipped with a Transrec 150 skimmer. TF-3 has a planned storage capacity of 8,000 bbl.	Regional OR-4A to 5B
	TF-4~~3~~: An approximately 513,000-barrel tanker located between 25 nm and ~~300~~ 200 nm from the drilling location is deployed immediately. It arrives within ~~33.5~~20 hours. Decanting (if required) follows FOSC plan and USCG approval. TF-4~~3~~ provides oil storage capacity for the offshore recovery task forces. ~~TF-1 and TF-2.~~	ACS R-28
	TF-5: The second OSRB, *Klamath* or similar, provides secondary response and is equipped with two Transrec 150 skimmers. TF-5 has a planned storage capacity of 76,900 bbl.	Regional OR-2B (modified)
(vi and vii) Spill Containment,		

TABLE 1-14~~13~~ (CONTINUED)
WELL BLOWOUT IN SUMMER SCENARIO
RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / *REGIONAL* TACTIC
Control, and Recovery Procedures (Continued)	**TF-7:** ACS nearshore recovery teams mobilize from Prudhoe Bay to recover oil that has escaped containment from the offshore Task Forces. Teams utilize skimmer boats with LORI LSC skimmers and mini-barges for storage.	ACS R-32A, R-32B
	TF-~~4~~8: ACS Shoreline Protection Task Forces mobilize from Prudhoe Bay and deploy exclusion booms at priority sites by the end of Day 1. The primary objective of TF-~~4~~ 8 is to prevent oil from entering priority sites. TF-~~4~~ 8 does not recover discharged oil.	ACS C-14
	~~**TF-5:** ACS nearshore recovery teams mobilize from Prudhoe Bay to recover oil that has escaped containment from the offshore Task Forces TF-1 and TF-2. Teams utilize skimmer boats with LORI LSC skimmers and mini-barges for storage.~~ **TF-9~~6~~:** ACS shoreline recovery teams to install deflection boom at the ~~-~~shoreline to recover oil. Boom is anchored to the shoreline and offshore, and oil is collected with a skimmer and stored in a Fastank. One team works 10 locations within a 5-mile area. Two crews can manage shoreline operations for 10 miles.	ACS C-13, R-16
	<u>Recovery Timeline:</u> **T= 1 Hour.** TF-1 is deployed immediately and locates to a safe distance from the blowout. A vessel-based boom-skimmer system deploys downwind/downcurrent of the blowout, ahead of the leading edge of the oil plume. The objective of TF-1 is to recover oil shortly after it surfaces and begins to move from the blowout location. While the burning of the well would likely eliminate some of the surfacing oil, it is assumed here (for planning purposes) that the full WCD of ~~5,500~~16,000 bopd (~~229~~667 bbl/hr) continues to flow from the blowout.	Regional OR-2B
	TF-1 deploys two workboats that tow boom in a U-shape, open-apex formation that allows oil to filter through to the OSRB at the apex of the boom. The U-shaped formation remains in a static location situated a safe operating distance from the blowout at the thickest portion of the oil plume. The two brush skimmers on the OSRB have a combined total derated recovery of 516 bbl/hr (see Table 1-15~~14~~). ~~**T= 4 Hours.** The volume of recovered liquids exceeds the volume of discharged oil (with emulsification).~~	Regional OR-1B and OR-4B ACS R-20
	T= 3. TF-2 and TF-3 begin recovery operations. For the first 42 hours, TF-1 recovers at a rate of 250 bbl/hr. TF-2 and TF-3 recover at 250 bbl/hr and 167 bbl/hr, respectively. The task forces operate continuously. **T=20 Hours**. TF-4 (the oil storage tanker) arrives on site.	
	T= 24 Hours. Currents and prevailing winds continue to move the oil that is not contained and recovered to the west. TF-9~~6~~ is mobilized from Prudhoe Bay to install boom in a hook configuration with a Vikoma skimmer in the recovery area of the boom. Each task force can deploy and maintain one team at up to 10 locations for this configuration. ~~TF-1 begins recovery operations with the 47-foot skim boat. The 47-foot boat operates 12 hours a day for the remainder of the recovery operations.~~	ACS R-16 ~~ACS R-17~~
	T= 42 ~~33.5~~ Hours. TF-~~3~~ 5 arrives. ~~(the oil storage tanker) arrives.~~ At this time, TF-1 through 3 stop~~s~~ skimming and begin~~s~~ the process of lightering to TF-~~3~~4. TF-1 through TF-3 have ~~The OSRB has~~ the storage capacity to handle ~~over 30~~42 hours of oil recovery operations~~; consequently, lightering to TF-43 occurs before the recovery vesselreaches full capacity~~. Lightering procedures are detailed in Section 1.6.8.	ACS R-28
(vi and vii) Spill Containment, Control, and	When TF-1 through TF-3 stop~~s~~ skimming, they are replaced by TF-5 which has a recovery rate of 1,006 bbl/hr.~~.~~ ~~TF-2 begins skimming with the Transrec 150 skimmer. TF-2 begins recovery operations with a recovery capacity of 503 bbl/hr.~~	

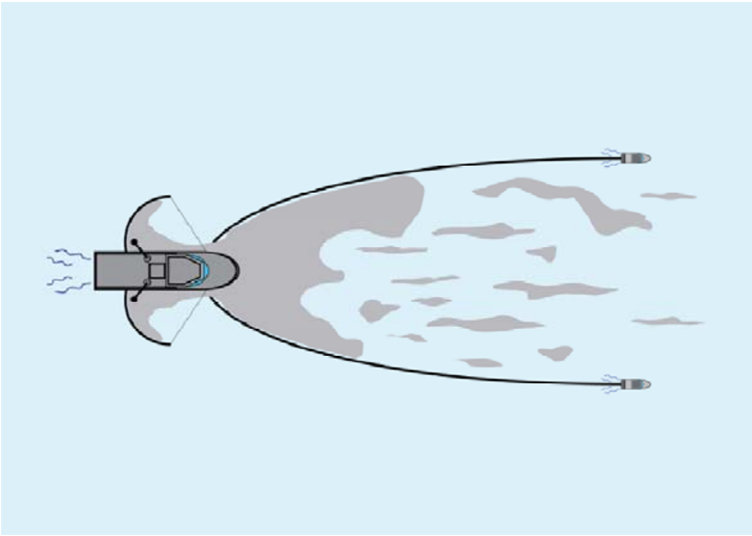
TABLE 1-14~~13~~ (CONTINUED)
WELL BLOWOUT IN SUMMER SCENARIO
RESPONSE STRATEGY

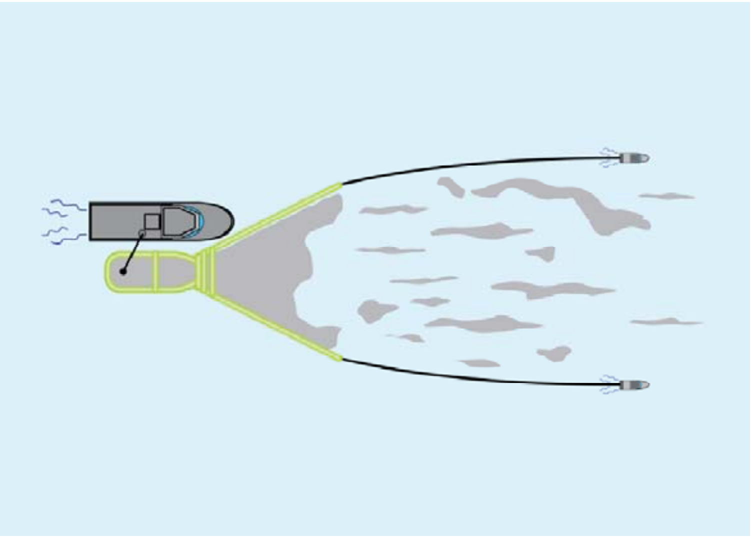
ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / *REGIONAL* TACTIC
Recovery Procedures (Continued)	**T=72 Hours.** From this time forward, recovery operations rotate every 24 hours. TF-1 through TF-3 comprise one shift and TF-5 is the opposite shift. ~~TF-1 and TF-2 alternate recovery operations, so that one task force is always skimming. Two workboats continuously tow boom in a U-shape, open-apex formation that allows oil to filter through at the apex of the boom to either the OSRB or the vessel of opportunity.~~ ~~J-Boom skimmer deployment is considered by TF-1 and TF-2 if sea conditions prevent U-Boom deployment.~~ Recovery rates of the offshore task forces are detailed in Figures 1-12 and 1-13. ~~TF-1 and TF-2 are detailed in Table 1-1514.~~ The recovery capacities exceed the rate that oil is released from the blowout location. Oil that is not contained and recovered by the offshore recovery task forces ~~TF-1 and TF-2~~ is transported westward by the ocean currents and prevailing winds. TF-~~5~~ 7 is deployed from Prudhoe Bay to recover oil that is often encountered in windrows and linear slicks. TF-~~5~~ 7 consists of two skimming vessels – one vessel is configured with two side booms and two LORI skimmers; the other vessel is configured with a single side boom and LORI skimmer. Mini-barges and shuttle boats are used to transport recovered oil to Prudhoe Bay for processing. ~~**T = 41.5 Hours**. TF-2 stops skimming operations in order to begin lightering and TF-1 resumes skimming operations.~~	
	T= 5 Days. Oil trajectory modeling predicts WNW movement of oil. Oil recovery vessels adjust positioning accordingly.	
	T= 11 Days. Oil trajectory modeling predicts WNW movement of oil. Oil recovery vessels adjust positioning accordingly.	
(viii) Lightering Procedures	Decanting (if required) follows FOSC plan approval. Stored liquids are offloaded from ~~the OSRB~~ TFs1-3 and 5 to the tanker. The offshore recovery task forces time-to-fill times are detailed in Figures 1-12 and 1-13. ~~For planning purposes, the TF-1 OSRB has a fluid storage capacity of 17,000 barrels. Based on a maximum oil exposure rate of 5,500 bbl/day (or 229 bbl/hr), an emulsification factor of 1.54, and free water retained in storage (20%), the skimming vessel could be filled at a rate of approximately 400 bbl/hr. The 17,000-barrel- storage capacity could therefore be filled in about 42 hours. The estimated time for transit and lightering (a full storage tank) is approximately 8 hours.~~ ~~The TF-2 vessel of opportunity has a planning capacity of 3,200 barrels; consequently, the "Time-to-Fill" for the vessel of opportunity is approximately 8 hours. Once the TF-3 tanker has arrived on the scene, TF-1 and TF-2 alternate recovery operations so that recovery occurs 24 hours a day.~~	ACS R-28 Regional OR-3A and OR-6
(ix) Transfer and Storage of Recovered Oil/Water; Volume Estimating Procedure	Stored liquids are offloaded from the ~~OSRB and the vessel of opportunity~~ offshore recovery task forces to the tanker. Liquids from the nearshore skimmer vessels are stored in mini-barges to be transported back to Prudhoe Bay and disposed of accordingly or transferred to the OSRBs. Liquids recovered by the shoreline recovery task forces are stored in Fastanks or bladder tanks. See Section 1.6.10. The volumes of stored oil emulsion and free water are gauged with ullage tape and recorded on waste manifests	ACS R-28 Regional OR-3A and OR-6

TABLE 1-14~~13~~ (CONTINUED)
WELL BLOWOUT IN SUMMER SCENARIO
RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / *REGIONAL* TACTIC
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	A Waste Management Plan is developed in order to (1) fill out and sign manifests, (2) measure liquid and other waste, and (3) submit a plan to ADEC for waste management. Non-liquid oily wastes are classified and disposed of according to classification. Non-oily wastes are classified and disposed of accordingly. Recovered fluids stored onboard the ~~Arctic~~ oil storage tanker will be disposed of outside the U.S., either at Shell Group refineries or other third-party processors, in accordance with Shell environmental policy, and relevant local laws and regulations (see Section 1.6.10).	ACS D-1 ACS D-2 ACS D-3
(xi) Wildlife Protection Plan	Wildlife monitoring and deterrents to protect animals are put in place at the spill scene and impacted areas during recovery operations. The International Bird Research and Rescue Center is put on standby in the event the wildlife treatment facility is required. Building U-8 is made available to agency biologists and veterinarians standing by to respond to potential reports of oiled wildlife. An aircraft monitors wildlife twice daily at the spill scene.	ACS W-1,W-2, W-2B, L-~~6~~9, W-3, W-4, W-5
(xii) Shoreline Cleanup Plan	Shoreline impact is not expected with the current trajectory; however, for planning purposes a percentage of the oil is projected to reach the nearshore environment as detailed in Section 1.6.7.~~.~~ Shoreline cleanup operations are based on a plan approved by the Unified Command. A shoreline assessment is conducted to understand the nature and extent of oiling. Based on the shoreline assessment, priorities are established for cleanup. Cleanup techniques chosen are based on shoreline type and degree of oiling. Access to the Canning River delta and shoreline with large equipment is limited. Primary delta and shoreline cleanup techniques include: • Burning of oily vegetation, • Deluge of minor to moderately oiled shoreline in the river, including those areas where heavier concentrations were manually removed, and • Natural recovery for those areas where residual staining may remain, but further recovery would cause more harm than good.	ACS SH-1 ACS B-2 ACS SH-3 ACS SH-2

FIGURE 1-12
FIRST 42 HOURS: FLEET STORAGE, RECOVERY, AND LIGHTERING SUMMARY



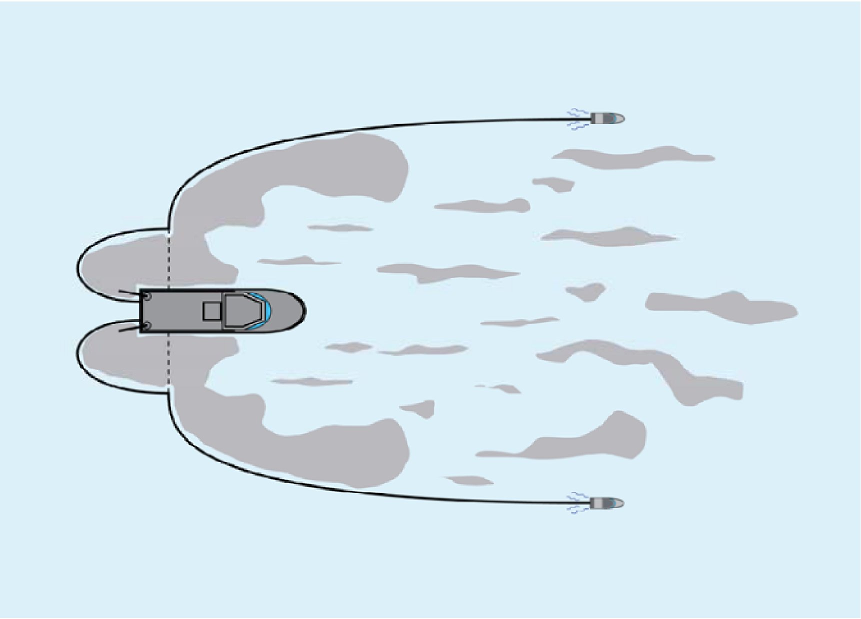


	TF-1: ***Endeavor****	**TF-2:** ***Hull 247****	**TF-3:** ***Harvey Spirit****
Recovery Tactic:	OR-2B	OR-2B mod	OR-2B mod
Planning Storage Capacity (bbl):	17,000	13,000	8,000
Effective Recovery Capacity (bbl/hr):	516	503	503
Scenario Recovery Rate (bbl/hr):	250	250	167
Time-to-Lighter (hr):	5.9	4.5	2.8

*Vessel names as provided may change but would be "similar" in type to the vessel listed.

Summary:
Response capability of TF-1 through TF-3 meets the WCD volume.
'Scenario Recovery Rate' accounts for amount of discharged oil available to recovery vessels.
Personnel shifts are 12 hours.
Lightering is performed after Hour 42, with 4 GT-A pumps, or the installed cargo system on the vessel, as described in Appendix A.

FIGURE 1-13
42 TO 72 HOURS: FLEET STORAGE, RECOVERY, AND LIGHTERING SUMMARY



	TF-5: *Klamath**
Recovery Tactic:	OR-2A
Planning Storage Capacity (bbl):	76,900
Effective Recovery Capacity (bbl/hr):	1,006
Scenario Recovery Rate (bbl/hr):	667
Time-to-Lighter (hr):	4.9

*Vessel names as provided may change but would be "similar" in type to the vessel listed.

Summary:

Response capability of TF-5 meets the WCD volume.

'Scenario Recovery Rate' accounts for amount of discharged oil available to recovery vessels.

Personnel shifts are 12 hours.

From 42 to 72 Hours, TF-1 through TF-3 are lightering, conducting preventative maintenance, and other non-skimming tasks.

~~TABLE 1-14~~
~~WELL BLOWOUT IN SUMMER~~
~~DERATED POTENTIAL RECOVERY CAPABILITY~~

~~A~~	~~B~~	~~C~~	~~D~~	~~E~~	~~F~~	~~G~~	~~H~~	~~I~~	~~J~~	~~K~~	~~L~~
~~ACS / REGIONAL SPILL RECOVERY TACTIC~~	~~NUMBER OF SYSTEMS~~	~~RECOVERY SYSTEM~~	~~DERATED RECOVERY CAPACITY PER SKIMMER [BBL/HR]~~	~~SCENARIO RECOVERY RATE [BBL/HR]~~	~~MOBILIZATION AND TRANSIT TIME TO SITE [TIME]~~	~~OPERATING TIME ON DAY 1 [HR/DAY]~~	~~RECOVERY RATE ON DAY 1 [BBL/DAY]~~	~~OPERATING TIME ON DAY 2 [HR/DAY]~~	~~RECOVERY RATE ON DAY 2 [BBL/DAY] (E X I)~~	~~OPERATING TIME AFTER DAY 2 [HR/DAY]~~	~~RECOVERY RATE AFTER DAY 2 [BBL/DAY] (E X L)~~
~~OPEN-WATER RECOVERY~~											
~~TF-1: ACS R-20~~	~~2~~	~~Lamor 205 m^3 brush skimmers Derated to 20% of the nameplate pump rate (20% x 1,289 = 258)~~	~~258~~	~~400~~	~~1 Hour~~	~~23~~	~~9,600~~	~~16~~	~~6,400~~	~~16~~	~~6,400~~
~~TF-2: ACS R-20~~	~~1~~	~~Transrec 150 – 400 m^3/hr (2,516 bbl/hr) derated to 20% of the nameplate pump rate (20% x 2,516 = 503)~~	~~503~~	~~400~~	~~30 Hours~~	~~0~~	~~0~~	~~8~~	~~3,200~~	~~8~~	~~3,200~~
~~TF-1: ACS R-17~~	~~1~~	~~Lamor 82 m^3 brush skimmer (47-foot workboat) Derated to 20% of the nameplate pump rate (20% x 516 bbl/hr = 103 bbl/hr)~~	~~103~~	~~400~~	~~24 Hours~~	~~0~~	~~0~~	~~12~~	~~1,236~~	~~12~~	~~1,236~~
~~NEARSHORE RECOVERY~~											
~~TF-5: R32A~~	~~1~~	~~LORI LSC skimmers Derated to 80% of the nameplate pump rate (80% x 271 = 217)~~	~~217~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TF-5: R32B~~	~~2~~	~~LORI LSC skimmers Derated to 80% of the nameplate pump rate (80% x 271 = 217)~~	~~217~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TF-6: R-16~~	~~10~~	~~Hook Boom configuration with Vikoma or Morris skimmer~~	~~10~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TOTAL BBL OF RECOVERED LIQUIDS PER DAY~~							~~9,600~~		~~10,836~~		~~12,036~~

~~[1] The *Derated Recovery Capacities* of the skimmers are 20 percent of the manufacturer nameplate recovery rate per 30 CFR 254.44(a) and (b). Federal de-rating regulations are more conservative than ADEC regulations; consequently, federal regulations are used to estimate recovery capacity. Lori LSC-3 skimmers are an exception: a de-rating of 80% is applied to the nameplate pumping rate per MMS and ADEC guidelines. The *Scenario Recovery Rate* for offshore operations is based on the amount of oil emulsion (plus free water) that is escaping from the well - 400 bbl/hr. The assumed nearshore operations rate is 10% of the offshore rate. See Section 1.6.7 for a complete description of assumptions,~~

~~[2] Once the TF-3 tanker is on site, the OSRB and the vessel of go a 24-hour rotation with only one vessel skimming at a time, while the other transits to the tanker and offloads.~~

~~[3] Pump performance calculations assume 1 m^3 equals 6.29 barrels (U.S. oil).~~

TABLE 1-15
FLEET STORAGE, RECOVERY, AND LIGHTERING SUMMARY

A	B	C	D	E	F	G
ELEMENT	**MAXIMUM STORAGE CAPACITY**	**PLANNING STORAGE CAPACITY**	**STORAGE DERATE**	**EFFECTIVE RECOVERY CAPACITY (ERC)**	**TIME-TO-FILL PLANNING VOLUME AT ERC**	**TIME-TO-LIGHTER PLANNING VOLUME**
Units:	(bbl)	(bbl)	(%)	(bph)	(hrs)	(hrs)
TF-1: OSRB *Endeavor**	18,636	17,000	91%	516	32.9	5.9
TF-2: *Hull 247**		13,000		503	25.8	4.5
TF-3: *Harvey Spirit**		8,000		503	15.9	2.8
TF-4: Tanker	553,494	513,000	93%	-	-	-
TF-5: *Klamath**	80,947	76,900	95%	1,006	76.4	4.9**
Mini-barges (each)	249	237	95%	variable	variable	1.5

Notes:

Maximum capacity volumes listed above are cited from the vessel specifications in Appendix A. For planning purposes, the storage capacities of the assets above have been derated in the scenarios.

**Lightering is done with four GT-A heavy oil transfer pumps capable of transferring at 723 bbl/hr each, or the installed cargo system on the vessel as described in Appendix A.

* Vessel names as provided may change but would be "similar" in type to the vessel listed.

Pump performance calculations assume 1 m3 equals 6.29 barrels (U.S. oil).

TABLE 1-16~~15~~
MAJOR EQUIPMENT TO CONTAIN AND RECOVER OIL IN OPEN WATER

ITEM	EQUIPMENT INFORMATION	QUANTITY
TF-1 Vessels		
OSRB *Arctic Endeavor* (or similar)	Storage Barge with Support Tug	1
Workboats	Kvichak 34-ft Workboat	3
	Rozema 47-ft recovery vessel	1
Oil Recovery Equipment		
Large Brush Skimmer	Lamor 205-m^3 Skimming Packages	2
Vertical Rope Mop	Portable Skimming Package	1
Mini-Brush Skimmer	Portable Skimming Package	1
Storage Bladder	100-bbl Bladders	2
Kvichak Mini-Barges	249-bbl storage	4
Offshore Boom	200-meter Containment Boom Sections	4
Coastal Boom	6,000 ft	
Fire Boom System	In Situ Burning Containment	1
TF-2 Vessels		
~~Vessel of Opportunity~~ *Hull 247* (or similar)		
~~(*Tor Viking* or equivalent)~~	Anchor Handler Tug Supply	1
Oil Recovery Equipment		
Transrec 150 Skimmer	Portable Skimming Package	1
TF-3 Vessels		
Harvey Spirit (or similar)	OSV	1
Oil Recovery Equipment		
Transrec 150 Skimmer	Portable Skimming Package	1
TF-4 Vessels		
Arctic Tanker	Approx 513,000-bbl oil storage tanker	1
TF-5 Vessels		
Klamath (or similar)	*Klamath*	1
Oil Recovery Equipment	Portable Skimming Package	2
Transrec 150 Skimmer		
Other		
Offloading Pumps	Mini-barge Offloading Pumps	1
	Spare Pump w/Hoses	1

TABLE 1-17~~16~~
MAJOR EQUIPMENT FOR SHORELINE AND NEARSHORE OPERATIONS

TASK FORCE	EQUIPMENT	QUANTITY
TF-~~5~~7, Nearshore Recovery	Skimming Vessel (Type D)	2
	Workboat (Shuttle)	2
	LORI Skimmer	3
	Boom	21 feet (R-32A), 42 feet (R-32B)
TF-~~4~~8, Shoreline Containment	Workboat Type C (2 teams, 2 boats each)	4
	Anchor Containment Boom	Varies among sites, >2,000 feet
TF-9~~6~~, Shoreline Recovery	Workboat Type C	2
	Vikoma or Morris Skimmer	20
	Anchor Boom	Varies, <6,000 feet (total)

TABLE 1-~~17~~18
STORAGE EQUIPMENT FOR RECOVERY OPERATIONS

SUM OF CAPACITY OF OIL STORAGE TANKS			
ELEMENT	**MAXIMUM CAPACITY (BBL)**	**PLANNING CAPACITY (BBL)**	**REFERENCE**
OFFSHORE STORAGE			
TF-1 ~~OSRB~~	18,636	17,000	Shell Charter, available to ACS and AES
~~Vessel of Opportunity~~	~~3,850~~	~~3,200~~	~~Shell Charter, available to ACS and AES~~
TF-2		13,000	Shell Charter, available to ACS and AES
TF-3		8,000	Shell Charter, available to ACS and AES
TF-4 Arctic Tanker	553,494	513,000	Shell Charter, available to ACS and AES
TF-5	80,947	76,900	Shell Charter, available to ACS and AES
Mini-barges	996 (4 x 249 bbl)	944 (4 x 236 bbl)	AES Equipment (comparable to ACS mini-barges below)
NEARSHORE STORAGE			
Mini-barges	1,992 (8 x 249)	1,896 (8 x 237 bbl)	ACS *Technical Manual*
SHORELINE STORAGE			
Fastanks	1,140 (20 x 57)	1,080 (20 x 54)	ACS *Technical Manual*
TOTAL STORAGE	**~~580,108~~657,205**	**~~537,120~~631,820**	

Note: Maximum capacity volumes listed above are cited from the vessel specifications in Appendix A and in the ACS *Technical Manual*. For planning purposes, the storage capacities of the assets above have been derated in the scenarios.

TABLE 1-19~~18~~
STAFF TO OPERATE OIL RECOVERY AND TRANSFER EQUIPMENT

LABOR CATEGORY	TASK FORCE	DESCRIPTION	NO. STAFF PER SHIFT AT HOUR 1	NO. STAFF PER SHIFT AT HOUR 24	NO. STAFF PER SHIFT AFTER DAY 1
Team Leader/Field Supervisors	TF-1	OSRB Supervisor	1	~~2~~1	~~2~~1
	TF-2	~~Vessel of Opportunity~~ *Hull 247* (or similar) Supervisor	~~0*~~	~~0~~1*	~~0~~1*
	TF-3	~~Tanker Deck PIC~~*Harvey Spirit* (or similar) Supervisor	~~1~~	1	1
	TF-4	Tanker Deck PIC		~~2~~1	~~2~~1
	TF-5 *	OSRB Supervisor		~~2~~	~~2~~1
	~~TF-6~~			~~1~~	~~1~~
Large Vessel Operators, >30 feet	TF-1	Vessel Operators	4	4	4
	TF-2	Vessel Operators	~~2~~	2	2
	TF-3	~~Tanker~~Vessel Operators	~~PIC~~	~~PIC~~2	~~PIC~~2
	TF-5 *	~~Workboat Type D (2 skimmer boats, 2 work boats)~~Vessel Operators		~~6~~	~~6~~4
Small Vessel Operator, <30 feet	TF-~~4~~7	~~Workboat Type C (2 teams, 2 boats each)~~Vessel Operators		~~4~~8	~~4~~8
	TF-~~6~~8 TF-9	~~Workboat Type C~~Vessel Operators		2 4	2 4
Skilled Technicians	TF-1	OSRB Deck ~~Support~~ Techs	~~4~~2	~~4~~2	~~8~~2
	TF-2	Deck ~~Support~~ Techs	~~2~~	~~2~~1	~~4~~1
	TF-3	~~Tanker~~Deck Techs	~~PIC~~	~~PIC~~1	~~PIC~~1
	~~TF-4~~	~~2 Teams~~		~~8~~	~~8~~
	TF-5*	~~Tactic R-32A, 1 Team~~Deck Techs		~~6~~2	~~6~~2
	TF-1	Deck Support	2	2	2
	TF-2			1	1
	TF-3			1	1
	TF-5*			2	2
	TF-7	Nearshore Equipment Operator		6	6
	TF-8	Onshore Booming Operator		4	4
	TF-9	Onshore Equipment Operator		5	5

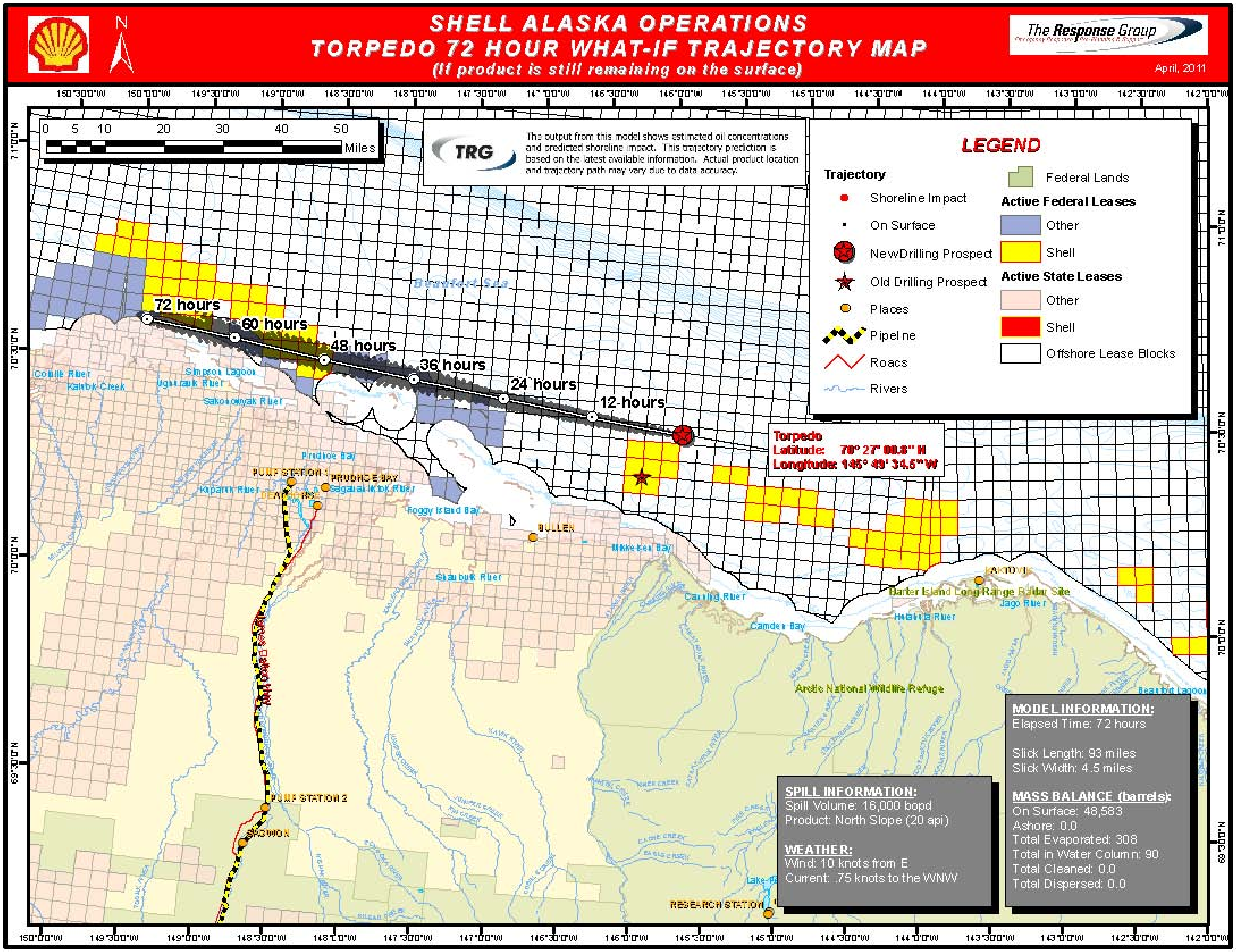
TABLE 1-19 (CONTINUED)
STAFF TO OPERATE OIL RECOVERY AND TRANSFER EQUIPMENT

LABOR CATEGORY	TASK FORCE	DESCRIPTION	NO. STAFF PER SHIFT AT HOUR 1	NO. STAFF PER SHIFT AT HOUR 24	NO. STAFF PER SHIFT AFTER DAY 1
		~~Tactic R-32B, 1 Team~~		~~8~~	~~8~~
	~~TF-6~~	~~Tactic R-16, 2 Teams~~		~~6~~	~~4~~
General Laborer	TF-1	Deck Hand	~~4~~2	~~4~~2	~~4~~2
	TF-8 and TF-9	General Laborer		2	2
Total	-	-	~~18~~11	~~64~~57	~~68~~62

* ~~The TF-2 Team Leader is accounted for in the TF-1 number~~Personnel provided from TF-6.

PIC – Person in charge, indicating that this aspect will be performed by a member of the tanker crew who is assigned to this duty; no additional response staff from Shell or ACS included.

FIGURE 1-14~~13~~
ESTIMATED OIL TRAJECTORY (IF UNCONTAINED AND UNRECOVERED)



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SCENARIO 2

ADEC ~~WORST-CASE DISCHARGE~~ RPS SCENARIO

**UNCONTROLLED SUB-SEA WELL RELEASE
DURING SUMMER MONTHS**

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SCENARIO 2 SCENARIO PARAMETERS

This ~~WCD~~ scenario was developed to specifically describe a response that addresses each of the ADEC-compliant regulations of 18 AAC 75.425. Although Section 1.6.13, Scenario 1, of this plan provides a state-compliant blowout ~~WCD~~ scenario, the following is provided at the specific request of ADEC to address the requirements of AS 46.04.030 subsections (k)(2) and (r)(3). This scenario is not a guarantee of performance. Rather, it is an illustration of the spill and response conditions that could be expected in the event of a loss of primary well control. The scenario makes certain assumptions about spill conditions and describes equipment, personnel and strategies that would be used to respond to a WCD.

The response timelines are for illustration only. In fact, in the unlikely event primary well control was lost, the well would be secured and physically shut-in in less than three minutes. The extended response timeline described has been manufactured to meet contingency planning requirements. Additionally, spill response decisions depend on a host of considerations, including safety, weather, and other environmental conditions. It is the discretion of the IC and persons in charge of the spill response to select any sequence or take as much time as necessary to employ an effective response without jeopardizing personnel safety. As in any incident, personnel safety is the highest priority.

Simulated weather and sea conditions, oil characteristics, aerial deposition, oil trajectory modeling and resources of importance are as described in Scenario 1 ~~(pages 1-62 thru 1-64)~~. The difference between this response scenario and Scenario 1 is that ~~the well location has been changed to Sivulliq N and~~ the scenario duration is 15 days instead of 30 days and includes State of Alaska allowances for recovered oil emulsification and free water. All other parameters are as described in Scenario 1 (see Table 1-13~~12~~).

TABLE 1-20~~19~~
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(i) Stopping Discharge at Source	As soon as the well kicks, subsurface well control, such as increasing the drilling mud weight, is initiated. Initial actions, including the attempted closing of the blowout preventer (BOP) rams fail. Other well control attempts are unsuccessful, and the Torpedo ~~Sivulliq N~~ exploration well is now classified as an "unobstructed" well release (T= 00 hours). The well has a continuous flow rate that will deposit at the surface a total of ~~5,500~~16,000 bopd.	ACS Volume 3
	The On-site Shell Drilling Foreman notifies ACS and personnel on the OSRB collocated with the drilling ship. Notifications to appropriate state and federal agencies~~, including MMS,~~ are performed. The NRC is notified and the IMT is activated as outlined in Shell's Blowout Contingency Plan.	ICS Regional LE-2 Table 1-1, Section 1 of this Plan
	An oil storage tanker located between 25 nm and ~~300~~ 200 nm from the drilling location is also notified and immediately deployed to within a few miles of the uncontrolled well.	
	Safety analyzed the situation and initiates equipment and personnel mobilization on the ~~drillship~~drilling vessel. Well control is discussed in Section 1.6.3 of this plan. The decision is made to move the ~~drillship~~ drilling vessel away from the area of the surfacing well release.	ACS A-1, A-2
(ii) Preventing or Controlling Fire Hazards	Throughout the first few hours of the spill, the Site Safety Officer verifies that all sources of ignition are shut down or removed from the area. The Site Safety Officer provides access zone information and determines PPE requirements. Monitoring protocol is established for all work areas to ensure personnel protection. The monitoring protocol establishes safety zones according to applicable OSHA and fire hazard standards. Consideration is given to pull anchors and move the ~~drillship~~ drilling vessel from the well release. Once the ~~drillship~~ drilling vessel has been moved, the FOSC approves the ignition of the surfacing plume for safety reasons	ACS S-1 through S-6
(iii) Well Control Plan	Well control is as described in Scenario 1~~, except the well site is Sivulliq N~~. The Blowout Contingency Plan is initiated, of which relief well drilling is one sub-component.	Section 1.6.3 of this plan
	Although available on site, for planning purposes, specialty equipment and personnel required for secondary well control arrive at the ~~drillship~~ drilling vessel at T=4 days. Plans are to close the blind shear rams, located on the BOP stack, remotely using a remotely operated vehicle (ROV) to activate the sub-sea control panel. Hypothetically, on arrival, it is discovered the ROV was damaged in shipping. Repair parts for the ROV are ordered, but the ETA is several days. Other options are considered, including a diver and diver support requirements.	
	T=5 days. The diver option is rejected due to safety concerns.	
	T=7 days. ROV repair parts arrive in Deadhorse, but due to a clerical error, the parts are not transferred to an awaiting vessel at West Dock.	
	T=8 days. ROV repair parts arrive at the ~~drillship~~drilling vessel, and the ROV is repaired.	
	T=9 days. ROV successfully activates the sub-sea BOP control panel and activates the blind shear rams on the BOP stack. The wellbore is secured and the discharge is stopped.	

TABLE 1-20~~19~~ (CONTINUED)
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(iv) Surveillance and tracking of Oil	Oil movement is tracked using a combination of visual observations and remote sensing techniques. Within the first hours of initial notification of the well release, a FLIR-equipped aircraft is deployed. Response vessels also deploy buoys with transmitters. Both systems are capable of real-time tracking of the leading edge of the oil. Oil location information is digitized and transferred to the IMT and On-Scene Commander for response planning and trajectory modeling.	ACS T-4 ACS T-5
	NOAA and The Response Group are requested to provide trajectories based on wind speed and direction. Vector addition and trajectory modeling are used to forecast oil and movement.	ACS T-5
(v) Exclusion Procedures; Protection of Sensitive Resources	The Environmental Unit's Cultural Resource Specialist and State Historic Preservation Officer issue an advisory. The NOAA ESI maps, ACS Map Atlas, and the *North Slope Sub-Area Contingency Plan* are used to identify areas of major concern.	NOAA ESI Maps ESI 3-5 Map Atlas Sheets 80, 83,85-87, 89-91, 93, 100-104, and 184-188
	A shoreline cleanup plan is approved by the Unified Command and the State Historic Preservation Officer. A shoreline assessment is conducted to understand the nature and extent of oiling. Based on the shoreline assessment, priorities are established for cleanup. Cleanup techniques chosen are based on shoreline type and degree of oiling. Access to the Canning River delta and shoreline with large equipment is limited.	SH-1
	Based on trajectory calculations and oil tracking, there is no indication of oil impacting the shoreline; nonetheless, barrier islands are identified as the first area to be potentially impacted by oil. There are two areas near the projected trajectory with priority protection sites - Cross Island and Kadleroshilik River.	http://www.asgdc.state.ak.us/maps/cplans/subareas.html#northslope
	T=1 day. There are no individual priority protection sites on Cross Island; however, all of Cross Island is considered a priority protection area. ACS Shoreline Protection Task Forces are mobilized to deploy deflection and exclusion booms at selected sites on Cross Island Two teams, traveling by small workboats and airboats from Prudhoe Bay, each place boom in the quantities described in ACS *Technical Manual* Map Atlas.	ACS C-13, C-14
	T=2 days. ACS Shoreline Protection Task Forces deploy exclusion booms at **PS3** and **PS3A** south of Tigvariak Island, and **PS-3D, PS-4, PS-4A,** and **PS-4B** adjacent to the Kadleroshilik River. ACS dispatches additional Shoreline Protection Task Forces to deploy exclusion boom.	ACS C-14
(vi and vii) Spill Contain, Control and Recovery Procedures	**Task Force (TF) Descriptions:** **TF1.** Primary response is provided by equipment stationed near the ~~drillship~~ drilling vessel This equipment includes an OSRB with two Lamor brush skimmers, three 34-foot workboats, and containment and fire boom.	Regional OR-2A to 2D ACS R-20~~, R-17~~
	TF2: Additional primary response is provided by *Hull 247* (or similar), equipped with a Transrec 150 skimmer. TF-2 has a planned storage capacity of 13,000 bbl.	Regional OR-1A to 1D
	TF3: Additional primary response is provided by Harvey Spirit (or similar), equipped with a Transrec 150 skimmer. TF-3 has a planned storage capacity of 8,000 bbl. ~~**TF2.** Operating in relief of TF1, a vessel of opportunity, one of the on-site drillship support vessels, equipped with a Transrec 150 skimmer performs oil recovery operations while TF1 is offloading recovered oil to TF3.~~	

TABLE 1-20~~19~~ (CONTINUED)
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(vi and vii) Spill Contain, Control and Recovery Procedures (continued)	**TF4~~3~~.** An approximately 513,000-barrel tanker located between 25 nm and ~~300~~ 200 nm from the drilling location is deployed immediately. It arrives within ~~33.5~~20 hours. Decanting (if required) follows FOSC plan and USCG approval. TF-~~3~~ 4 provides oil storage capacity for recovery TFs 1-3, ~~and TF-2~~ and 5.	Regional OR-4A to 5B ACS R-28
	TF5~~4~~. Secondary response is provided by *Klamath* (or similar) from the Chukchi Sea, equipped with two Transrec 150 skimmers and utilizes the boom and boom towing boats from TF-1. TF-5 has a planned storage capacity of 79,600 bbl.	Regional OR-2B, ACS R-19
	TF-8. ACS Shoreline Protection Task Forces mobilize from Prudhoe Bay and deploy exclusion booms at priority sites by the end of Day 1. The primary objective of TF-~~4~~ 8is to prevent oil from entering priority sites. TF-~~4~~ 8does not recover discharged oil.	ACS C-14
	~~TF5~~TF-7. ACS nearshore recovery teams mobilize from Prudhoe Bay to recover oil that has escaped containment from the offshore task forces. ~~TF-1 and TF-2.~~ Teams utilize skimmer boats with LORI LSC skimmers and mini-barges for storage.	ACS R-32A, R-32B
	TF-~~6~~9. ACS shoreline recovery teams to install deflection boom at the shoreline to recover oil. Boom is anchored to the shoreline and offshore, and oil is collected with a skimmer and stored in a Fastank. One team works 10 locations within a 5-mile area. Two crews can manage shoreline operations for 10 miles.	ACS R-16
	<u>Recovery Timeline:</u> **T = 1 hour.** TF-1 is deployed immediately and locates to a safe distance from the well release. A vessel-based boom-skimmer system deploys downwind/downcurrent of the blowout, ahead of the leading edge of the oil plume. The objective of TF-1 is to recover oil shortly after it surfaces and begins to move from the location. While the burning of the well would likely eliminate some of the surfacing oil, it is assumed for planning purposes that the full WCD of ~~5,500~~16,000 bopd (~~229~~ 667 bbl/hr) continues to flow from the well.	 Regional OR-2B
	TF-1 deploys two workboats that tow boom in a U-shape, open-apex formation that allows oil to filter through to the OSRB at the apex of the boom. The U-shaped formation remains in a static location situated a safe operating distance from the well release at the thickest portion of the oil plume. The two brush skimmers on the OSRB have a combined total derated recovery of 516 bbl/ hr (see Table 1-~~21~~15). **T=3 Hours**. TF-2 begins recover operations at 151 bbl/hr.	Regional OR-~~1B and OR-4B~~10, Option 2 ACS R-20
	T = ~~4~~ 20 hours. TF-4 (the oil storage tanker) arrives. At this time TF-1 stops skimming and begins the process of lightering to TF-4. TF-1 has storage capacity to handle over 20 hours of oil recovery operations; consequently, lightering to TF-4 occurs before the recovery vessel reaches full capacity. Lightering procedures are detailed in Section 1.6.8. **TF-**3 maneuvers into position and assists TF-2 with free oil recovery at 500 bbl/hr utilizing the last small boat from TF-1.The volume of recovered liquids exceeds the volume of discharged oil (with emulsification).	ACS R-28

TABLE 1-20~~19~~ (CONTINUED)
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(vi and vii) Spill Contain, Control and Recovery Procedures (continued)	**T=24 hours.** Currents and prevailing winds continue to move the oil that is not contained and recovered to the west. TF-~~6~~ 9 is mobilized from Prudhoe Bay to install boom in a hook configuration with a Vikoma skimmer in the recovery area of the boom. Each task force can deploy and maintain one team at up to ten locations for this configuration. ~~TF-1 begins recovery operations with the 47-foot skim boat. The 47-foot boat operates 12 hours a day for the remainder of the recovery operations.~~ ~~**T=33.5 hours.** TF-3 (the oil storage tanker) arrives. At this time, TF-1 stops skimming and begins the process of lightering to TF-3. The OSRB has storage capacity to handle over 30 hours of oil recovery operations; consequently, lightering to TF-3 occurs before the recovery vessel reaches full capacity. Lightering procedures are detailed in Section 1.6.8.~~ ~~When TF-1 stops skimming, TF-2 begins skimming with the Transrec 150 skimmer. TF-2 begins recovery operations with a recovery capacity of 503 bbl/hr.~~	~~ACS R-20~~
	From this time forward, TF-1,~~ and~~ TF-2, and TF-3 alternate recovery operations, so that one task force is always skimming at 500 bbl/hr and another at 167 bbl/hr. Two workboats continuously tow boom in a U-shape, open-apex formation that allows oil to filter through ~~at~~ the apex. ~~of the boom to either the OSRB or the vessel of opportunity~~. The other two workboats work with either TF-2 or TF-3 to create a J-configuration for oil recovery. ~~J-Boom skimmer deployment is considered by TF-1 and TF-2 if sea conditions prevent U-boom deployment.~~ Recovery rates of TF-1, TF-2, and ~~and~~ TF-~~2~~ 3 are detailed in Table 1-22~~21~~. As long as two of these task forces are recovering oil, ~~T~~the recovery capacity rates exceed the rate at which oil is released from the well.	~~ACS R-17~~ ACS R-17, R-20
	Oil that is not contained and recovered by TF-1,~~ and~~ TF-2, and TF-3 is transported westward by the ocean currents and prevailing winds. TF-~~5~~ 7 is deployed from Prudhoe Bay to recover oil that is often encountered in windrows and linear slicks. TF-~~5~~ 7 consists of two skimming vessels one vessel is configured with two side booms and two LORI skimmers; the other vessel is configured with a single side boom and LORI skimmer. Mini-barges and shuttle boats are used to transport recovered oil to Prudhoe Bay for processing. **T = ~~41.5~~42 hours.** TF- 5 arrives from the Chukchi Sea. TF-5 relieves TFs 1, 2, and 3 of primary oil recovery operations. TF-5 includes two Transrec 150 skimmers that possess de-rated recovery capacity in excess of the well release rate. During the time TF-5 operates, TFs 2 and 3 lighter recovered oil to TF-4. From here on out, TFs 1, 2, and 3 rotate oil recovery operations with TF-5 every 24 hours for the duration of the well release. TF- 3 provides additional backup capacity. ~~stops skimming operations in order to begin lightering, and TF-1 resumes skimming operations.~~ **T=5 days.** Oil trajectory modeling predicts WNW movement of oil. Oil recovery vessels adjust positioning accordingly. **T=11 days.** The volume of released oil is recovered.	ACS R-28

TABLE 1-20~~19~~ (CONTINUED)
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(vii) Lightering Procedures	Decanting, if required, follows FOSC plan approval. Stored liquids are offloaded from the OSRBs to the tanker. Typical vessel offloading times are presented in Table 1-15. ~~For planning purposes, the TF-I OSRV has a fluid storage capacity of 17,000 barrels. Based on a maximum oil exposure rate of 5,500 bbl/day (or 229 bbl/hr), an emulsification factor of 1.54, and free water retained in storage (20%), the skimming vessel could be filled at a rate of approximately 400 bbl/hr. The 17,000-barrel storage capacity could therefore be filled in approximately 42 hours. The estimated time for transit and lightering (a full storage tank) is approximately 8 hours.~~ ~~The TF-2 vessel of opportunity, *Tor Viking*, has a planning capacity of 3,200 barrels; consequently, the "Time-to-Fill" for the vessel of opportunity is approximately 8 hours. Once the TF-3 tanker has arrived on the scene, TF-1 and TF-2 alternate recovery operations so that recovery occurs 24 hours a day.~~	ACS R-28 Regional OR-3A and OR-6
(ix) Transfer and storage of Recovered Oil/Water; Volume Estimating Procedure	Stored liquids are offloaded from the OSRBs ~~and the vessel of opportunity~~ to the tanker. Liquids from the nearshore skimmer vessels are stored in mini-barges to be transported back to Prudhoe Bay and disposed of accordingly or transferred to the OSRBs. Liquids recovered by the shoreline recovery task forces are stored in Fastanks or bladder tanks. See Section 1.6.10. The volumes of stored oil emulsion and free water are gauged with ullage tape and recorded on waste manifests.	ACS R-28 Regional OR-3A and OR-6
(x) Plans, Procedures and Locations for Temporary Storage and Disposal	A waste management plan is developed in order to (1) fill out and sign manifests, (2) measure liquid and other wastes, and (3) submit a plan to ADEC for waste management.	ACS D-1
	Non-liquid oily wastes are classified and disposed of according to classification.	ACS D-2
	Non-oily wastes are classified and disposed of accordingly. Recovered fluids stored onboard the Arctic tanker will be disposed of outside the U.S., either at Shell Group refineries or other third-party processors, in accordance with Shell environmental policy, and relevant local laws and regulations (see Section 1.6.10).	ACS D-3
(xi) Wildlife Protection Plan	Wildlife monitoring and deterrents to protect animals are put in place at the spill scene and impacted areas during recovery operations. The International Bird Research and Rescue Center is put on standby in the event the wildlife treatment facility is required. Building U-8 is made available to agency biologists and veterinarians standing by to respond to potential reports of oiled wildlife. An aircraft monitors wildlife twice daily at the spill scene.	ACS W-1, W-2, W-2B L-~~6~~9, W-3, W-4 W-5
(xii) Shoreline Cleanup Plan	Shoreline impact is not expected with the current trajectory; however, for planning purposes, a percentage of the oil is projected to reach the nearshore environment as detailed in Section 1.6.7. Shoreline cleanup operations are based on a plan approved by the Unified Command. A shoreline assessment is conducted to understand the nature and extent of oiling. Based on the shoreline assessment, priorities are established for cleanup. Cleanup techniques chosen are based on shoreline type and degree of oiling. Access to the Canning River delta and shoreline with large equipment is limited.	ACS SH-1

TABLE 1-~~2019~~ (CONTINUED)
UNCONTROLLED SUB-SEA WELL RELEASE DURING SUMMER MONTHS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS/REGIONAL TACTICS MANUAL
(xii) Shoreline Cleanup Plan (continued)	Primary delta and shoreline cleanup techniques include: • Burning of oily vegetation • Deluge of minor to moderately oiled shoreline in the river, including those areas where heavier concentrations are manually removed, and • Natural recovery for those areas where residual staining may remain, but further recovery would cause more harm than good.	ACS B-2 ACS SH-3 ACS SH-2

~~TABLE 1-20~~
~~WELL BLOWOUT IN SUMMER~~
~~DERATED POTENTIAL RECOVERY CAPABILITY~~

~~A~~	~~B~~	~~C~~	~~D~~	~~E~~	~~F~~	~~G~~	~~H~~	~~I~~	~~J~~	~~K~~	~~L~~
~~ACS / REGIONAL SPILL RECOVERY TACTIC~~	~~NUMBER OF SYSTEMS~~	~~RECOVERY SYSTEM~~	~~DERATED RECOVERY CAPACITY PER SKIMMER [BBL/HR]~~	~~SCENARIO RECOVERY RATE [BBL/HR]~~	~~MOBILIZATION AND TRANSIT TIME TO SITE [TIME]~~	~~OPERATING TIME ON DAY 1 [HR/DAY]~~	~~RECOVERY RATE ON DAY 1 [BBL/DAY]~~	~~OPERATING TIME ON DAY 2 [HR/DAY]~~	~~RECOVERY RATE ON DAY 2 [BBL/DAY] (E X I)~~	~~OPERATING TIME AFTER DAY 2 [HR/DAY]~~	~~RECOVERY RATE AFTER DAY 2 [BBL/DAY] (E X L)~~
~~OPEN-WATER RECOVERY~~											
~~TF-1: ACS R-20~~	~~2~~	~~Lamor 205 m[3] brush skimmers Derated to 20% of the nameplate pump rate (20% x 1,289 = 258)~~	~~258~~	~~400~~	~~1 Hour~~	~~23~~	~~9,600~~	~~16~~	~~6,400~~	~~16~~	~~6,400~~
~~TF-2: ACS R-20~~	~~1~~	~~Transrec 150 – 400 m[3]/hr (2,516 bbl/hr) derated to 20% of the nameplate pump rate (20% x 2,516 = 503)~~	~~503~~	~~400~~	~~30 Hours~~	~~0~~	~~0~~	~~8~~	~~3,200~~	~~8~~	~~3,200~~
~~TF-1: ACS R-17~~	~~1~~	~~Lamor 82 m[3] brush skimmer (47-foot workboat) Derated to 20% of the nameplate pump rate (20% x 516 bbl/hr = 103 bbl/hr)~~	~~103~~	~~400~~	~~24 Hours~~	~~0~~	~~0~~	~~12~~	~~1,236~~	~~12~~	~~1,236~~
~~NEARSHORE RECOVERY~~											
~~TF-5: R32A~~	~~1~~	~~LORI LSC skimmers Derated to 80% of the nameplate pump rate (80% x 271 = 217)~~	~~217~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TF-5: R32B~~	~~2~~	~~LORI LSC skimmers Derated to 80% of the nameplate pump rate (80% x 271 = 217)~~	~~217~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TF-6: R-16~~	~~10~~	~~Hook Boom configuration with Vikoma or Morris skimmer~~	~~10~~	~~40~~	~~48 Hours~~	~~0~~	~~0~~	~~0~~	~~0~~	~~10~~	~~400~~
~~TOTAL BBL OF RECOVERED LIQUIDS PER DAY~~							~~9,600~~		~~10,836~~		~~12,036~~

[1] ~~The *Derated Recovery Capacities* of the skimmers are 20 percent of the manufacturer nameplate recovery rate per 30 CFR 254.44(a) and (b). Federal de-rating regulations are more conservative than ADEC regulations; consequently, federal regulations are used to estimate recovery capacity. Lori LSC-3 skimmers are an exception: a de-rating of 80% is applied to the nameplate pumping rate per BOEMREMMS and ADEC guidelines. The *Scenario Recovery Rate* for offshore operations is based on the amount of oil emulsion (plus free water) that is escaping from the well - 4001,160 bbl/hr. The assumed nearshore operations rate is 10% of the offshore rate. See Section 1.6.7 for a complete description of assumptions,~~

[2] ~~Once the TF-3 tanker is on site, the OSRB and the vessel of opportunity (*Tor Viking*) go into a 24-hour rotation with only one vessel skimming at a time, while the other transits to the tanker and offloads.~~

[3] ~~Pump performance calculations assume 1 m[3] equals 6.29 barrels (U.S. oil).~~

~~TABLE 1-21~~
~~MAJOR EQUIPMENT TO CONTAIN AND RECOVER OIL IN OPEN WATER~~

~~ITEM~~	~~EQUIPMENT INFORMATION~~	~~QUANTITY~~
~~TF-1~~		
~~Vessels~~	-	
~~OSRB *Arctic Endeavor*~~	~~-Storage Barge with Support Tug~~	~~1~~
~~Workboats~~	~~Kvichak 34-ft Workboat~~	~~3~~
~~Skimming Boat~~	~~Kvichak 47-ft Brush Skimming Vessel~~	~~1~~
~~Oil Recovery Equipment~~	-	
~~Large Brush Skimmer~~	~~Lamor 205-m^3 Skimming Packages~~	~~2~~
~~Vertical Rope Mop~~	~~Portable Skimming Package~~	~~1~~
~~Mini-Brush Skimmer~~	~~Portable Skimming Package~~	~~1~~
~~Storage Bladder~~	~~100-bbl Bladders~~	~~2~~
~~Kvichak Mini-Barges~~	~~249-bbl storage~~	~~4~~
~~Offshore Boom~~	~~200-meter Containment Boom Sections~~	~~4~~
~~Fire Boom System~~	~~In Situ Burning Containment~~	~~1~~
~~TF-2~~		
~~Vessels~~		
~~Vessel of Opportunity~~ ~~-(*Tor Viking* or equivalent)~~		~~1~~
~~Oil Recovery Equipment~~		
~~Transrec 150 Skimmer~~	~~Portable Skimming Package~~	~~1~~
~~TF-3~~		
~~Vessels~~	-	
~~Arctic Tanker~~	~~oil storage tanker~~	~~1~~
~~Other~~	-	
~~Offloading Pumps~~	~~Mini-barge Offloading Pumps~~	~~1~~
-	~~Spare Pump w/Hoses~~	~~1~~

~~TABLE 1-23~~
~~MAJOR EQUIPMENT FOR SHORELINE AND NEARSHORE OPERATIONS~~

~~TASK FORCE~~	~~EQUIPMENT~~	~~QUANTITY~~
~~TF-4, Shoreline Containment~~	~~Workboat Type C (2 teams, 2 boats each)~~	~~4~~
	~~Anchor Containment Boom~~	~~Varies among sites, >2,000 feet~~
~~TF-5, Nearshore Recovery~~	~~Skimming Vessel (Type D)~~	~~2~~
	~~Workboat (Shuttle)~~	~~2~~
	~~LORI Skimmer~~	~~3~~
	~~Boom~~	~~21 feet (R-32A), 42 feet (R-32B)~~
~~TF-6, Shoreline Recovery~~	~~Workboat Type C~~	~~2~~
	~~Vikoma or Morris Skimmer~~	~~20~~
	~~Anchor Boom~~	~~Varies, <6,000 feet (total)~~

~~TABLE 1-23~~
~~STORAGE EQUIPMENT FOR RECOVERY OPERATIONS~~

~~SUM OF CAPACITY OF OIL STORAGE TANKS~~			
~~ELEMENT~~	~~MAXIMUM CAPACITY (BBL)~~	~~PLANNING CAPACITY (BBL)~~	~~REFERENCE~~
~~OFFSHORE STORAGE~~			
~~OSRB~~	~~18,636~~	~~17,000~~	~~Shell Charter, available to ACS and AES~~
~~Vessel of Opportunity~~	~~3,850~~	~~3,200~~	~~Shell Charter, available to ACS and AES~~
~~Arctic Tanker~~	~~553,494~~	~~513,000~~	~~Shell Charter, available to ACS and AES~~
~~Mini-barges~~	~~996 (4 x 249 bbl)~~	~~944 (4 x 236 bbl)~~	~~AES Equipment (comparable to ACS mini-barges below)~~
~~NEARSHORE STORAGE~~			
~~Mini-barges~~	~~1,992 (8 x 249)~~	~~1,896 (8 x 237 bbl)~~	~~ACS *Technical Manual*~~
~~SHORELINE STORAGE~~			
~~Fastanks~~	~~1,140 (20 x 57)~~	~~1,080 (20 x 54)~~	~~ACS *Technical Manual*~~
~~TOTAL STORAGE~~	**~~580,108~~**	~~537,120~~	

~~Note: Maximum capacity volumes listed above are cited from the vessel specifications in Appendix A and in the ACS *Technical Manual*. For planning purposes, the storage capacities of the assets above have been derated in the scenarios.~~

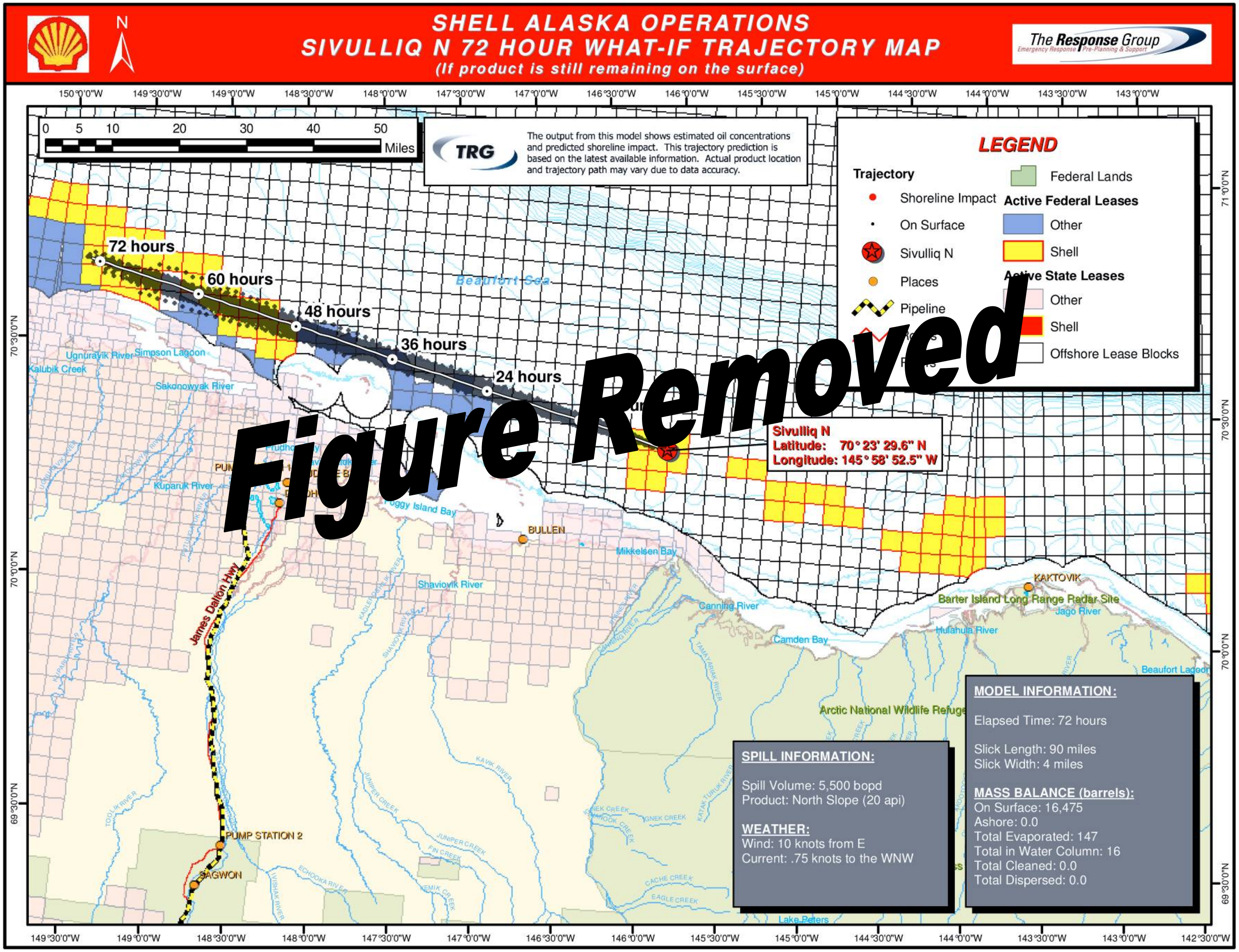
~~TABLE 1-24~~
~~STAFF TO OPERATE OIL RECOVERY AND TRANSFER EQUIPMENT~~

~~LABOR CATEGORY~~	~~TASK FORCE~~	~~DESCRIPTION~~	~~NO. STAFF PER SHIFT AT HOUR 1~~	~~NO. STAFF PER SHIFT AT HOUR 24~~	~~NO. STAFF PER SHIFT AFTER DAY 1~~
~~Team Leader/Field Supervisors~~	~~TF-1~~	~~OSRB Supervisor~~	~~1~~	~~2~~	~~2~~
	~~TF-2~~	~~Vessel of Opportunity Supervisor~~	~~0*~~	~~0*~~	~~0*~~
	~~TF-3~~	~~Tanker Deck PIC~~	~~1~~	~~1~~	~~1~~
	~~TF-4~~			~~2~~	~~2~~
	~~TF-5~~			~~2~~	~~2~~
	~~TF-6~~			~~1~~	~~1~~
~~Large Vessel Operators, >30 feet~~	~~TF-1~~	~~Vessel Operators~~	~~4~~	~~4~~	~~4~~
	~~TF-2~~	~~Vessel Operators~~	~~2~~	~~2~~	~~2~~
	~~TF-3~~	~~Tanker~~	~~PIC~~	~~PIC~~	~~PIC~~
	~~TF-5~~	~~Workboat Type D (2 skimmer boats, 2 work boats)~~		~~6~~	~~6~~
~~Small Vessel Operator, <30 feet~~	~~TF-4~~	~~Workboat Type C (2 teams, 2 boats each)~~		~~4~~	~~4~~
	~~TF-6~~	~~Workboat Type C~~		~~2~~	~~2~~
~~Skilled Technicians~~	~~TF-1~~	~~OSRB Deck Support Techs~~	~~4~~	~~4~~	~~8~~
	~~TF-2~~	~~Deck Support Techs~~	~~2~~	~~2~~	~~4~~
	~~TF-3~~	~~Tanker~~	~~PIC~~	~~PIC~~	~~PIC~~
	~~TF-4~~	~~2 Teams~~		~~8~~	~~8~~
	~~TF-5~~	~~Tactic R-32A, 1 Team~~		~~6~~	~~6~~
		~~Tactic R-32B, 1 Team~~		~~8~~	~~8~~
	~~TF-6~~	~~Tactic R-16, 2 Teams~~		~~6~~	~~4~~
~~General Laborer~~	~~TF-1~~	~~Deck Hand~~	~~4~~	~~4~~	~~4~~
~~Total~~	~~-~~	~~-~~	~~18~~	~~64~~	~~68~~

~~* The TF-2 Team Leader is accounted for in the TF-1 number.~~

~~PIC – Person in charge, indicating that this aspect will be performed by a member of the tanker crew who is assigned to this duty; no additional response staff from Shell or ACS included.~~

~~FIGURE 1-14~~
~~ESTIMATED OIL TRAJECTORY (IF UNCONTAINED AND UNRECOVERED)~~



RESPONSE STRATEGY 1

SUB-SEA BLOWOUT IN VARYING ICE CONDITIONS

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RESPONSE STRATEGY PARAMETERS

The following response strategy describes methods and equipment that could be used in response to a hypothetical oil spill from a sub-sea well blowout at one of Shell's exploration drilling locations during varying ice conditions.

For the purposes of the strategy, a Shell exploration well on the Torpedo prospect blows out at sub-sea on October 1, nine days before freeze-up. While open water at the Torpedo location can (and often does) extend well into mid-October, the formation of new ice by Day 9 provides ample time for the description of response techniques during freeze-up. In this simulation, oil and gas travels from the sub-sea release at the mud line to an open region at the water's surface.

TABLE 1-21~~25~~
RESPONSE STRATEGY
SUB-SEA WELL BLOWOUT IN VARYING ICE CONDITIONS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(i) Stopping Discharge at Source	The On-Site Shell Drill Foreman notifies ACS and AES personnel on the OSRB collocated with the drilling ship. All notifications to appropriate state and federal agencies are performed. The National Response Center (1–800–424–8802) is notified, and the Incident Management Team is activated. An oil storage tanker located between 25 nm and ~~300~~ 200 nm from the drilling location is also notified and immediately begins mobilizing to the spill location.	ACS A-1, A-2 Regional LE-2
(ii) Preventing or Controlling Fire Hazards	Throughout the first few hours of the spill, the Site Safety Officer verifies that all sources of ignition are shut down or removed from the area. The Site Safety Officer provides access zone information and determines PPE requirements. Monitoring protocol is established for all work areas to ensure personnel protection from fire hazards and other blowout conditions. All anchors are pulled, and the ~~drillship~~ drilling vessel is moved from the well blowout. As in the open-water scenario, the FOSC approves the ignition of the blowout for safety reasons.	ACS S-1 through S-6
(iii) Well Control Plan	Well control is discussed in Section 1.6.3 of this C-Plan.	Not applicable
(iv) Surveillance and Tracking of Oil; Forecasting Shoreline Contact Points	Oil movement is tracked using a combination of visual observations and remote sensing techniques. Within the first four hours of initial notification of the blowout, the Kuparuk Twin Otter with FLIR is deployed. Response vessels also deploy buoys with transmitters. Both systems are capable of real-time tracking of the leading edge of the oil.	ACS T-4, T4A
	By Day 9 of the spill, discharge tracking in ice is performed by helicopter, which deploys beacons capable of transmitting the leading edge of the oil.	
	NOAA is requested to provide trajectories based on wind speed, direction, and currents.	ACS T-5
(v) Protection of Environmentally Sensitive Areas and Areas of Public Concern	Land-fast ice may exist in early October. When present, land-fast ice provides an effective natural barrier against oil reaching the shoreline. If land-fast ice has not formed, nearshore skimming operations (ACS R-15 through R-18) will be used to intercept any oil that may approach the shoreline. In this scenario, containment booming and recovery with ACS skimmers and mini-barges is used to prevent oil from reaching the Canning River delta and other sensitive river outlets nearby.	NOAA ESI Maps ESI 3-5
	Oil that has not been recovered by primary response methods is expected to reach the first barrier island (Cross Island) by the end of Day 3. If land-fast ice has not formed in these areas, nearshore and shoreline containment and recovery operations will be mobilized to prevent oil from reaching sensitive sites.	ACS Atlas Maps 80, 83, 85-87,89-91, 93,100-104, 184-188 ACS R-15 through R-18
	The Environmental Unit's Cultural Resource Specialist and State Historic Preservation Officer issue an advisory. The NOAA ESI maps, ACS Map Atlas, and the *North Slope Subarea Contingency Plan* are used to identify areas of major concern.	http://www.asgdc.state.ak.us/maps/cplans/subareas.html#northslope

TABLE 1-21~~25~~ (CONTINUED)
RESPONSE STRATEGY
SUB-SEA WELL BLOWOUT IN VARYING ICE CONDITIONS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(v) Protection of Environmentally Sensitive Areas and Areas of Public Concern (Continued)	A shoreline cleanup plan is approved by the Unified Command; however, it is recognized that shoreline access will be limited as land-fast ice begins to form throughout the region. Should oil move into these nearshore waters and become entrained within the growing ice, the locations of the oiled regions will be recorded and monitored for ice movement. As ice thickness increases at these sites, stakes will be positioned to identify areas for on/in-ice recovery techniques.	ACS T-2
(vi) Spill Containment and Control Actions	From Day 1 and throughout the month of October, land-fast ice continues to grow out from the mainland and from long stretches of shoreline along the barrier islands. This land-fast ice becomes increasingly stable, resisting the forces of wind, current, and tidal changes. Due to the scale of the initial response to the oil farther offshore, relatively small quantities of oil are expected to reach the beaches. The land-fast ice continues to grow seaward out to depths of typically 5 to 10 meters (32 feet).	
	Beyond the land-fast ice, operations continue with conventional containment and recovery operations involving a large swath, open apex U-boom configuration, funneling oil immediately downstream of the blowout into narrow, thick bands. The concentrated bands of oil are intercepted by the OSRB~~, 47-foot vessel, and the vessel of opportunity~~ and the other two on site response vessels, which work in a rotation cycle, filling only a portion of the onboard storage capacity with each recovery cycle~~ (approximately 18 hours)~~. While some oil would undoubtedly be removed by the burning gas at the blowout, it is assumed (for planning purposes only) that a substantial amount of oil continues to be released from the burning blowout.	~~ACS B-3~~ Regional OR-1B~~, 4B~~, and 10 ~~Regional OR-7~~ ~~ACS L-2, S-6~~ ~~ACS C-12, B-5, B-6~~
	As offshore operations move into the second week of response, the hours of daylight and average air temperatures continue to drop, making oil surveillance and tracking more difficult, along with the location, containment, and recovery of oil.	ACS, B-3 B-5~~, B-6~~
	Intentional ignition of the blowout at the start of the spill helps keep dangerous vapors from accumulating and interfering with recovery operations; the fire helps responders to see the source from which oil is being released; and, depending upon the nature of the oil and the degree of emulsification, it is likely that some of the oil would be consumed through combustion at the spill site.	ACS B-3~~, B-5~~
	During the second week of response (Day 8 to Day 14), the formation of grease ice and nilas (e.g., a thin elastic crust of ice up to 10 centimeters thick that bends easily under pressure) make it increasingly difficult to work with booms as they begin to fill with ice, preventing the effective collection of oil. During this period, recovery continues with the more narrow-swath capabilities of the outriggers on the OSRB and the other two on site response vessels.~~,~~ 47-foot vessel, and the vessel of opportunity. Oil encounter rates are substantially reduced, and the large OSRB, together with the smaller skimming vessels (the 47-foot boat with built-in Lamor brushes, the ACS skimming workboats, and the vessel of opportunity), are limited to spot-removal techniques in the heaviest of concentrations. As oil accumulates in pockets, recovery continues with the OSRB operating rope-mop and direct suction skimmers along with the over-the-side Lamor brush skimmers.	Regional OR-1C-D, 4C-D, 5A, 7, and 10 ACS B-5

TABLE 1-2125 (CONTINUED)
RESPONSE STRATEGY
SUB-SEA WELL BLOWOUT IN VARYING ICE CONDITIONS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
	Beyond Day 14, the on-scene drilling support vessels with ice-breaking capabilities begin to break through the formation of pancake ice and large continuous layers of thin ice. These ice breakers patrol and move ice that can hamper normal drilling operations, and they are able to break and help deflect ice away from a blowout situation. By keeping the open water upstream of the blowout relatively free of heavy ice incursions, oil is exposed and made available for combustion and for limited recovery with spot-removal techniques further downstream.	ACS R-31
(vi) Spill Containment and Control Actions (continued)	As freeze-up continues and blowing snow begins to accumulate on young ice, it becomes impossible to operate the physical containment and recovery systems safely and effectively. Small workboats and barges ~~and the 47-foot skimmer~~ are loaded onto the larger OSRB. ACS boats return to Prudhoe Bay. At this point, the response shifts to a concentrated effort to break and deflect ice forward of the blowout to keep oil and gas exposed as it surfaces, in order to support combustion. A Heli-torch and/or hand-held igniters will be used to re-ignite vapors if flames become extinguished. Further downstream, there will be a concentration of oil and burn residue that escapes the blowout. It is expected that this oil will be confined to a relatively narrow swath created by the natural containment of the surrounding ice. To the extent that the oil accumulates within the broken ice, every effort will be made to ignite the oil with aerial ignition techniques.	Regional OR-7
	It may be necessary to rely upon burning as weather, ice, and visibility permit. During the final days of the blowout, darkness and snow coverage will continue to make tracking and recovery techniques difficult, if not impossible. After the blowout stops, and all vessels have been removed from the area, the movement of the ice in the region of the blowout is monitored and recorded until it is safe to move personnel to potential areas of contamination by helicopter, ATVs, and Rolligons (depending upon ridging, rafting, and ice stability).	
	When safe to do so, activities on ice will focus on the detection, delineation, and marking of oiled ice and snow, as responders attempt to expose and remove oil on top of or contained within and beneath the ice. Tracking devices such as radar reflectors, stakes, and other marking systems will be left in place to guide personnel as the spring melt approaches, and when oil begins to migrate to the surface and accumulate in melt pools. Again, as with freeze-up conditions, when the ice becomes unsafe to work on during break-up, response techniques will shift to aerial ignition of oil in melt pools, and accumulations in open leads and polynyas.	
	Throughout the first two weeks of October, personnel, workboats, equipment, and supplies are moved to shoreline cleanup sites and nearshore recovery areas possibly from Kaktovik and from other staging sites set up at key locations along the shoreline. These sites will also serve as decontamination facilities until all nearshore and shoreline response operations are shut down. Decontamination for all offshore personnel is staged on each of the OSRBs.	
(vii) Spill Recovery Procedures	ACS has the capabilities of mounting an effective nearshore and shoreline response program within the first 24 hours of a call-out. ACS, together with the Village Response Team personnel, will also be available to supplement the primary offshore response operations, as needed.	
	Task Force 1: Primary response is provided by personnel and equipment located on the OSRB. This equipment includes an OSRB with two large brush skimmers; one 47-foot skimming vessel (with built-in brush skimmers); three 34-foot workboats; and containment and fire boom.	Regional OR-2A to 2D
	TF-2: Secondary response is provided by *Hull 247* (or similar) equipped with a Transrec 150 skimmer, TF-2 has a planned storage capacity of 13,000 bbl.	Regional OR-5A to 5B
	TF-3: TF-3 is equipped with a Transrec 150 skimmer. TF-3 has a planned storage capacity of 8,000 bbl.	Regional OR-10

TABLE 1-21~~25~~ (CONTINUED)
RESPONSE STRATEGY
SUB-SEA WELL BLOWOUT IN VARYING ICE CONDITIONS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(vii) Spill Recovery Procedures (Continued)	**TF-4:** An approximately 513,000-barrel tanker located between 25 nm and 200 nm from the drilling location is deployed immediately. It arrives within 20 hours. Decanting (if required) follows FOSC plan and USCG approval. TF-4 provides oil storage capacity for the offshore recovery task forces. ~~Task Force 2: Secondary response is provided by personnel and equipment located on the vessel of opportunity equipped with a Transrec 150 skimmer.~~	
	~~Task Force 3: The Arctic tanker is located between 25 nm and 300 nm from the drilling location and begins to deploy immediately, arriving in the immediate vicinity of the blowout within 33.5 hours.~~ Within 1 hour, Task Force 1 initiates recovery of oil in the open water west of the ~~drillship~~drilling vessel, which is located north of Mikkelson Bay. Two workboats tow boom in a large, U-shaped configuration with an open apex that allows oil to filter through to an OSRB immediately downstream of the apex of the boom. The open-apex booming allows for the deflection of small amounts of ice that begin to form during the early stages of freeze-up.	
	By Hour 33.5, Task Forces 2 and 3 assist Task Force 1 in open water recovery operations. Decanting follows FOSC plan approval. Cleanup in open water continues through Day 8. Open water conditions persist through the first week of October. Depending on wind and sea conditions, young ice begins to form offshore and develops into thin layers and/or pancake ice, gradually becoming isolated from the effects of wind and wind-generated currents. Heavier ice incursions are possible with the presence of northerly winds. Through the second week, open-water recovery is hampered by increasing ice and slush, forcing the cessation of large-swath, open-apex booming. Increasing ice concentrations, together with increasing darkness, soon reduce all skimming to the spot-removal of oil pockets in broken ice. Ice breakers and burning at the spill site enhance the elimination of oil at the source, and limited physical removal continues until the end of the second week. Shortly after that, nearly all offshore response is conducted without support from skimming vessels, leaving aerial ignition of isolated patches downstream of the blowout and combustion of oil and gas at the source as the only response mode, until it is safe to operate on stable ice with the onset of winter.	
(viii) Lightering Procedures	Lightering crews offload ~~oily waste~~ recovered oil from the OSRBs and the other vessels ~~of opportunity~~ to the tanker. Once the tanker arrives on site, it remains in close proximity (within a mile or two) of the recovery operations, so transit times to the tanker are minimal. With the use of BAT for transfer operations (annular injection of water at the suction of the Archimedes-type screw pumps) aboard each oil spill response platform, the lightering of viscous oil emulsions can be accomplished in approximately 6 to 8 hours (for a full tank). Decanting from the oil spill response platforms is accomplished with all discharge forward of the skimmers. All decanting (including from the tanker) is performed in strict compliance with all relevant state and federal regulations.	ACS R-28 Regional OR-3A and OR-6
(ix) Transfer and Storage of Recovered Oil/Water; Volume Estimating Procedure	As the OSRBs and other vessels ~~of opportunity~~ near capacity, the oil spill response platform transits to ~~the Arctic tanker~~TF-4 for offload, and the recovered emulsions and free water are transferred to the tanker. Stored liquids are gauged with ullage tape, manifested, and logged with the assistance of the Waste Management Team.	ACS D-1
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	A Waste Management Plan is developed in order to (1) fill out and sign manifests, (2) measure liquid and other waste, and (3) submit a plan to ADEC for ~~waste management~~approval. Non-liquid oily wastes are classified and disposed of according to classification. Non-oily wastes are classified and disposed of accordingly.	ACS D-1 through D-3

TABLE 1-21~~25~~ (CONTINUED)
RESPONSE STRATEGY
SUB-SEA WELL BLOWOUT IN VARYING ICE CONDITIONS

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal (continued)	Recovered fluids stored onboard the Arctic tanker will be disposed of outside the U.S., either at Shell Group refineries or other third-party processors, in accordance with Shell environmental policy and relevant local laws and regulations (see Section 1.6.10).	
(xi) Wildlife Protection Plan	Priority areas are protected by containment booming or by land-fast ice, which creates an effective natural barrier to exclude oil from sensitive habitats. A strategy is implemented to deal with any birds and mammals that may become oiled at sea, and the ACS Wildlife Stabilization Center is made operational. Polar bear guards and security staff trained by government biologists are assigned to protect bears and workers.	ACS C-13, C-14 ACS W-1 ACS W-2A, W-2B ACS W-5, W-6
(xii) Shoreline Cleanup Equipment	Shoreline cleanup operations are based on a plan approved by the Unified Command. A shoreline assessment is conducted to understand the nature and extent of oiling. Shoreline operations are conducted if land-fast ice is not yet present. Land-fast ice provides an effective natural barrier against the shoreline.	ACS SH-1
	Surface access is temporarily limited by forming ice. As freeze-up continues and ice becomes more stable, oil is burned in situ and/or trenched to direct entrapped oil to containment areas where it can be burned.	ACS B-5, B-6, C-12
	A shoreline cleanup plan is submitted to Unified Command before break-up in the event that oiled shorelines are discovered after break-up. At break-up, Shoreline Cleanup Assessment Teams (SCATs) monitor the tundra and adjacent shorelines for oiling, according to the plan. Based on the shoreline assessment, priorities are established for cleanup. Cleanup techniques chosen are based on shoreline type and degree of oiling.	ACS SH-1
	Access to the Canning River delta and shoreline with large equipment is limited. Primary delta and shoreline cleanup techniques include: • Burning of oily vegetation, • Deluge of minor to moderately oiled shoreline in the river, including those areas where heavier concentrations were manually removed, and • Natural recovery for those areas where residual staining may remain, but further recovery would cause more harm than good.	ACS B-2 ACS SH-3 ACS SH-2

RESPONSE STRATEGY 2

FUEL TRANSFER RELEASE DURING SUMMER MONTHS

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RESPONSE STRATEGY PARAMETERS

The following response strategy describes methods and equipment that could be used in response to a hypothetical diesel spill during a fuel transfer from a fuel barge to one of Shell's exploration drilling locations during summer months.

For the purposes of the strategy, the release occurs during a fuel transfer from a barge or supply boat to the ~~drillship~~drilling vessel. Assumptions for the discharge are based on 33 CFR 154.1029(b). The diesel release is assumed to occur due to transfer hose failure. The spill duration is assumed to be 5.5 minutes, resulting in the release of 2,000 gallons (48 bbl) of diesel. Approximately 10 percent of the spill is contained on the deck of the ~~drillship~~drilling vessel, and 90 percent of the spilled diesel enters the water. The maximum targeted recovery volume is 3,132 gallons (75 bbl). This volume includes an emulsion factor of 1.54 and a free-water recovery at 20 percent of the original spill volume.

The direction of the wind and ocean current will have limited effect to the recovery of diesel because containment boom will be pre-deployed prior to the fuel transfer. The current is assumed to be 0.75 knots to the WNW. The sea conditions are assumed to be typical 1½ to 2 feet wave height.

TABLE 1-22~~26~~
FUEL TRANSFER RELEASE DURING SUMMER RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(i) Stopping Discharge at Source	The fuel barge is positioned adjacent to the ~~drillship~~ drilling vessel to conduct a fuel transfer. The fuel transfer is monitored by a dedicated response team equipped with an OSRB and two Kvichak workboats.	
	A pre-transfer conference is conducted between the fuel vessel, the ~~drillship~~drilling vessel, and response team personnel. During the transfer, the fuel vessel operator, an officer in the wheelhouse of the fuel barge tug, and the hosewatch from the ~~drillship~~ drilling vessel remain in both visual and radio contact. Additionally, the response team pre-deploys containment boom downcurrent of the fueling operation.	Appendix C of this plan
	During the fuel transfer, the fuel hose close to the deck rail of the ~~drillship~~ drilling vessel fails. The failure is assumed to be a complete rupture of the hose.	
	For the purposes of the strategy, the hosewatch discovers the hose failure after 5 minutes. The hosewatch activates the emergency shutdown, stopping the pump on the fuel barge. At T= 5.5 minutes, fuel transfer has stopped.	
	The On-Site Shell Drill Foreman assumes the role of IC. The IC activates the ~~drillship~~ drilling vessel response team. The response team lifts a section of hose onto the deck from the ~~drillship~~drilling vessel, attempting to prevent any further draining of fuel. The end of the hose is sealed.	Table 1-1, Section 1 of this plan
	Notifications to appropriate state and federal agencies are performed. ACS (in Prudhoe Bay) is put on standby.	ACS A-1, A-2
(ii) Preventing or Controlling Fire Hazards	Throughout the first few minutes of the spill, the Site Safety Officer verifies that all sources of ignition are shut down or removed from the area. The Site Safety Officer also reminds personnel that the vessel diagram has the location of all fire suppression equipment. The Site Safety Officer then provides access zone information and determines PPE requirements. Monitoring protocol is established for all work areas to ensure personnel protection. The monitoring protocol establishes safety zones according to applicable OSHA and fire hazard standards.	ACS S-1 through S-6
(iii) Well Control Plan	Not applicable.	
(iv) Surveillance and Tracking of Oil	Diesel movement is tracked using visual observations from the ~~drillship~~drilling vessel, fuel barge, and support vessels. After recovery operations, one of the two Kvichak workboats performs reconnaissance of the area downcurrent of the release. If necessary, the Kuparuk Twin Otter with FLIR or alternative aircraft with SAR is put on standby.	
(v) Protection of Environmentally Sensitive Areas and Areas of Public Concern	A shoreline assessment/recovery plan is not activated, because reconnaissance indicates the diesel is recovered in open water. If necessary, NOAA ESI maps, ACS Map Atlas, and the *North Slope Subarea Contingency Plan* are used to identify areas of major concern. Nearby priority protection sites are identified. ACS is put on standby to deploy exclusion booms at the nearest shoreline.	NOAA ESI Maps ESI 3-5 Map Atlas Sheets 80, 83, 85-87, 89-91, 93, 100-104 http://www.asgdc.state.ak.us/maps/cplans/subareas.html#northslope

TABLE 1-22~~26~~ (CONTINUED)
FUEL TRANSFER RELEASE DURING SUMMER
RESPONSE STRATEGY

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS / REGIONAL TACTIC
(vi and vii) Spill Containment, Control, and Recovery Procedures	**Task Force (TF) Descriptions:** **TF-1:** Primary response is provided by personnel and equipment stationed near the ~~drillship~~drilling vessel. This equipment includes an OSRB with two Lamor brush skimmers;~~ one 47-foot skimming vessel (with built-in brush skimmers)~~; three 34-foot Kvichak workboats; a vertical rope mop skimmer; a mini-brush skimmer; a 100-barrel storage bladder; and containment and fire boom.	Regional OR-2A to 2D Regional OR-5A to 5B
	TF-2: ACS Shoreline Protection Task Forces from Prudhoe Bay is put on standby to deploy exclusion booms at priority sites. TF-3 is not mobilized because the diesel is contained at sea. The IC, Barge Captain, and Site Safety Officer communicate throughout the recovery operations.	~~Regional OR-1A to 1D~~ ~~Regional OR-4A to 4B~~ Regional SR-4
	Recovery Timeline: **T= 0 Minutes.** Transfer hose ruptures. TF-1 has pre-deployed two Kvichak workboats towing boom in a U-shape formation downcurrent of the fuel transfer operations.	Regional OR-3A
	T= 5.5 Minutes. Fuel transfer operations have stopped. Site Safety Officer assesses access and PPE requirements. The ~~drillship~~ drilling vessel and fuel barge detach and separate. Recovery operations begin. Sorbents are used to clean the deck of the ~~drillship~~drilling vessel.	Section 1.6.6 and 1.6.7 of this plan
	T= 20 Minutes. The workboats position the boom to contain the spilled fuel, and then proceed to the OSRB for recovery. The OSRB utilizes either a mini-brush skimmer or rope mop to collect the contained diesel. Recovered fuel/water mixture is stored in the OSRB.	
	End of Day 1. Recovery operations have stopped. Approximately 75 barrels of liquid (fuel/water) is collected and stored in the OSRB.	
(viii) Lightering Procedures	On a non-emergency basis the recovered diesel is lightered to a 249-barrel barge mobilized from Deadhorse by ACS.	ACS R-28 Regional OR-3A or OR-6
(ix) Transfer and Storage of Recovered Oil/Water; Volume Estimating Procedure	The volumes of stored oil emulsion and free water are gauged with ullage tape and recorded on waste manifests	ACS R-28 Regional OR-3A or OR-6
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	A Waste Management Plan is developed in order to (1) fill out and sign manifests; (2) measure liquid and other waste; and (3) submit a plan to ADEC for waste management.	ACS D-1
	Non-liquid oily wastes are classified and disposed of according to classification.	ACS D-2
	Non-oily wastes are classified and disposed of accordingly.	ACS D-3
	Recovered fluids potentially transferred to West Dock by ACS will be disposed of either using available injection wells or by re-processing in available production facilities as discussed in Section 1.6.10.	Section 1.6.10 of this plan
(xi) Wildlife Protection Plan	Wildlife monitoring is conducted immediately. If necessary, deterrents to protect animals are put in place at the spill scene during recovery operations. The International Bird Research and Rescue Center is put on standby in the event the wildlife treatment facility is required.	ACS W-1 ACS W-2, W-2B, ACS L-6
(xii) Shoreline Cleanup Plan	Not Applicable. Fuel dissipates prior to encountering any shoreline.	

1.7 NON-MECHANICAL RESPONSE OPTIONS [18 AAC 75.425(e)(1)(G)]

Shell will mechanically contain and clean up oil spills to the maximum extent possible. When mechanical response methods are no longer effective, in situ burning will be used to augment mechanical response.

1.7.1 Obtaining Permits and Approvals

Burning will not occur without approval of federal, state, and local agencies. The Shell IC will discuss the option of in situ burning with the Unified Command, and a Regional Response Team In Situ Burn Application Form will be prepared. This form is provided in the ACS *Technical Manual*, Tactics B-1 and B-1A. Deliberate ignition of the blowout for safety reasons, however, may be approved by the FOSC without delay if it is felt that an accidental ignition of vapors from the blowout could result in serious harm to on-site personnel and responders.

1.7.2 Decision Criteria for Use

As covered in ACS Tactic B-1, burning may be used as a spill control measure once regulatory approval has been obtained. Should burning be needed, Shell will complete the ARRT Application for In Situ Burning, and submit the application to the Unified Command (see ARRT Unified Plan, Appendix 2, Annex F, In Situ Burning Guidelines for Alaska).

When mechanical recovery is not feasible or is ineffective, removing oil from the water by in situ burning may provide significant protection for fish, wildlife, and sensitive environments, as well as commercial, subsistence, historic, archaeological, and recreational resources.

In situ burning may:

- Prevent the resources from coming into contact with spilled oil;
- Reduce the size of the spill and thus the amount of spilled oil affecting natural resources;
- Allow the environment to recover to the pre-spill state sooner; and
- Provide the most effective means to remove oil from water prior to shoreline impacts in broken ice conditions, in remote or inaccessible areas, or when containment and storage facilities are overwhelmed.

1.7.3 Implementation Procedures

If the Shell IC or the Unified Command decides to use in situ burning and obtains the necessary authorization, ACS and AES will carry out the response (see ACS Tactics B-1, B-1A, B-3, B-5, and B-6 and Regional Tactic OR-7).

Once approved, in situ burning will normally involve the following steps:

1. Collect and concentrate the oil using a fire-resistant boom, ice cakes/floes, ice pits, or other natural features as gathering places for the burn.
2. Ignite the oil using the Heli-torch or hand-held igniters, making sure to avoid flashback and ignition of the spill source.

3. Monitor the burn, maintaining constant watch on the fire and smoke plume, condition of containment boom, speed and position of boom-towing vessels, and other safety hazards and issues.
4. To the extent possible, recover and dispose of the burn residue.

1.8 FACILITY DIAGRAMS [18 AAC 75.425(e)(1)(H)]

Diagrams for the ~~drillship~~ drilling vessels are presented as Figures 1-15 through 1-21~~19~~.

FIGURE 1-15
***NOBLE~~FRONTIER~~ DISCOVERER* GENERAL ARRANGEMENT OF OUTBOARD PROFILE**

PRINCIPLE DIMENSIONS

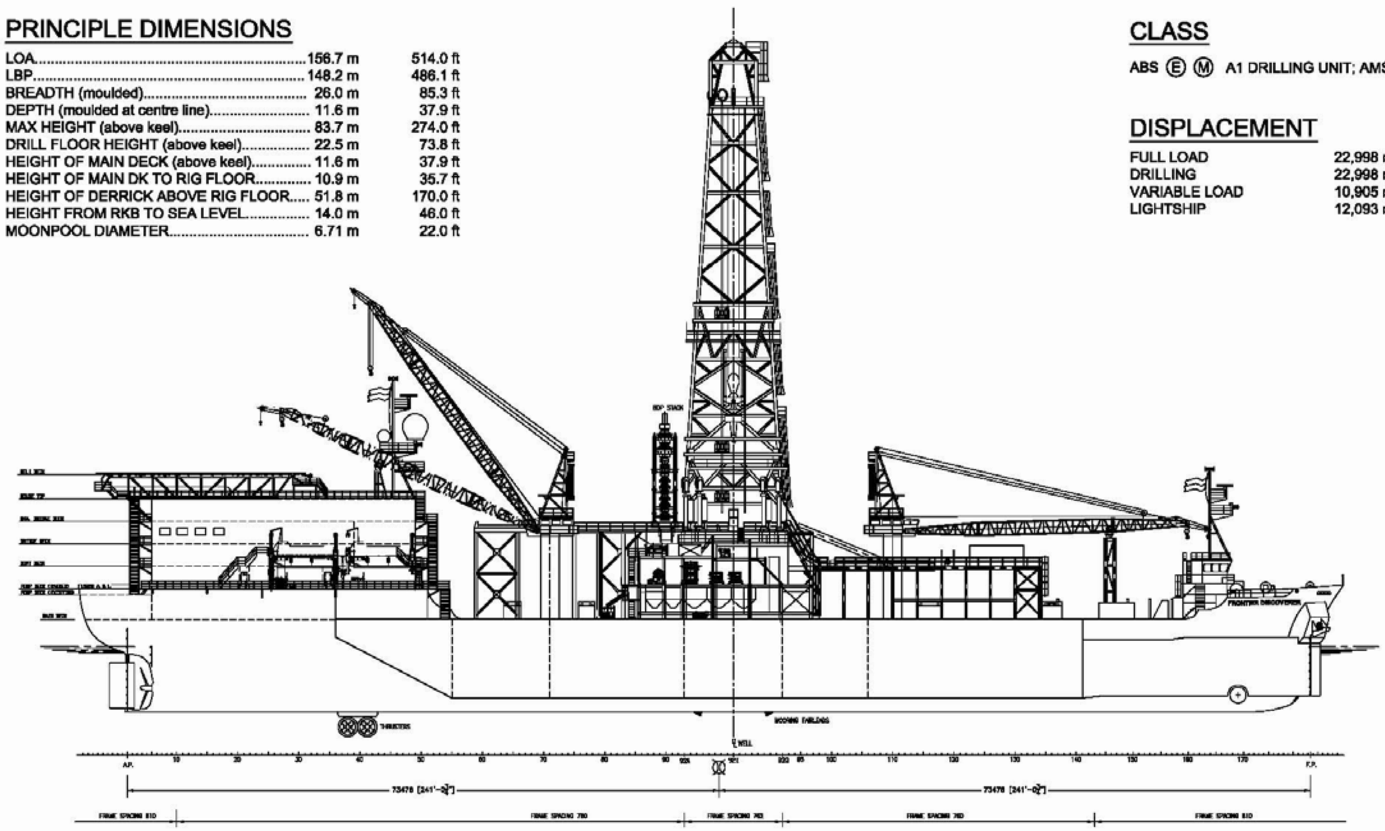
LOA	156.7 m	514.0 ft
LBP	148.2 m	486.1 ft
BREADTH (moulded)	26.0 m	85.3 ft
DEPTH (moulded at centre line)	11.6 m	37.9 ft
MAX HEIGHT (above keel)	83.7 m	274.0 ft
DRILL FLOOR HEIGHT (above keel)	22.5 m	73.8 ft
HEIGHT OF MAIN DECK (above keel)	11.6 m	37.9 ft
HEIGHT OF MAIN DK TO RIG FLOOR	10.9 m	35.7 ft
HEIGHT OF DERRICK ABOVE RIG FLOOR	51.8 m	170.0 ft
HEIGHT FROM RKB TO SEA LEVEL	14.0 m	46.0 ft
MOONPOOL DIAMETER	6.71 m	22.0 ft

CLASS

ABS Ⓔ Ⓜ A1 DRILLING UNIT; AMS

DISPLACEMENT

FULL LOAD	22,998 mt
DRILLING	22,998 mt
VARIABLE LOAD	10,905 mt
LIGHTSHIP	12,093 mt



OUTBOARD PROFILE

TONNAGES

GROSS (International)	12,230 tons
NET (International)	3,669 tons

DRAUGHT

DRAFT AT LOAD LINE	8.20 m	27 ft
TRANSIT	8.20 m	
DRILLING	8.20 m	
LIGHTSHIP DRAFT (Mean)	4.75 m (Lightship incl. perm ballast, mean)	

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NOBLE DISCOVERER
GENERAL ARRANGEMENT OF
OUTBOARD PROFILE

May 2011 | Figure 1-15

FIGURE 1-16
***NOBLE~~FRONTIER~~ DISCOVERER* GENERAL ARRANGEMENT OF MAIN DECK AND ABOVE**

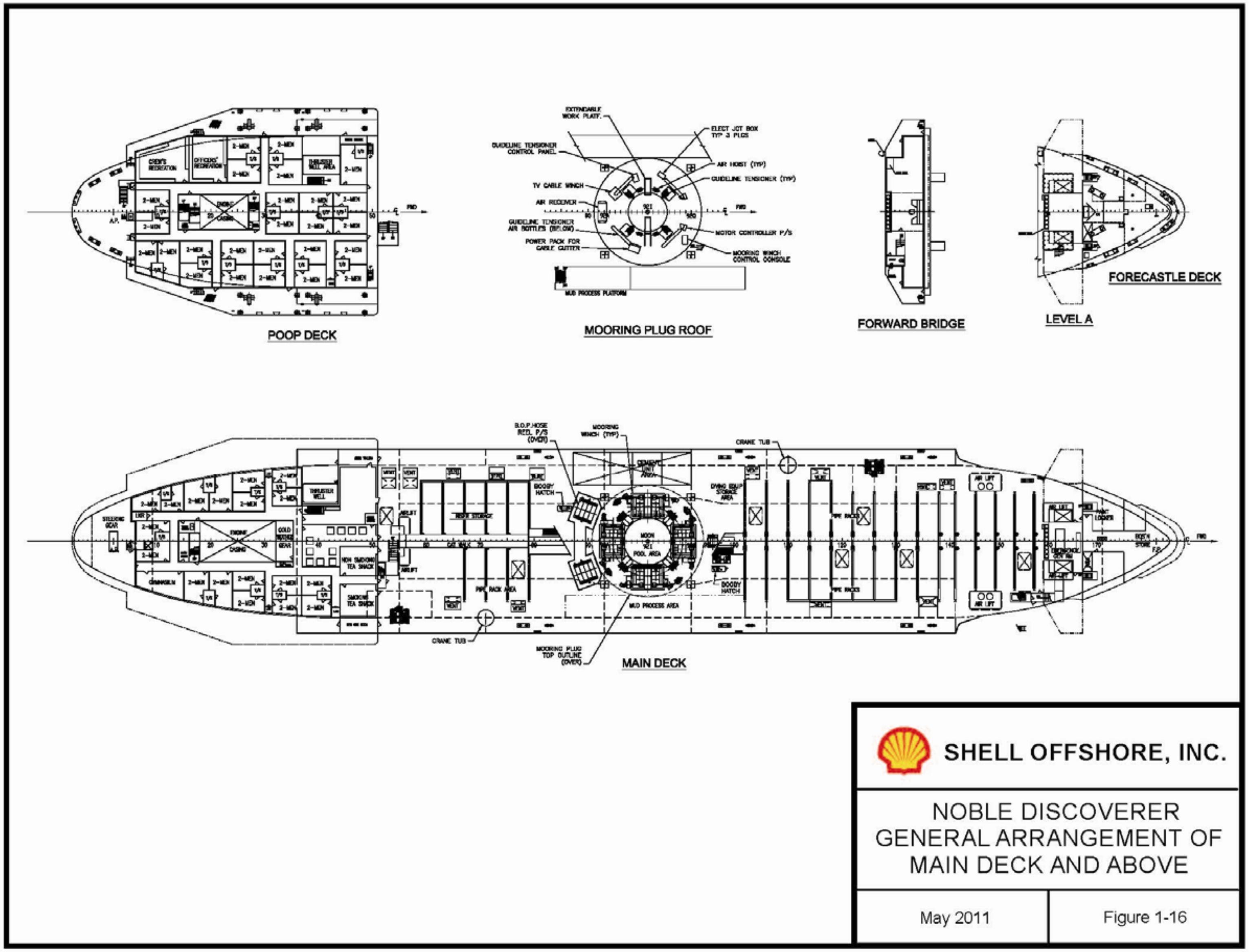


FIGURE 1-17
***NOBLE~~FRONTIER~~ DISCOVERER* MAIN DECK VIEW 2**

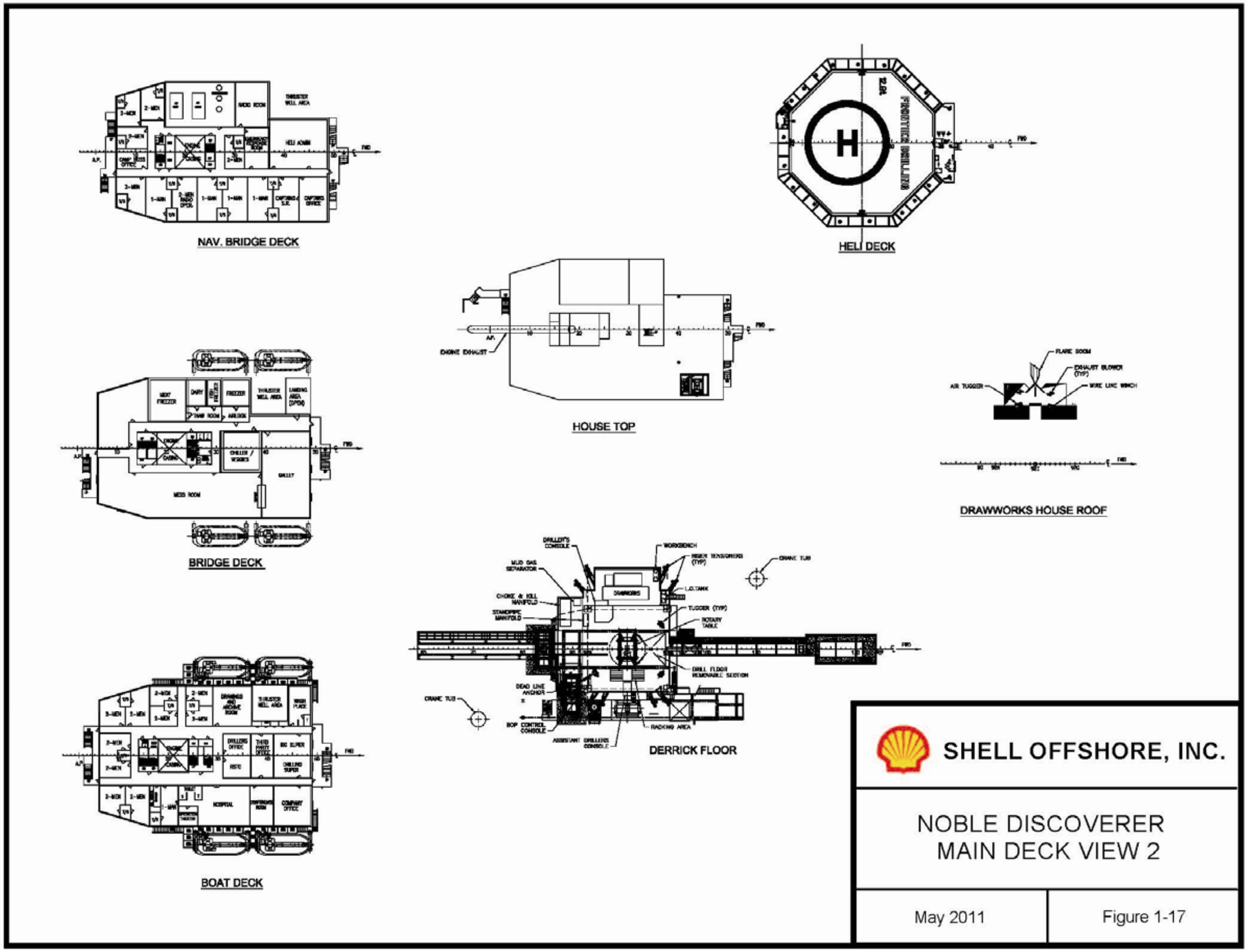


FIGURE 1-18
***NOBLE~~FRONTIER~~ DISCOVERER* GENERAL ARRANGEMENT OF LOWER DECKS**

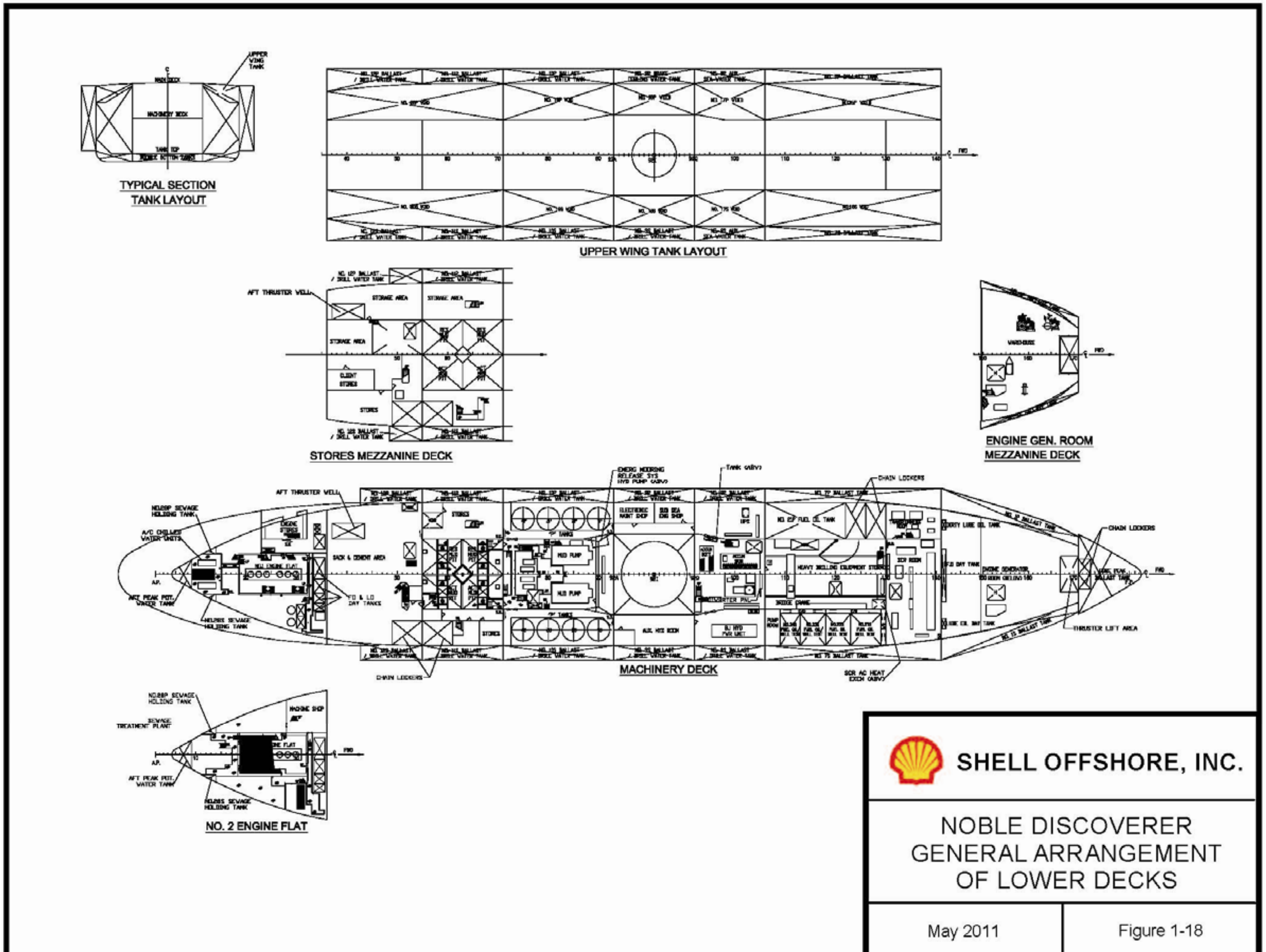


FIGURE 1-19
***NOBLE~~FRONTIER~~ DISCOVERER* LOWER DECKS VIEW 2**

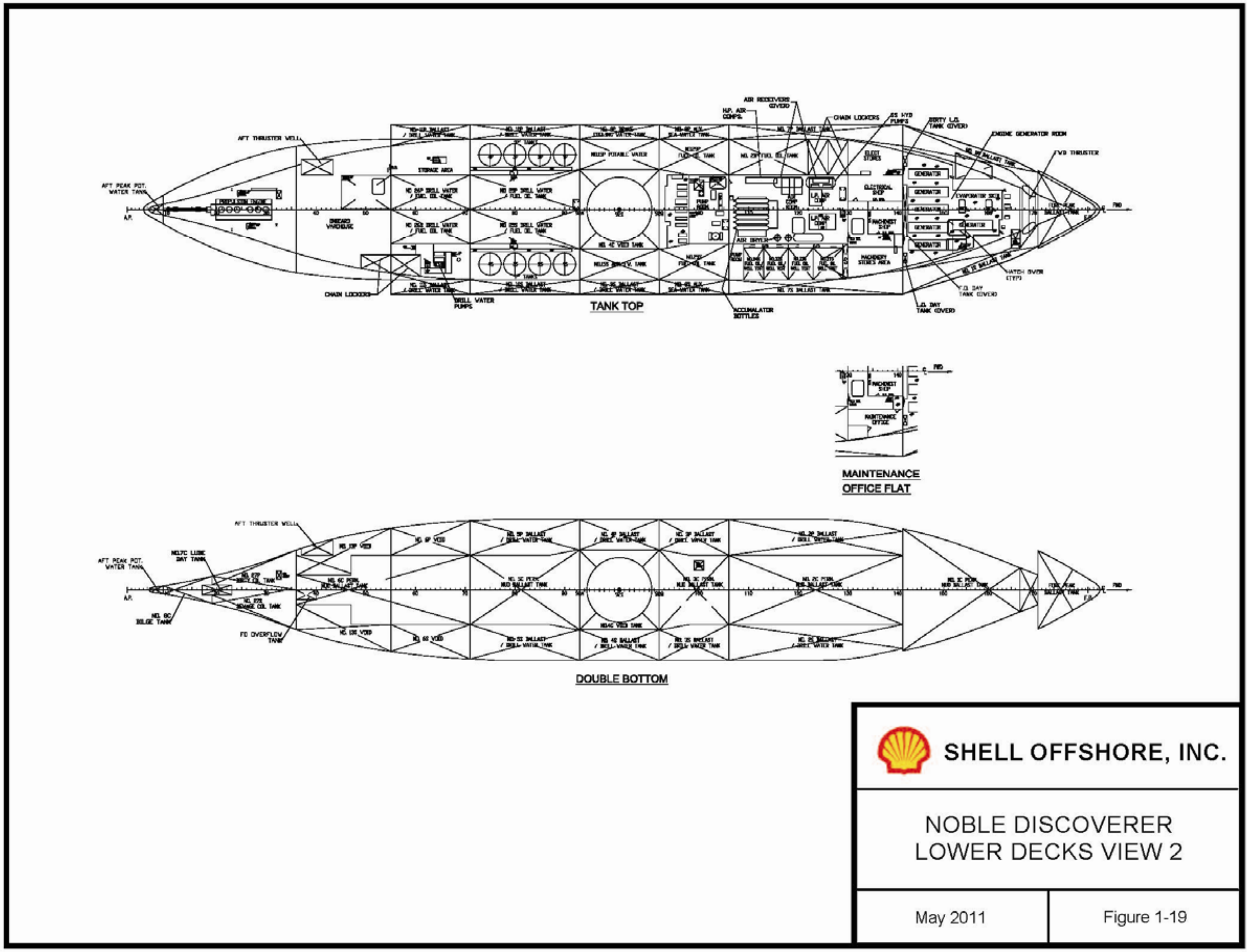
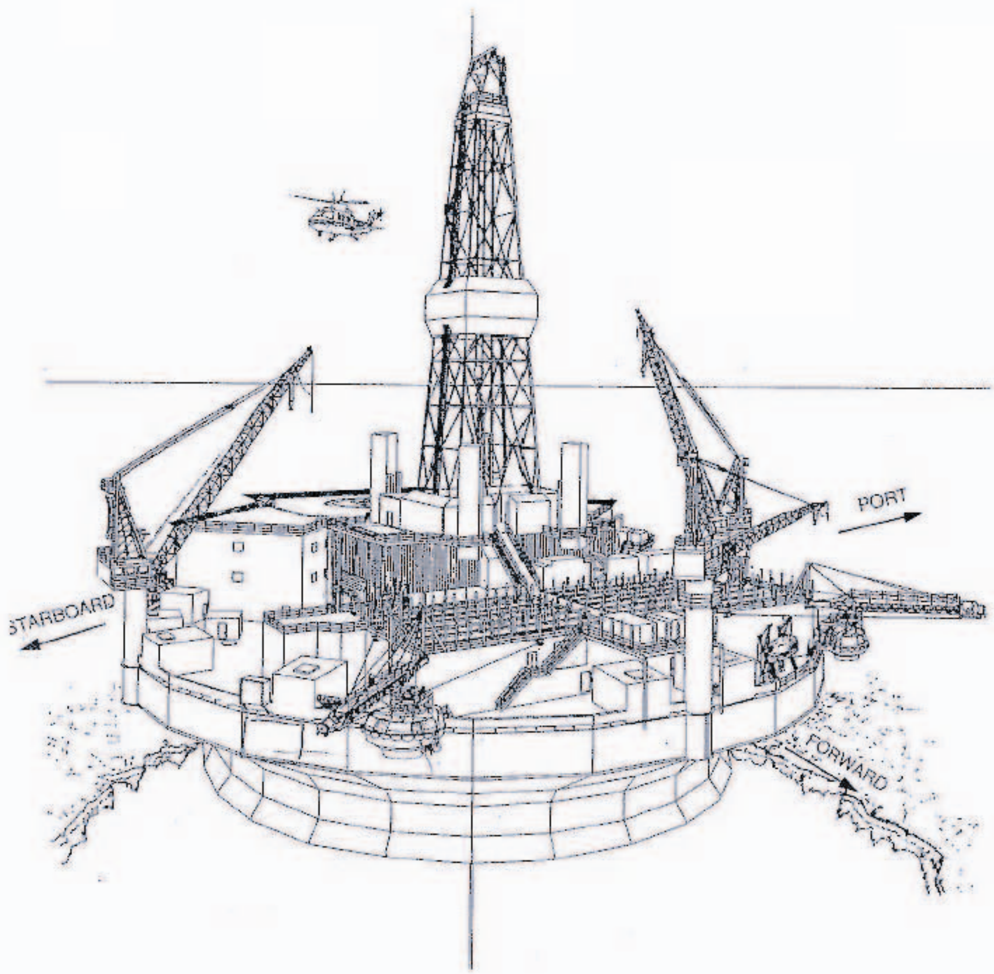


FIGURE 1-20
***KULLUK* DRILL RIG**

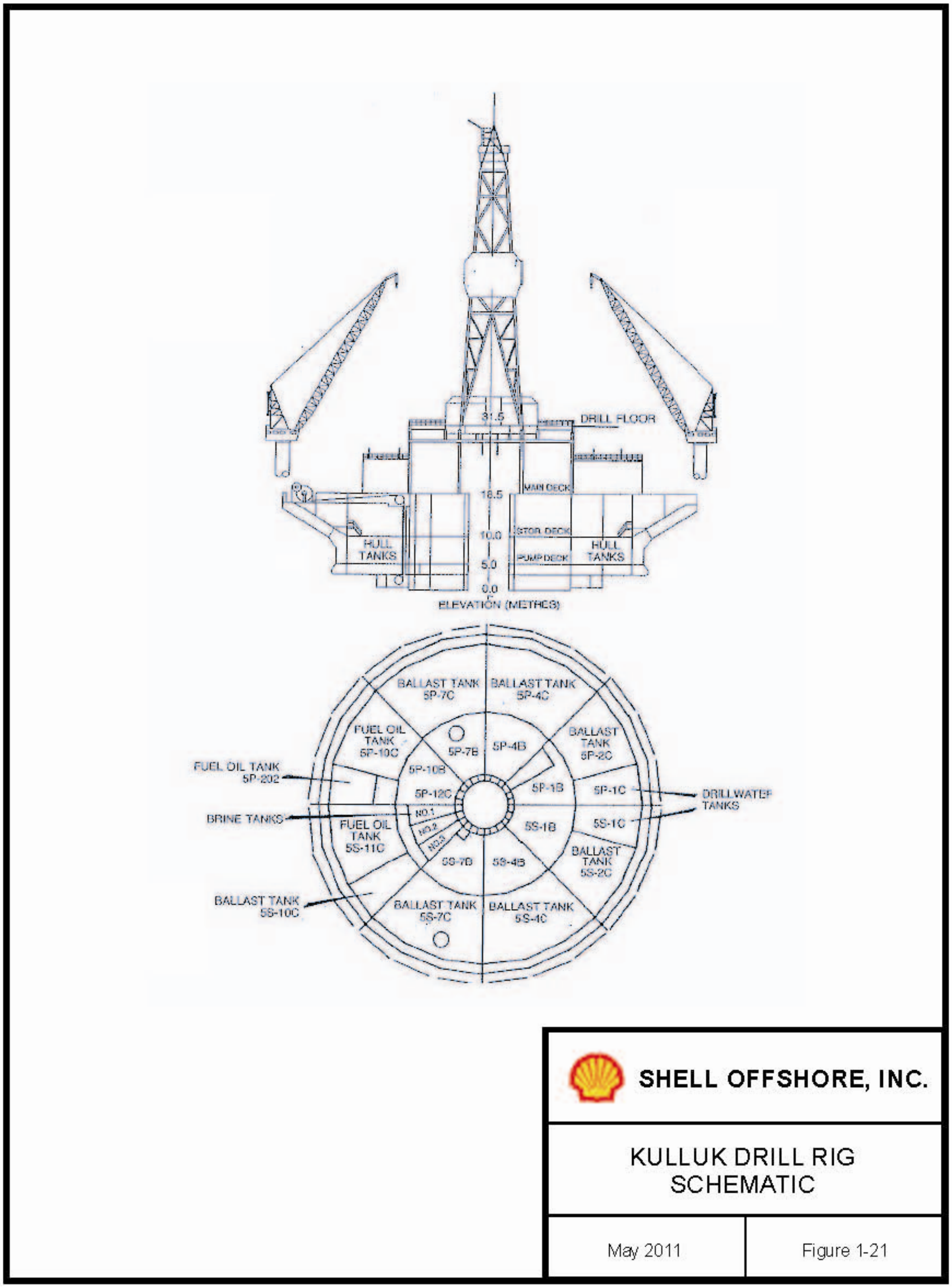


SHELL OFFSHORE, INC.

KULLUK DRILL RIG

May 2011	Figure 1-20

FIGURE 1-21
***KULLUK* DRILL RIG SCHEMATIC**



PART 2 PREVENTION PLAN [18 AAC 75.425(e)(2)]

2.1 PREVENTION, INSPECTION, AND MAINTENANCE PROGRAMS [18 AAC 75.425(e)(2)(A)]

2.1.1 Prevention Training Programs [18 AAC 75.007(d)]

Personnel involved in spill response or cleanup activities are thoroughly trained and are expected to be knowledgeable of safety, health, and environmental requirements, so they fully understand the safety and health risks associated with their job and the practices and procedures required to control their exposure to potential safety and health hazards. The level of training is based on the duties and functions of each responder in the emergency response, and complies with the regulatory requirements for employee training. See Section 3.9 for additional training information.

All drilling personnel will be required to take additional training in key subjects, such as:

- Safety Orientation/Personal Protective Equipment (PPE)
- Environmental Handbook/Spill Prevention Guidelines
- Confined Space Entry
- Lockout/Tagout of Hazardous Energy Sources
- Safety and Health Accident Prevention
- Incident Command System (ICS) Basic Overview
- Hazardous Waste Operations and Emergency Response (HAZWOPER 8-Hour)
- First Aid/CPR Training

In addition, selected site personnel shall be fully aware of waste issues involving on-site generation, storage, segregation, manifesting, and transportation. They must be knowledgeable of exempt vs. nonexempt, and hazardous vs. non-hazardous materials, and the associated practices in managing the material in accordance with standard operating procedures.

Site personnel who are expected to participate in oil spill response activities will require training in a number of other subjects, including:

- HAZWOPER 24-Hour
- Fate and Transport of Oil Under Arctic Conditions
- Shell C-Plan Overview
- Oil Spill Response Equipment Overview and Oil Spill Response System Performance
- Specialized training as needed for oil spill response boat operations, lightering, spill containment and recovery, and in situ burning operations

Shell Drill Foreman and Contractor Toolpushers, Drillers, and Assistant Drillers are required to have formal well control training in accordance with Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)~~Minerals Management Service (MMS)~~ Code of Federal Regulations (CFR) requirements. In addition, BOEMRE~~MMS~~ requires weekly pit and trip drill exercises designed to keep drill crew personnel alert to well control contingencies. Blowout prevention equipment is regularly pressure-and function-tested again under BOEMRE~~MMS~~ CFR requirements, and flow chart response plans are kept visible on the drill floor as decision aids to the driller should a well-flow event occur.

2.1.2 Substance Abuse Programs [18 AAC 75.007(e)]

The Shell drug policy was established to ensure a safe working environment at all operations. Shell's company-wide policy covers all employees. All contractors and non-employees who work at Shell facilities must also obey this policy. Shell requires joint venture partners under its operational control to apply this policy and uses its influence to promote it in other ventures.

The use, possession, distribution, or being under the influence of illegal drugs or alcohol is strictly prohibited on Shell-controlled premises. Entry onto Shell-controlled premises constitutes consent to, and recognition of, the right of the Company to random drug testing, as well as drug testing for cause.

Beyond these requirements, operators of designated critical equipment (such as company drivers, crane operators, workboat operators) are subject to daily alcohol testing.

Failure to cooperate, or repeated positive test results, will result in termination for Shell personnel, and removal from Company premises for all others.

2.1.3 Medical Monitoring [18 AAC 75.007(e)]

Shell has a systematic approach to medical management designed to assure compliance with the law and continuous performance improvement. All Shell and contract employees must meet the minimum physical requirements for their job classifications as determined by the Medical Department. For example, crane operators must undergo periodic vision examinations. These tests allow for a safe working environment and pursue Shell's international goal of safe working conditions.

At the onset of employment, personnel receive a physical examination, at which time they can voluntarily declare pre-existing medical conditions and current medications. This procedure allows for the accurate monitoring of all employees' health.

Subsequent physical examinations are available to employees, with frequency based on age.

2.1.4 Security Program [18 AAC 75.007(f)]

The primary safety and security concern relates to the transportation of Shell and contractor personnel via the Shell facility in Deadhorse.

Access to the ~~drillship~~drilling vessels is either by helicopter or by vessel. Personnel are primarily transferred to the platform by helicopter, which is strictly controlled at Shell's Deadhorse, Alaska warehouse and office facility, located along the airport runway at the Deadhorse Airport. Purcell Security will provide security services for the Deadhorse facility.

Vessels will arrive in the Beaufort Sea fully outfitted and supplied. A mid-season resupply consisting primarily of drilling mud, water, and fuel is expected to occur in September from Prudhoe Bay. Transport of any remaining supplies during the drilling season is expected to be minimal, mainly related to transfers of spare parts, drilling tools, and other unforeseen items that can be transported from the Deadhorse area to the drilling location by helicopter (or boat, if weather conditions preclude helicopter operations).

In the event of an actual spill, Rolligons may be used for supplemental transportation of equipment, personnel, and supplies in support of the Alaska Clean Seas shoreline recovery effort and, in all likelihood, temporary camps would be mobilized to available gravel pads and communities adjacent to the shoreline recovery effort.

Access to the drilling sites themselves will be very limited, given that they are in remote, offshore locations and subject to authorization by the on-site Drill Foreman who strictly controls transit and access to the drilling site. For safety reasons, access to the ~~drillship~~drilling vessel will be limited to authorized personnel only.

For further information regarding on-site security and regulations, see the Shell Security Plans on the ~~drillship~~drilling vessel.

2.1.5 Fuel Transfer Procedures [18 AAC 75.025]

Each vessel has its own fuel transfer procedure as part of the company's HSSE or operations management system. At exploration sites, the following types of fuel transfers take place:

- Fuel transfers to or from ~~the~~ the drilling vessels~~drillship~~, including transfers from ~~this~~ these vessels to other supporting vessels (e.g., anchor handler) or helicopters.
- Fuel transfers to or from the oil spill response barge (OSRB) platform, including transfers from this vessel to other supporting vessels (e.g., workboats).

Fuel Transfer Procedures for the OSRB, ~~and the *Frontier*~~ *Noble Discoverer* and the *Kulluk* are in Appendix C.

The offshore ~~drillship~~drilling vessels, ~~and the~~ *Noble*~~*Frontier*~~ *Discoverer* and *Kulluk*, incorporate~~s~~ fuel transfer facilities for heli-support, fuel barge to fuel barge, and supports vessels.

Fuel transfers will be done in accordance with:

- Lease-specific requirements including the pre-deployment of booming and oil spill response personnel.
- U.S. Coast Guard (USCG) regulations [33 CFR 154.1035(b)(2)(i)] and vessel response plans.
- Alaska Department of Environmental Conservation (ADEC) regulations 18 AAC 75.025.

Manuals governing fuel transfers, including emergency shutdown, are strictly followed by maintenance personnel and can be found onboard the ~~drillship~~drilling vessel. If a spill of any size is detected, immediate action will be taken to stop the source. The ~~drillship~~drilling vessel has shipboard oil pollution emergency plans that personnel adhere to, including immediate contact of the supervisor.

Fuel Transfers within a ~~Drillship~~Drilling vessel

Internal fuel transfers include flow of fuel from the onboard storage tanks to settling tanks or to loading stations on deck. Onboard storage tanks include:

- Boiler day tank,
- Cold start compressor,
- Emergency generator day tank,

- Incinerator day tank,
- Deck cranes,
- Crude oil tank,
- Survival anchor windlass diesel, and
- Mud pits

The boiler day tank, emergency generator day tank, and the incinerator day tank are fitted with overflow pipes that return excess fuel back to the hull storage tanks. These transfers generally take place twice daily, once per shift, and are handled by maintenance personnel. Safety procedures include adherence to an internal fuel transfer checklist, direct communication among personnel, and visual inspection of the transfers. No internal fuel transfers take place during high-risk situations such as bad weather or alarm status.

If an alarm occurs, an emergency shutdown system at the pumps closes any valve in use and stops the transfer to avoid spill overflow.

Helicopter Fuel Transfer

Helicopter fuel transfers include storage, filtering, and transfer of fuel from the fuel pods located on the ~~drillship~~drilling vessel deck through pumps and filters to the delivery skid on the heli-deck. An emergency shutdown valve at the control room is both manually and pneumatically operated. Preventive measures for fuel transfer to the helicopters include:

- Ensure no helicopters are inbound/outbound;
- Discontinue hot work on the heli-deck and starboard decks;
- Verify operative firefighting system, including extinguisher on the heli-pad; and
- Proper alignment of fueling facilities (including valves, motor, pump, and coalescing filter).

Only authorized personnel (either the Helicopter Landing Officer or one of three heli-deck crew members) will activate this system.

Fuel Oil Transfer from Fuel Barge to ~~*Frontier Discoverer* Drillship~~Drilling Vessels

No fuel transfers will occur during emergency weather conditions or alarms without the direct approval of the Maintenance Superintendent. Safety of fuel transfer procedures for the transfer of diesel fuel to the ~~drillship~~drilling vessels is reliant on direct communication between rig and fuel supply vessel personnel responsible for the transfer procedures. Preventive measures for ensuring a safe transfer will be reliant on pre-transfer procedures. Prior to transfer, these persons will identify:

- Product, rate of transfer, and sequence of operations;
- Critical stages of the transfer operation;
- Applicable federal, state, and local regulations; and
- Emergency procedures including shutdown operations.

Refer to Appendix C for the fuel transfer procedures for the *Noble*~~*Frontier*~~ *Discoverer* and *Kulluk*.

Fuel transfers will include the use of pre-deployed boom, visual inspection, and open communication between the fueling facility and the ~~drillship~~drilling vessel personnel and is the best preventive measure for avoiding an emergency situation. If radios are used for communication, they will be tested and ensured to be safe as required by 46 CFR 110.15 through 46 CFR 110.100 and 46 CFR 11.80.

Once the fuel transfer is complete, fill valves are closed and visual inspection of valves, flanges, pumps, and connection facilities ensures that no discharge is detected.

Fuel Oil Transfer to/from the OSRB

In normal operation, the OSRB will receive diesel fuel delivered from bunkers on the *Arctic Endeavor,* storage tanker, or from either of the ~~two~~ drilling support vessels. In both cases, the fuel transfer procedures will be based on the more stringent of either vessel's own procedures (as part of the USCG-approved Vessel Response Plan submitted by each vessel owner), or the similar procedures in place on the ~~drillship~~drilling vessel.

Refer to Appendix C for the fuel transfer procedures.

The OSRB may also be used to provide diesel bunkering for oil spill response-related workboats (either 34-foot or 47-foot craft), in which case, the transfer would always be conducted under the fuel transfer procedure of the OSRB.

In the event that any oil spill response-related workboats or support vessels have fuel delivered to them by a third-party fuel barge, the transfer would be conducted in accordance with the fueling procedure established by the owner of the fueling barge.

Where required as part of an approved Vessel Response Plan, or as required under the lease stipulations, fuel transfers will include the use of pre-deployed boom, visual inspection, and communication among the vessel personnel as the best preventative measures.

2.1.6 Maintenance Programs

The *Noble~~Frontier~~ Discoverer* and *Kulluk* ~~drillship~~drilling vessels ~~has~~ have routine internal inspections and maintenance. Maintenance is an important tool for spill prevention because it monitors mechanical integrity and is documented daily by written reports. During the refurbishment phase, maintenance records are kept in log books. Under the operating phase, maintenance is performed according to a computerized maintenance program with records kept in the electronic maintenance database. The mechanical integrity of the ~~drillship~~drilling vessel is upheld through the planned maintenance program initiated following rig refurbishment.

For malfunctioning or corroded materials, the Maintenance Department is notified and personnel are assigned the repair task by either the Chief Engineer or the Maintenance Supervisor. Equipment is inspected based on frequency intervals indicated in the maintenance program and in accordance with manufacturer and industry recommendations. For example, cranes are inspected daily per regulatory requirement, while the blowout preventer (BOP) gantry crane hydraulic system, which receives only sporadic use, is inspected weekly.

2.1.7 Operating Requirements for Exploration [18 AAC 75.045]

~~Drillship~~Drilling Vessel Integrity Inspections

During drilling, a visual inspection of major tanks and lines will be conducted daily. Shift inspections are conducted by personnel to detect leakage, damage, or serious deterioration of the storage tanks, fuel lines, piping, and associated facilities. Potential leaks will be properly reported in the daily tour report and the Toolpusher will be notified.

Piping between the storage tanks and boilers or engines is attached to the structure with brackets or double plates that protect the piping from damage. These brackets are visible for regular inspections. Much of the piping is routed by design to be out of the way and protected from impact or the environment.

Preventive measures include the installation of floor drains around the ~~drillship~~drilling vessels ~~to~~ that stop minor spills from flowing off the deck. Supplemental 1-inch drain lips at individual doorways are provided to contain potential spills to a single room. On the *Kulluk*, the drains flow to the disposal caisson from which oil or pollutants are subsequently skimmed and sent to the sludge tank. From the sludge tank, skimmed contaminants are shipped ashore for proper disposal. Each sump is equipped with level-sensing alarms.

2.1.8 Blowout Prevention and Emergency Shutdown [18 AAC 75.425(e)(1)(F)(III)]

Drilling Assurance

Well control is the process of maintaining positive pressures in the drilled wellbore in a manner that pressures in the geologic formations do not cause gas or fluids from the formations to escape from the pit in an uncontrolled manner. This section provides information on the measures taken to maintain well control, preventing a blowout from occurring during drilling and testing operations. Recovery measures used to regain well control in the event of lost control are discussed in Section 1.6.3. The potential for discharge is discussed in Section 2.3.

Shell believes that no failure of a single barrier or a barrier element, whether caused by operational error or equipment failure, should lead to loss of well control. Therefore, Shell applies the following series of layers of prevention and response to well control issues:

- Layer I includes proper well planning, risk identification, training, routine tests and drills on the rig (e.g., blowout prevention equipment [BOPE] tests, pit drills, and trip drills), which build a strong foundation.
- Layer II includes early kick detection and timely implementation of kick response procedures. Continuous monitoring including the use of Shell's Real Time Operations Center (see subsections below on Well Control During Drilling) provides early kick detection. When a kick is detected, the general response is to immediately shut down the pumps, perform a flow check, shut in the well, and kill the well.
- Layer III involves the use of mechanical barriers, including, but not limited to, BOPs, casing, and cement. Testing and inspections are performed to ensure competency.
- Layer IV represents relief well drilling, which would be implemented if a blowout were to occur, despite the first three layers of protection. Contingency plans include dynamic surface control measures and the methods of drilling a relief well.

Well Control During Planning and Preparation

The primary method of well control is properly designed casing/cementing programs to isolate and structurally support downhole formations and maintenance of drilling fluids of sufficient volume and density in the wellbore to counteract any geologic pressures. Data from previous wells in the area have been used to anticipate formation pressures that might be experienced when drilling the proposed wells, and the wells have been designed to handle the expected pressures. See Figure 2-1 for an example of this process.

The primary causes of loss of well control are insufficient fluid density, fluid losses to the formation, swabbing, not keeping the wellbore full of drilling mud, charged formations, rapidly drilling a gas sand, and dissolution of shallow gas hydrates. Loss of well control, an uncontrolled influx of formation fluids into the wellbore, is primarily prevented by properly designed casing strings and drilling fluid systems.

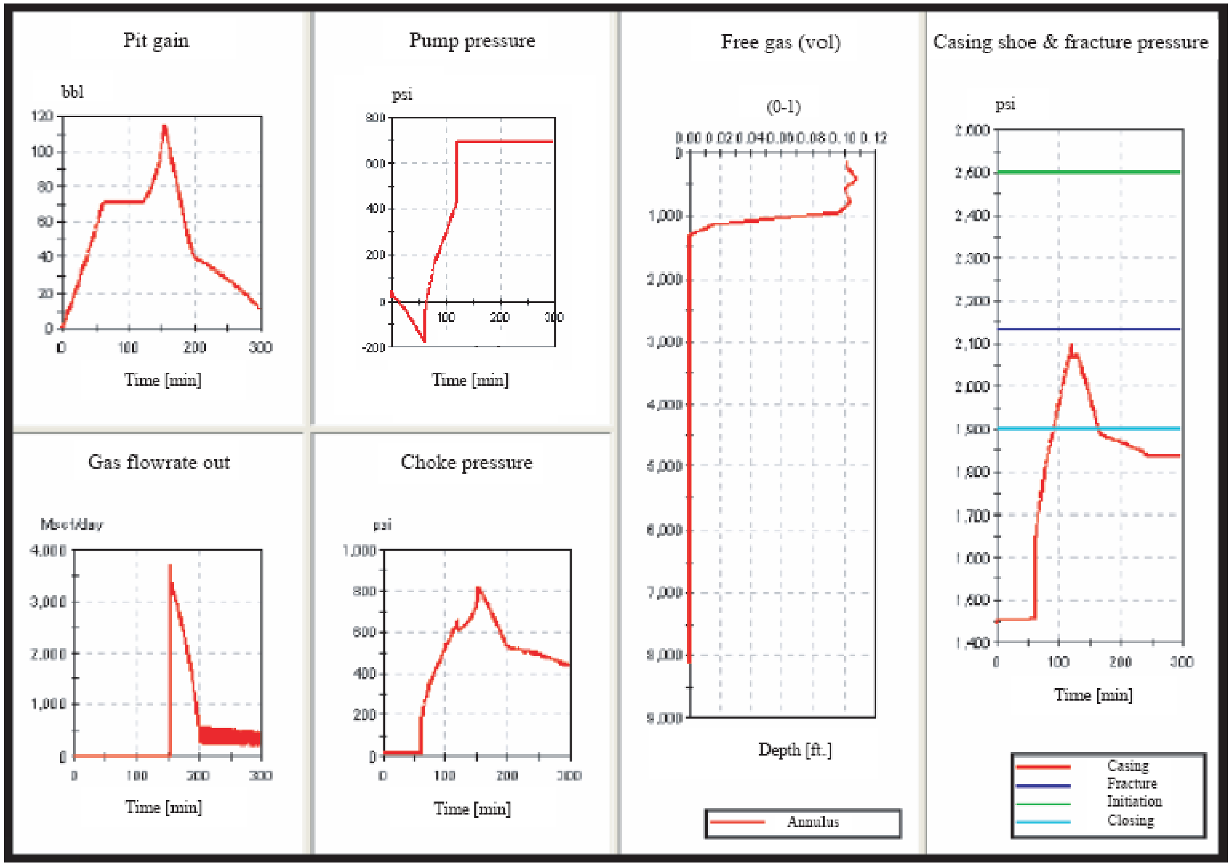
Shell's approach to reducing the risk of a well control incident includes proactive measures to maintain well control. This starts with the following key safeguards during well planning and preparation:

- Training key rig site personnel;
- Risk identification and mitigation, including writing Shell's Drill the Well on Paper (DWOP) exercise;
- Contingency planning, including operation-specific plans to mitigate all of the potential causes of loss of well control; and
- Flexible well design to accommodate a range of uncertainty in subsurface data.

The following training and drills support the proactive approach to well control in the well preparation phase:

- On-site Shell and contractor supervisors maintain current well control certification.
- Prospect-specific well control scenarios and kill techniques are modeled and simulated using Shell's proprietary software and well control simulators at the Robert Training and Conference Center.
- Shell foremen, Shell engineers, contractor supervisors, and contracted rig skilled positions (e.g., drillers and assistant drillers) are trained for prospect-specific well control situations.
- Pit drills and trip drills are performed weekly.

FIGURE 2-1
MODELS FOR SITE-SPECIFIC WELL CONTROL



- Secure well drills performed when applicable.
- Training on the Critical Operations Curtailment Plan (COCP) and the associated daily status reporting conducted for appropriate personnel.
- Blowout prevention drills performed on a frequent basis ensure the well can be shut in properly and quickly. BOP service and inspection are performed throughout the drilling and off seasons.

Available data from seismic operations and neighboring exploration wells, such as rock types and subsurface pressure profiles, are interpreted to ensure a design that permits effective control of the well. Drilling engineers predict downhole pressures and interpret existing datasets to design a safe and productive drilling program.

Shell performs a site-specific hazardous operations analysis for each prospect. In addition, Shell's DWOP exercise is performed for each prospect. DWOP is a systematic method to 1) identify and prioritize a set of actions to optimize the drilling program, considering all areas of activity; 2) identify and prioritize key operational and Health, Safety, and Environment risks and associated mitigation opportunities; and 3) use this information to develop the optimum drilling program. Shallow hazard surveys also have been conducted to assess the shallow areas of the planned wellbore for potential pockets of shallow gas that could result in loss of control.

In addition to site-specific hazardous operations analyses and the DWOP exercise for each prospect, the following additional risk identification and mitigation measures are taken:

- Site-specific well control modeling for anticipated hydrocarbon intervals,
- Site-specific dynamic well control modeling for any prospects with possible shallow gas or hydrae accumulations, and
- Virtual ice management using shipboard marine radar combined with satellite RADARSAT ice imagery to permit advanced and accurate warning of ice hazards.

Well Control During Drilling

General

The primary means of controlling well pressure uses hydrostatic pressure exerted by drilling fluid of sufficient density to prevent flow from the formation into the wellbore. The condition of the drilling fluid is continuously monitored using both manual and automated means, and adjusted as necessary to meet the actual wellbore requirements. Monitored parameters include mud weight into and out of the well, mud flow rate into and out of the well, and presence and analysis of any gases in the return mud flow. The majority of those monitoring duties are performed by the staff of the drilling crew. A mud logging unit, staffed by experienced personnel, will be in continuous use during drilling operations.

Should a kick occur, kick identification and detection, and timely kick management, are the primary tools used to prevent a blowout. Latest generation measurement-while-drilling (MWD) and pressure-while-drilling (PWD) tools are used, allowing real-time monitoring of downhole pressures and drilling parameters. This allows rapid identification of the onset of abnormal pore pressures, swabbing, or the influx of hydrocarbons near the drilling bit.

The drilling operations are supported by Shell's Real Time Operations Center (RTOC), where technical experts in Houston or New Orleans can assist by monitoring ongoing operations, analyzing penetrated formations, and analyzing pressure trends. Data can be transferred from the rig to the RTOC in real time.

See Figure 2-2. This service augments the mud logging capabilities at the ~~drillship~~drilling vessel and allows Shell to easily make the people with the right skills available to support the drilling operation.

FIGURE 2-2
REAL TIME OPERATIONS CENTER

Early kick detection is critical to maintaining well control. The drillers, drill crews, mud engineers, mud loggers, and logging engineers are all trained on kick detection and rapid response procedures. In addition, all drilling breaks are treated as potential kick situations, taking all necessary precautions until the situation has been determined to be stable.

Well Control While Drilling at the Mudline

There is risk for a shallow gas blowout while drilling a hole at the mudline before the subsea BOPs or surface casing have been installed. Large volumes of high-pressure gas can escape from shallow formations, into the wellbore, and then into the water. It should be noted that shallow gas blowouts do not contain oil and, therefore, no spill of oil would be expected at the surface. However, such an incident would be critical from a worker safety standpoint.

Should a shallow gas blowout occur, no attempt would be made to shut in the well to contain the gas because the shallow formations exposed at these depths generally would not have enough strength to control the gas. Instead, the gas would be directed away from the rig floor using a diverter valve and diverter line.

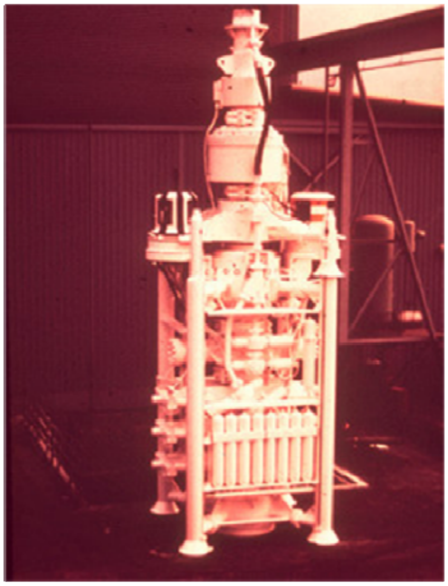
Free gas accumulations in shallow permafrost have been encountered in the course of drilling permafrost intervals. To avoid release of this gas and the potential loss of structural integrity of the wellbore, the drilling fluid is cooled to ensure that the wellbore remains frozen, with the gas trapped, and the integrity of the hole is intact.

Well Control While Drilling Below the Conductor Casing

Each well is drilled according to a detailed location-specific well plan, based on expected downhole conditions at that location. Such plans are part of the first layer of protection, proper planning, and risk identification. Isolating formations with casing and appropriately maintaining the drilling fluid properties, including density, are critical to preventing loss of well control during drilling.

Once the conductor casing has been set across the shallowest formations, BOPE provides a mechanical barrier to loss of well control, key to the third layer of protection. See Figure 2-3 for an example of a blowout preventer. Although rarely needed, this equipment is available as a back-up means (secondary to the mud system) to secure well pressure. In the unlikely event that primary well control is lost; the BOPE can be used to safely halt an uncontrolled flow from the wellbore.

FIGURE 2-3
EXAMPLE OF A BLOWOUT PREVENTER



In the event the well kicks, the BOPE will be used immediately to shut in the well and confine the pressure within a closed system. The casing program will be designed so that any anticipated formation pressure can be shut in at the subsea BOPE without rupturing the casing. Shell representatives assigned to the ~~drillship~~drilling vessel have BOEMRE~~MMS~~-approved blowout prevention training and actual experience in controlling and killing kicks. Training of this nature is a continual program with Shell. Drilling crews will be trained to a standard sufficient to satisfy both the BOEMRE~~MMS~~ and Shell.

All surface-mounted BOPE meets the BOEMRE~~MMS~~ standards as defined in 30 CFR 250.440 through 30 CFR 250.451.

The BOPE is installed after the conductor casing is run and cemented.

The BOPE for the *Noble~~Frontier~~ Discoverer* consists of:

- Four 18 ¾-inch 10,000 pounds per square inch (psi) WP, ram-type preventers (Cameron).
- Two 18 ¾-inch 5,000 psi annular preventers (Hydril).
- 2 ¾-inch 10,000 psi choke and kill lines.

For a diagram of the BOPE for the *Noble~~Frontier~~ Discoverer*, refer to Figure 2-4.

The BOPE for the *Kulluk* consists of:

- Four 18 ¾-inch 10,000 pounds per square inch (psi) WP, ram-type preventers,

- Two 18 ¾-inch 5,000 psi annular preventers
- 3-inch 10,000 psi choke and kill lines.
- Hydraulic control system with accumulator back-up closing capability.

For a diagram of the *Kulluk* BOPE, refer to Figure 2-5.

After installation, the BOPE will be tested in accordance with BOEMRE~~MMS~~ and Shell specifications. Tests will be conducted at least weekly and prior to drilling out casing.

Well Suspension or Abandonment

Upon completion of drilling operations, the well will be properly plugged and abandoned following BOEMRE~~MMS~~ requirements. Procedures include setting cement across hydrocarbon intervals. All plug and abandonment operations will be conducted per 30 CFR 250 Subpart D and with prior approval from BOEMRE~~MMS~~.

Spill Prevention Practices and Training

Blowout prevention drills are performed on a frequent basis to ensure the well is shut in properly and quickly. Blowout prevention testing intervals are within the standard of BOEMRE~~MMS~~ regulations. Blowout preventers will be pressure-tested every 14 days and function-tested every 7 days. In addition, drilling personnel are BOEMRE~~MMS~~-certified in well control, and weekly pit/trip drills will be conducted.

2.1.9 Oil Storage Tanks [18 AAC 75.065]

Section 3.1 contains information about the major tank facilities on the ~~drillship~~drilling vessel. During drilling, a visual inspection and soundings of the major tanks will be conducted twice daily during shift inspections to allow leak or damage detection, or to identify questionable mechanical integrity of the storage tanks and their associated fuel lines, piping, and valves. Leak detection will be recorded in a daily tour report and the Offshore Installation Manager (OIM) in charge of the ~~drillship~~drilling vessel will be notified in order to ensure repairs are completed safely and in a timely manner.

Inspections of Elevated and Portable Tanks [18 AAC 75.065(a)]

The storage tanks to be used in Shell exploration are integral parts of the ~~drillship~~drilling vessels (*Noble~~Frontier~~ Discoverer* and *Kulluk*) which will undertake the drilling program. ~~The~~ Neither the *Noble~~Frontier~~ Discoverer* nor the *Kulluk* contain~~s~~ ~~no~~ non-integral bulk storage oil tanks equal to or greater than 10,000 gallons, which are regulated under 18 AAC 75.065.

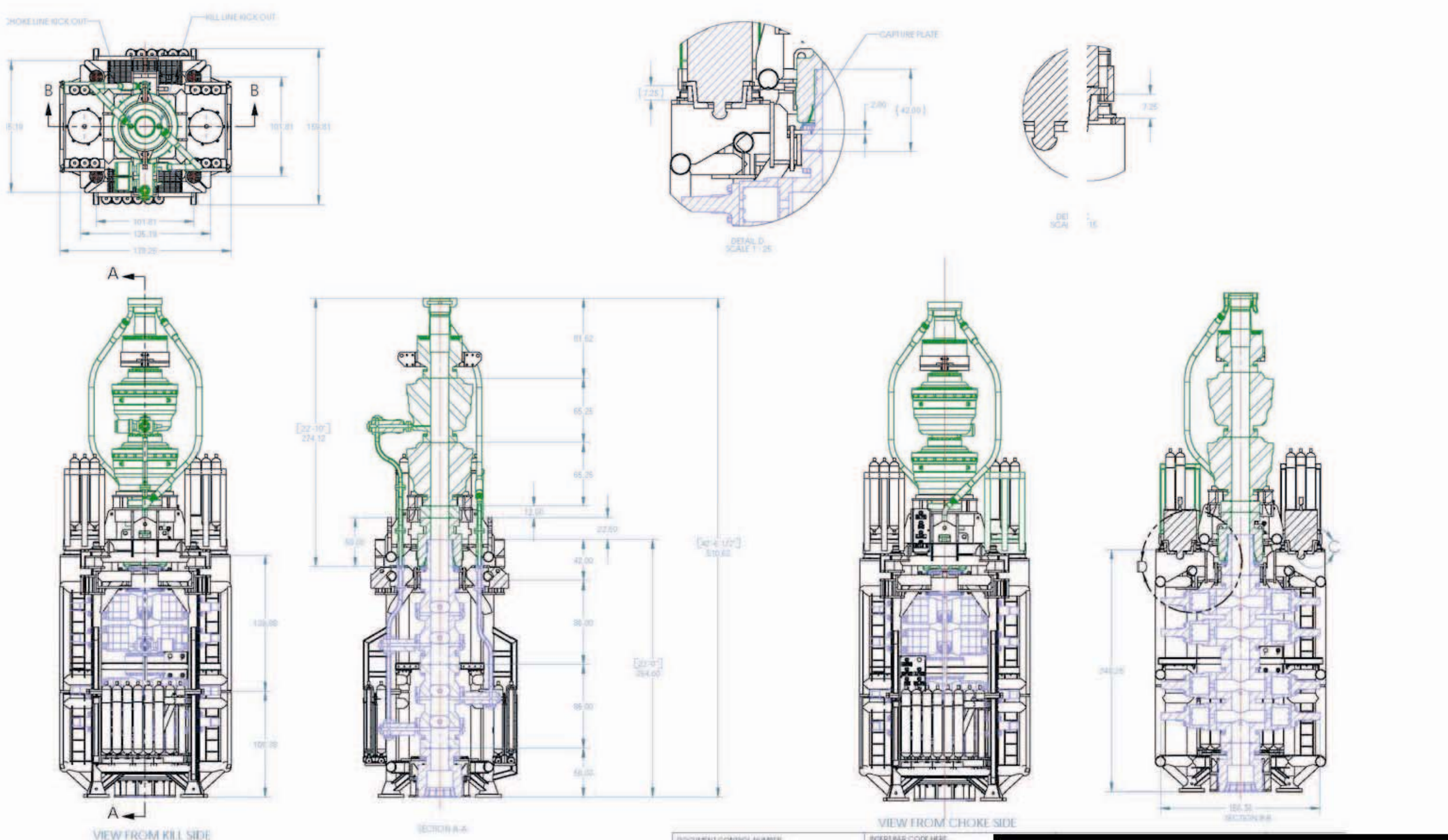
The largest non-integral tanks on the *Noble~~Frontier~~ Discoverer* are less than 5,000 gallons and are used for well testing purposes. The largest elevated tanks (on deck or in containment) on the *Kulluk* are two aviation fuel bowers that are 600 gallons each.

Inspection Records [18 AAC 75.065(d)]

Inspection records are maintained by the ~~drillship~~drilling vessel or well testing contractor.

Repair or Alteration [18 AAC 75.065(e)]

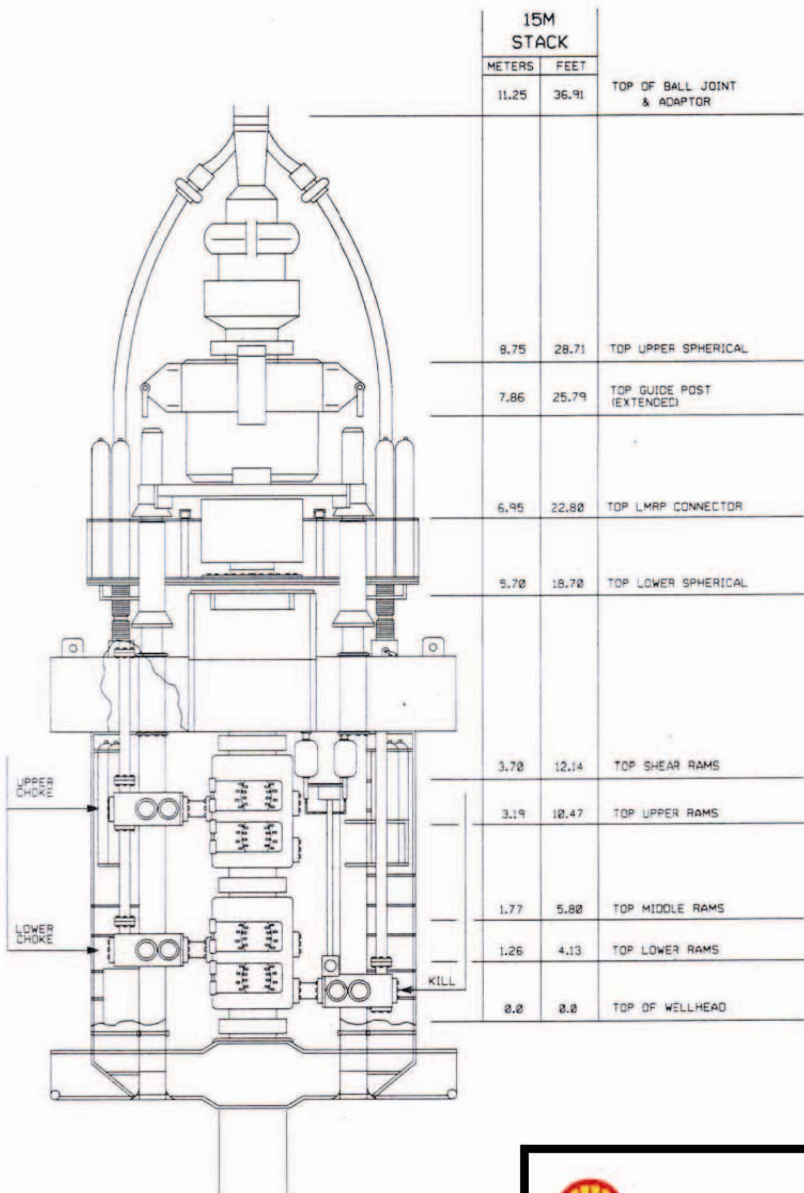
Shell will notify BOEMRE~~MMS~~ of any major repair or alteration.



SHELL OFFSHORE, INC.

NOBLE DISCOVERER
BOPE

May 2011 | Figure 2-4



SHELL OFFSHORE, INC.

KULLUK BOPE

May 2011	Figure 2-5

Leak Detection [18 AAC 75.065(h)(1)]

See Section 2.5.

Overfill Prevention [18 AAC 75.065(j), (k)]

Overfill protection is primarily through high-level alarm enunciations where incorporated (fueling), in conjunction with visual observation and mechanical and remote soundings during transfer operations. Containment coaming is in place around the fuel tank vent outlet.

The onboard tanks are equipped with high- and low-level alarms for overfill protection. There are 19 tank level indicators on the central control console on the *Kulluk* drilling vessel. There are 11 temperature indicators on 11 of the 19 tanks, and there are 11 high- or low-alarm lights associated with nine of the tank levels. The alarms and indicators on the tanks are listed below.

The 19 tank level indicators on the central control console are located on:

- Fuel Oil Tanks (3)
- Ballast Water Tanks (7)
- Drill Water Tanks (2)
- Portable Water Tanks (2)
- Brine Storage Tanks (3)
- Waste Oil Tank, (1)
- Water Glycol Storage Tank (1)

The 11 temperature indicators associated with 11 of the 19 tanks with level indicators are located on:

- Ballast Water Tanks (7)
- Drill Water Tanks (2)
- Potable Water Tanks (1)

Eleven high- or low-alarm lights are associated with nine of the tank levels. They are located on:

- Fuel Oil Tanks (2)
- Potable Water Tanks (2)
- Drill Water Tanks (2)
- Water Glycol Tank (low-level alarm) (1)
- Waste Oil Tank (high-level alarm) (1)

The four draft gauges are located on the *Kulluk* in the Forward, Aft, Port, and Starboard locations.

The Noble~~Frontier~~ Discoverer's fuel tanks are integral to the vessel's hull. Therefore all loading stations and vents are provided with save-alls or high coamings as per the requirements of the International Convention for the Safety of Life at Sea (SOLAS), International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL), and DNV requirements.

Bulk oil storage tanks located on the ~~drillship~~drilling vessels will be lined with appropriate impermeable liners. Tanks will be visually inspected daily for the presence of oil leaks or spills.

Debris Removal [18 AAC 75.075 (c)]

The tank areas will be maintained free of debris and other material that might interfere with the effectiveness of the system.

Drainage [18 AAC 75.075(d)]

Deck drains including coamed drainage will be routed to a facility designed for oily water separation. This drainage system and the separation process will be inspected to ensure that separated oily water may safely be disposed.

2.1.10 Emergency Tow and Escort Vessels Program

~~The~~ Each of the ~~drillship~~drilling vessels will have two dedicated ice management vessels assigned to support ~~it~~ them for the purpose of anchor handling and ice management (see Appendix A).

2.2 DISCHARGE HISTORY (GREATER THAN 55 GALLONS) [18 AAC 75.425(e)(2)(B)]

Not applicable.

2.3 ANALYSIS OF POTENTIAL DISCHARGES [18 AAC 75.425(e)(2)(C)]

This section contains a summary of potential discharges and their impact. Based on a spill history of the Beaufort Sea, there is a low probability of an event causing oil to enter into an open-water environment. However, there is a chance that a blowout could occur.

A response scenario addresses the potential immediate release of crude oil to the environment by a loss of well control during drilling operations in open-water conditions. The probability of a major oil spill occurring during drilling operations is extremely low. Comprehensive flow histories are generally not available for exploration areas. For planning purposes, the flow rate from a blowout is ~~5,500~~16,000 barrels (bbl) of oil per day for the duration of the event.

2.3.1 Potential Areas for Discharge

Table 2-1 contains a summary of potential discharges.

Fuel Transfers

A potential source of discharge occurs during fuel transfers of any kind. This discharge is minimized by the weather restrictions of transfer procedures, which prevent transfers during unfavorable wind or sea conditions. Transfers are announced in advance; verbal communication, in combination with visual inspection, is the best method of discharge detection.

If discharge is detected, the fuel would most likely be contained immediately on deck. If fuel overflow of the containment dikes occurs, edge coaming would prevent flow of fuel off the vessel into open water.

TABLE 2-1
SUMMARY OF POTENTIAL DISCHARGES

TYPE	CAUSE	PRODUCT	SIZE	DURATION	ACTIONS TAKEN TO PREVENT POTENTIAL DISCHARGE
Transfer from fuel barge to ~~drillship~~drilling vessel	Hose rupture	Diesel	Approximately 2,000 gallons (Section 1.6)	5.5 minutes (Section 1.6)	Transfer procedures in place; Note: This scenario will be addressed as part of USCG approval of Vessel Response Plans by individual vessel owners.
Diesel	Tank rupture	Diesel	1,555 bbl	Minutes to hours	Note: The diesel tanks are internal to the ~~drillship~~drilling vessel rather than deck-mounted, where the potential for marine spills is much greater. As a result, a scenario involving tank rupture has not been included in the oil spill response plan, but will be monitored as part of an ongoing tank inspection program.
Blowout	Uncontrolled flow at the mudline	Crude oil	~~287,100~~480,000 bbl ~~including emulsion and free water~~	30 days (Section 1)	BOPE and related procedures for well control.

Blowouts

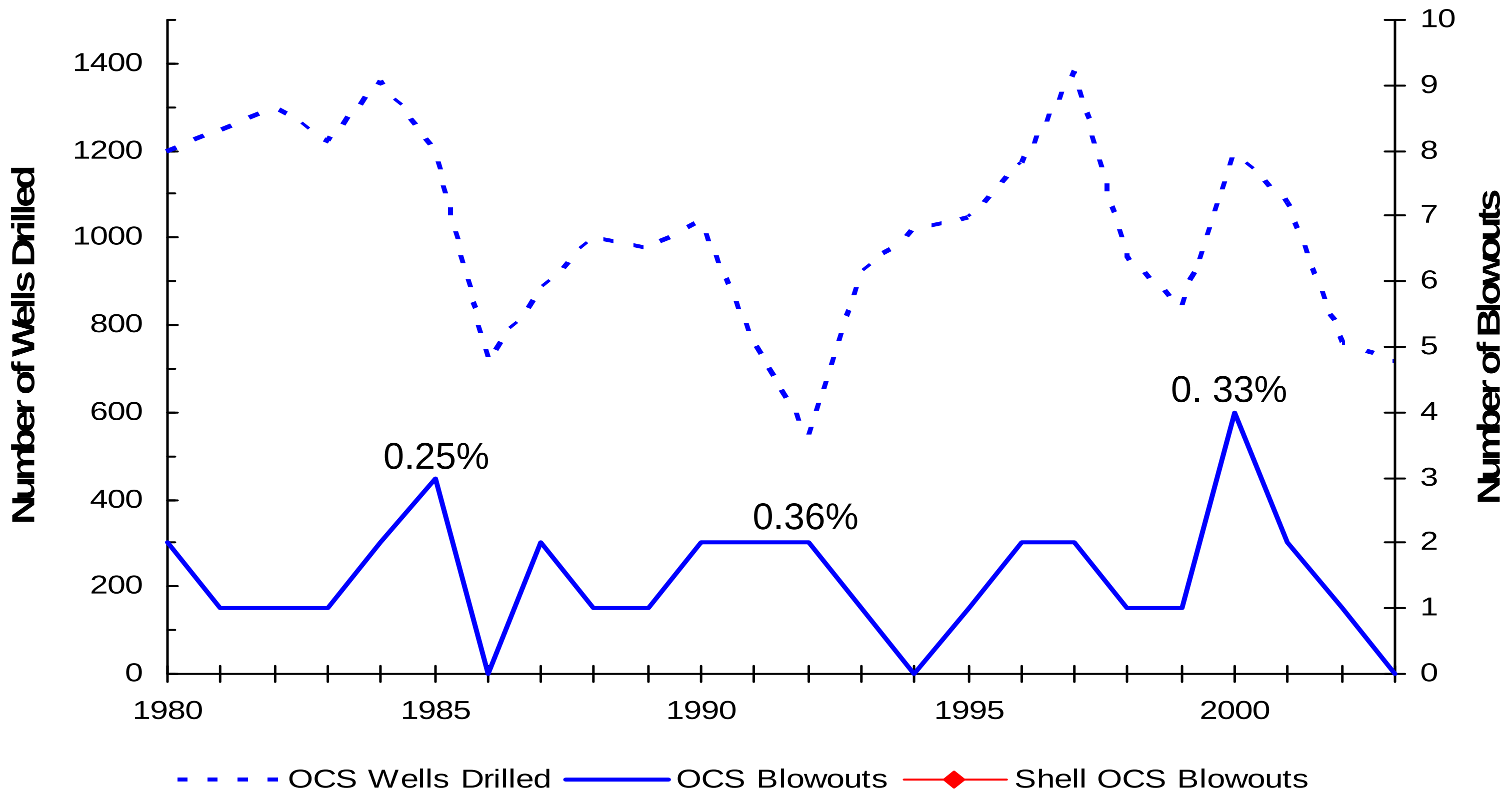
The uncontrolled release of oil during a blowout is discussed in Section 1.6. Table 2-2 provides a summary of potential discharge volumes for wells drilled in the OCS and in Alaska state waters since 1997.

Given the use of modern prevention and control techniques, actual blowouts are extremely rare and of relatively short duration. See Figures 2-6~~5~~ through 2-~~7~~8.

TABLE 2-2
POTENTIAL DISCHARGE FOR ALASKA OFFSHORE DRILLING (1997-2003)

PLAN NAME	PRODUCTION OR EXPLORATION	OPERATOR	18 AAC 75.425(e)(1)(f) SCENARIO WELL BLOWOUT WORST-CASE DISCHARGE VOLUME (bbl/day)	18 AAC 75.425(e)(2)(C) POTENTIAL DISCHARGE ANALYSIS BLOWOUT VOLUME (bbl/day)	BOEMRE~~MMS~~ WORST-CASE DISCHARGE VOLUME (bbl/day)
McCovey Exploration	Exploration	AEC Oil & Gas, Inc.	5,500 (March 2002)	5,500 (March 2002)	5,500 (March (2002)
Warthog #1	Exploration	ARCO	5,500 (August 1997)	5,500 (August 1997)	5,500 (August 1997)
Northstar Operations	Production	BP Exploration (Alaska) Inc. (BPXA)	7,220 (May 2003)	10,000 (July 2005)	8,872 (January 2005)
Milne Point Unit (F Pad)	Production	BPXA	2,000 (June 2002)	142,800 gallons per day = 3,400 bbl/day (March 2003)	Not applicable
Greater Prudhoe Bay	Exploration	BPXA	3,000 (September 2006)	6,005 (September 2003)	2,000 (September 2003)
Endicott	Production	BPXA	2,000 (December 2003)	2,250 (December 2003)	2,000 (December 2003)
Badami	Production	BPXA	1,100 (May 2005)	1,045 (May 2005)	Not applicable
Alpine Dev. Participating Area	Production	CPA	7,500 (January 2004)	7,500 (August 2004)	Not applicable
Point Thomson Gas Cycling	Exploration	Exxon Mobil	517 (May 2003)	517 bbl/day (May 2003)	Not applicable
Kuparuk Field	Production	Phillips 66	1,000 (March 2003)	Not applicable	Not applicable
Cook Inlet Area Exploration Program	Exploration	Phillips 66	1,500 (July 2001)	5,500 (February 2001)	Not applicable
Tyonek Platform	Exploration	Phillips 66	5,500 (September 1998)	5,500 (September 1998)	5,500 (April 1998)
North Slope Exploration Program	Exploration	Pioneer Natural Resources	5,500 (September 2005)	5,500 (September 2005)	Not applicable
Kitchen Prospect	Exploration	Escopeta Oil	4,675 (June 2006)	4,353 (June 2006)	4,675 (June 2006)
Cook Inlet Production Facilities	Production/Exploration	Unocal 76	300 (December 2006)	1,200 (December 2006)	300 (December 2006)
Oil & Gas Production Operations	Production	Kerr-McGee	1,000 (September 2005)	Not applicable	1,000 (April 2006)
Northwest Milne Point Exploration Operations	Exploration	Kerr-McGee	5,500 (January 2004)	5,500 (January 2004)	5,500 (January 2004)
Ooguruk Development Project	Exploration	Pioneer Natural Resources Alaska Inc.	2,500 (April 2006)	2,500 (April 2006)	2,500 (April 2006)
Cook Inlet Area Production Operations	Production/Exploration	Forest Oil Corporation	1,500 (February 2002)	1,500 (August 2004)	1,500 (January 2002)

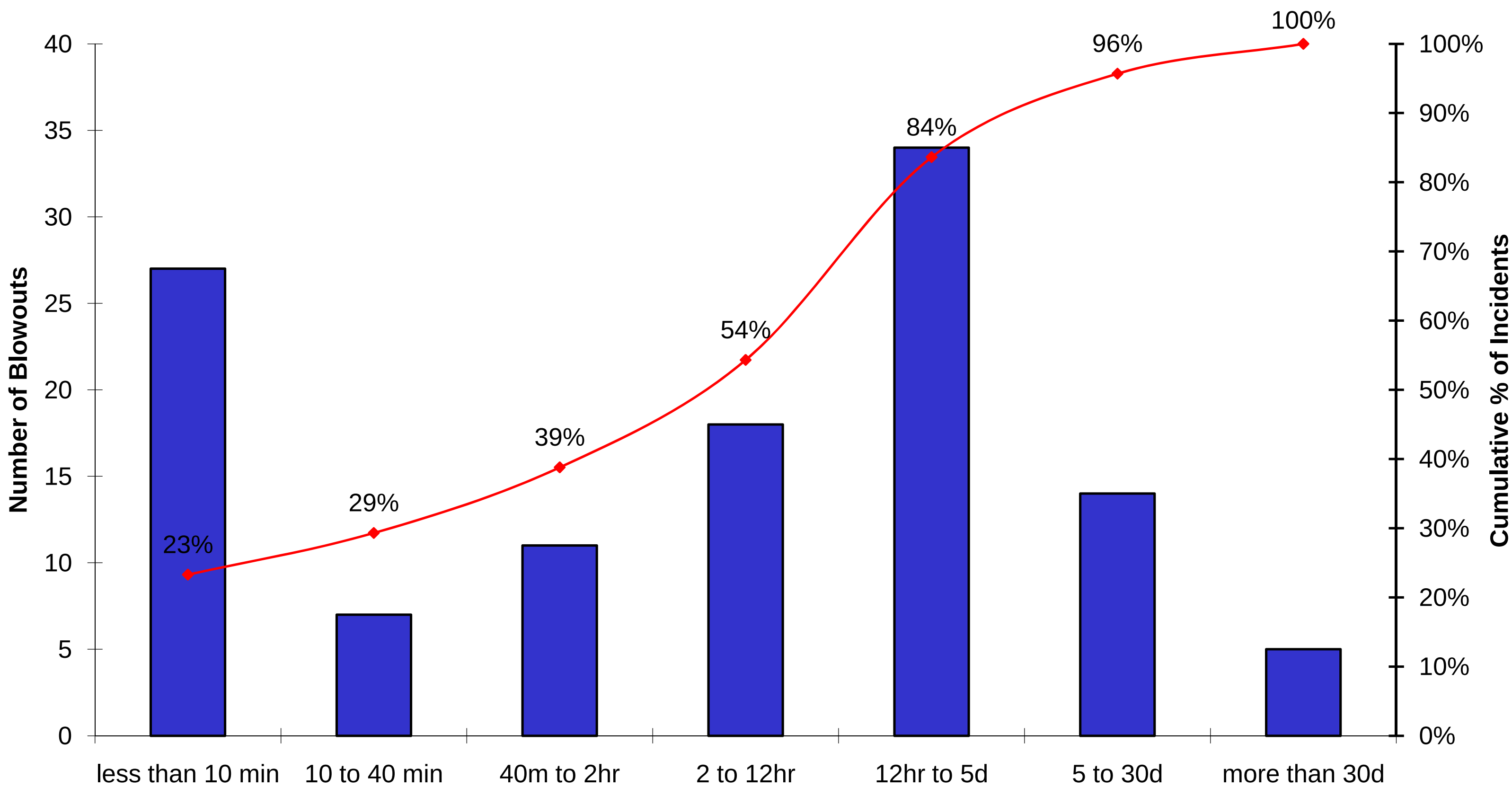
FIGURE 2-6~~2-5~~
HISTORICAL INFORMATION ON OFFSHORE BLOWOUTS
IN THE U.S. OUTER CONTINENTAL SHELF (1980 – 2003)



Key Points:

- **Across the period, only 0.14 percent of wells drilled have blown out.**
- **No Shell blowouts have occurred in the OCS during the period (Troll in UK 1983**)

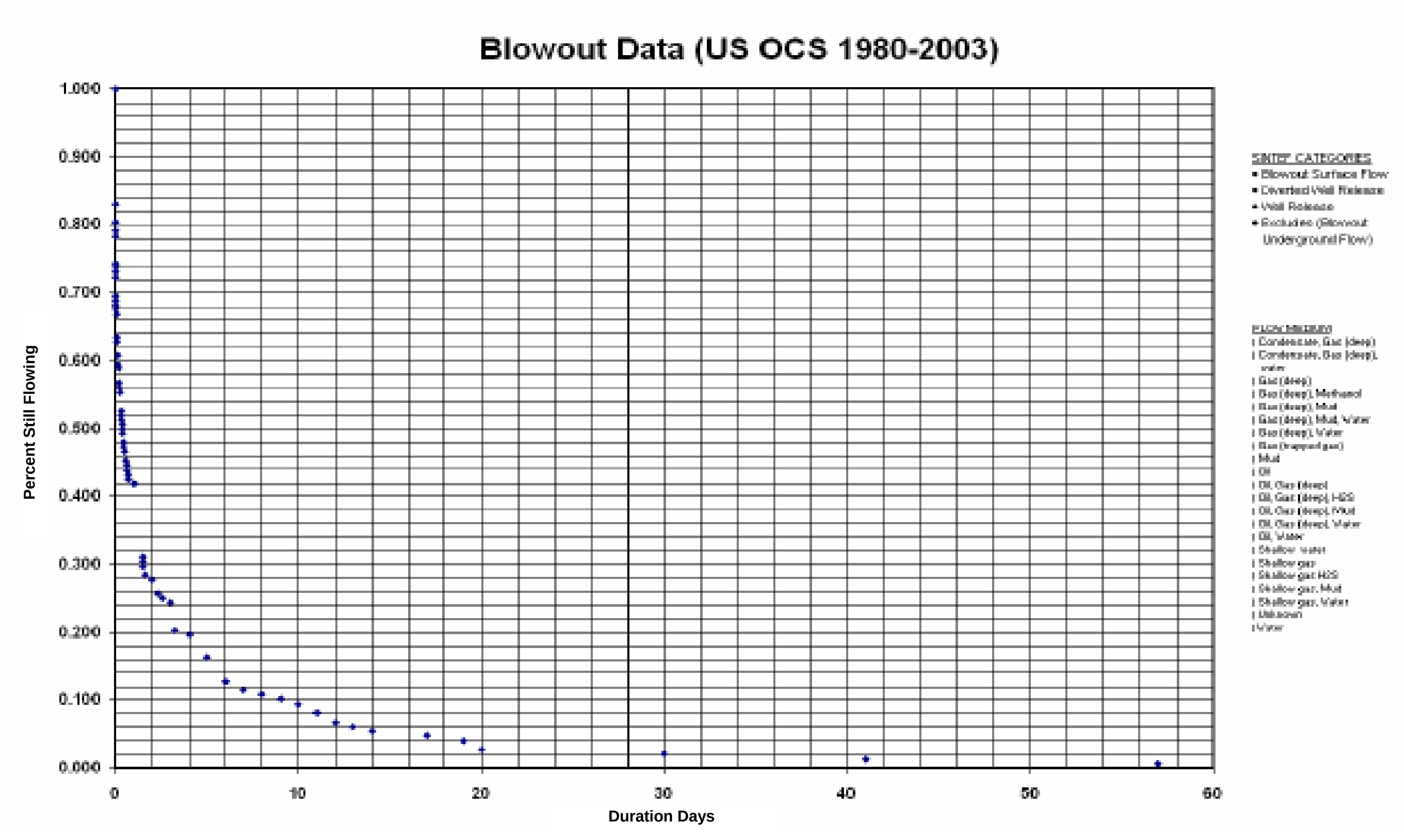
FIGURE 2-7~~2-6~~
DURATION OF OFFSHORE BLOWOUTS IN THE U.S. AND NORWAY (1980-2003)



Notes:

- 116 Blowout events between 1980 – 2003
- Surface and Underground Blowouts in the U.S. and Norway (1980 – 2003)

FIGURE 2-8~~2-7~~
DURATION OF BLOWOUTS IN THE U.S. OUTER CONTINENTAL SHELF (1980 – 2003)



2.4 OPERATIONAL CONDITIONS INCREASING RISK OF DISCHARGE [18 AAC 75.425(e)(2)(D)]

Severe weather and ice conditions are the primary factors most likely to curtail operations and increase the potential for accidental discharge. The key measure that has been taken to reduce the risk of a discharge attributable to these conditions is the COCP for the drilling operations. Conditions specific to Shell's Beaufort Sea operations that potentially increase the risk of discharge, and actions taken to eliminate or minimize identified risks, are summarized below:

- Temperature: Cold temperatures pose a threat to personnel and equipment. Heat may cause gases to expand and increase the likelihood of discharge. The ~~drillship~~drilling vessel is near the Alaska Arctic coastline, which is marked by arctic air masses with relatively harsh temperatures throughout the year.
- Weather Conditions: The operation most likely to be affected by adverse weather conditions is the drilling support operation, such as transportation activities between the drill site and Prudhoe Bay or other staging areas. Strict adherence to air safety will be enforced.
- Sabotage or Vandalism: Potential for any sabotage or vandalism is minimal. Security and special-interest training by Shell and its contractors should deter any damage from these acts at any of the drill sites. Air safety is essential.

These characteristics can affect the movement of discharge as well as deployment of equipment and efforts to contain and recover the oil.

2.4.1 Severe Weather

In general, meteorological and oceanographic conditions at the project site during the summer season are relatively mild. Intensity and frequency of storms increase as the season progresses into the late September-October timeframe. Generally, storms follow a northeast-southwest track, moving fairly rapidly, and influence the area for a relatively short period of time.

Environmental parameters such as wind speed and wave height do not directly influence drilling operations. Rather, it is the ~~drillship~~drilling vessel's response to environmental conditions, coupled with the drill crew's ability to handle equipment safely, that affects curtailment of critical operations. Conditions of curtailment due to heavy weather are therefore determined in accordance with the ~~drillship~~drilling vessel's responses to heave, pitch, roll, horizontal displacement, and anchor tension as a function of the corresponding environmental parameters.

Since heavy weather will clearly influence vessel response, environmental conditions will be regularly monitored at the ~~drillship~~drilling vessel and regional wind and wave forecasts will be received on the ~~drillship~~drilling vessel two times a day with two updates between each forecast. Meteorologists with the weather forecasting service will provide weather consultation services on a 24-hour basis.

Shell has developed a COCP (see Section 2.4.4 for more information on the plan), which has procedures to aid operations personnel in determining the correct procedures to follow when storm conditions are anticipated. Implementing the procedures will ensure the safety of any personnel onboard, minimize the risk of damage to equipment, and minimize the chance of a discharge attributable to the severe weather conditions.

On an ongoing basis once on location, the ~~drillship~~drilling vessel and key personnel will monitor weather conditions using a variety of data, including aerial ice reconnaissance, third-party forecasts from weather services, and onboard weather surveillance and motion monitoring. Critical operations will be managed in accordance with the COCP, which sets forth allowable operating parameters based on the use of T-time. T-time is the time required to trip or recover the drill pipe and associated equipment and complete the operations required to leave the well in a secured state. In heavy weather conditions, when vessel heave and horizontal displacement exceed pre-set levels, drilling operations cease, the drill string is pulled into the protective casing of the well, the drill pipe is hung off the blowout prevention stack, and the ~~drillship~~drilling vessel prepares to recover its anchor equipment. If conditions continue to deteriorate, the lower marine riser package is disconnected, and anchor equipment is recovered (or released if necessary). If weather severity reaches specified levels, the ~~drillship~~drilling vessel moves off location and is positioned to ride out the storm.

2.4.2 Ice Conditions

The start of on-site project activities will coincide with the northward retreat of the ice edge possibly as early as July. At any time during the drilling season, occasional incursions of ice floes are expected, and so a mitigation plan is in place. On-site activities will conclude prior to freeze-up, which is not anticipated until the latter half of October, based on the average historic freeze-up dates.

Shell's ice management system is a combination of ice monitoring and forecasting techniques, along with icebreaking operations. Ice monitoring techniques include satellite-based Synthetic Aperture Radar, airborne and icebreaker reconnaissance, ice forecasting, and weather forecasting. Forecasting incorporates data from the federal services of Canadian Ice Service and National Oceanic and Atmospheric Administration. Shell also intends to use specialized software to integrate ice speed and direction data from the vessel's radar, aerial reconnaissance, and satellite imagery in order to predict individual ice floe movement, allowing modification of icebreaking operations on a real-time basis. Shell's ice management team at Shell's Anchorage office will be fully engaged to support the collection and use of ice-related information.

Two ice management vessels will accompany ~~the~~ each ~~drillship~~drilling vessel. Typically, one icebreaker will deflect or break up large ice floes farther away by circling updrift or upwind ("upstream") in the flowing sea ice, while the other vessel protects the ~~drillship~~drilling vessel by further deflecting nearer ice floes, or fracturing them into smaller and smaller pieces so that the ~~drillship~~drilling vessel is able to hold station.

Shell has developed two sets of protocols for responding to potentially hazardous ice conditions, one for typical summer drilling when ice can move in with wind and currents, and another in anticipation of winter freeze-up. These two sets of procedures use T-time estimates for establishing alert stages and associated operational and communication protocols.

In general, drilling operations will cease and preparations will be made to disconnect drill pipe when hazardous ice conditions are anticipated within the T-time plus 4 hours. If the ice management strategy is not capable of preventing a large ice floe from impacting the ~~drillship~~drilling vessel or reducing ice buildup, then the ~~drillship~~drilling vessel begins preparing in stages to disconnect from the lower marine riser package, recover anchor equipment, and vacate the drilling location.

The Ice Alert Procedures spell out specific responsibilities for personnel aboard the ~~drillship~~drilling vessels and aboard its support vessels. The conditions necessary to achieve a given alert level are described, along with the corresponding tasks for each of the key individuals assigned to Drilling Operations, Marine Operations, and Helicopter Support Base Operations. The conditions for each alert level relates to a time value "T" which is defined as "the time required to stop the current operations safely and efficiently so that the riser can be disconnected and the anchors retrieved or disconnected to move off location." All estimates of operations closure time include safety margins that guarantee that the well will be completely secured in the best possible way by the end of the period, "T."

2.4.3 Structural Icing

Meteorological data for the project area indicate that structural icing is most prevalent in September, when open water, subfreezing air temperatures, and wind are all present. The severity of icing conditions is a function of surface water temperature, air temperature, and wind speed. Structural icing can be enhanced by the occurrence of atmospheric icing due to freezing fogs and by snow.

Accumulations of ice on the ~~drillship~~drilling vessel~~'~~s' superstructure will be thickest on windward surfaces between 10 and 50 meters above sea level. Heavy structural icing will raise the vessel's vertical center of gravity and affect its heeling and righting moments.

The *Kulluk* was designed for Arctic conditions and the *Noble~~Frontier~~ Discoverer* has been Arctic strengthened. ~~The drillship has~~Both vessels have pre-established ice load limits. If icing for ~~the~~ either ~~drillship~~drilling vessel ~~-~~approaches the allowable amount and raises the allowed vertical center of gravity, critical operations will be curtailed until sufficient ice has been removed and the loading is acceptable.

The *Kulluk* has been designed to minimize the accumulation of spray ice. All work areas are enclosed and heated, piping is enclosed or heat traced and wrapped with insulation. In addition, on-deck equipment, such as anchor windlasses, is wrapped with tarps and blower-heated to minimize spray ice accumulations. Heating and wrapping greatly reduces icing and facilitates ice removal when spray ice conditions are present. The *Noble~~Frontier~~ Discoverer* will, upon conversion, incorporate features to minimize the accumulation of spray ice, such as enclosed work spaces and enclosed or heat-traced piping.

When icing conditions exist, crew vigilance will be essential to preventive accumulation. At the start of each tour, crewmembers will inspect their work areas for icing. Roustabouts will remove ice, snow, and standing water from decks, equipment, railings, and the superstructure to prevent ice accumulation in any of these areas. If ice builds up on the derrick, steps will be taken to see that it is removed. Removal onboard the vessel will be accomplished by means of portable heaters, steam hoses, steam lances, wooden ice bats, and picks.

2.4.4 Critical Operations and Curtailment Plan

BOEMRE~~MMS~~ requires that offshore operators in the Alaska OCS region develop procedures and maintain an BOEMRE~~MMS~~-approved COCP. The plan deals largely with potential problems associated with severe weather and unexpected levels of ice. The procedures identify ice conditions, weather, and other constraints under which the exploration activities will be either curtailed or stopped. Shell's COCP provides a series of procedures for monitoring and responding to various ice conditions and weather/wave conditions at the drilling sites. The focus of the COCP is to prevent personnel injury, equipment damage, and any accidental discharges to the environment. The main objective is to secure the well in an orderly manner when facing adverse environmental conditions.

A prerequisite to safe and efficient Arctic offshore operations is an environmental monitoring and forecasting system. A comprehensive system has been established to support Shell's drilling activities in the Beaufort Sea. Components of the monitoring and forecasting system include meteorological observations, on-site weather forecasts, oceanographic observations, sea state forecasts, ice monitoring, and ice forecasting. In addition to the environmental monitoring and forecasting system, real time measurements of the ~~drillship~~drilling vessel's performance in ambient conditions is obtained from a performance monitoring system installed onboard. An alert status system has been established onboard the ~~drillship~~drilling vessel to anticipate hazardous ice and weather events and to assign pre-determined responses to all responsible personnel.

The COCP describes the comprehensive effort that Shell and the ~~drillship~~drilling vessel contractors are providing to ensure that drilling operations are conducted in a safe and prudent manner in the unique environment of the Beaufort Sea. The COCP is a component of the Applications for Permit to Drill submitted for approval to the BOEMRE~~MMS~~. The COCP is also readily available onboard the ~~drillship~~drilling vessels and in Shell's offices.

The COCP defines standards and guidelines for the conduct of operations on the ~~drillship~~drilling vessel to minimize any hazard to personnel or the environment. In the Alaskan Beaufort Sea, the two primary factors that can cause curtailment of critical operations and that potentially increase the risk of discharge while drilling are sea ice and heavy weather. The objective of the COCP is to detail the critical drilling operations and the conditions under which such operations will be curtailed.

The COCP will be strictly followed to mitigate ice forcing the ~~drillship~~drilling vessel off location in an uncontrolled fashion.

2.4.5 Hours of Light at 70°N

In addition to severe weather and ice conditions described above, reduced hours of daylight during the end of the drilling operations could increase the risk of a discharge during some activities. The average number of daylight hours for the Beaufort Sea at 70°N are as follows:

- January 0.0
- February 4.9
- March 9.5
- April 14.0
- May 18.9
- June 24.0
- July 24.0
- August 21.2
- September 15.5
- October 11.2
- November 6.1
- December 0.0

Drilling operations will be aided by rig lights and portable lighting as necessary.

2.5 DISCHARGE DETECTION [18 AAC 75.425(e)(2)(E)]

2.5.1 Drilling Operations

Discharge detection will rely on visual surveillance. Visual inspections are an important component of leak and spill detection because automated systems may not detect small leaks and spills. The ~~drillship~~drilling vessel and fuel transfer operations will be closely monitored at all times (see Section 2.1.6). The drill site will be staffed 24 hours a day by drilling personnel. Once a day, facility personnel will visually inspect tankage, sumps, and drains for indications of oil leaks. Piping, valves, pumps, and other machinery will also be visually inspected as part of the daily routine. Any oil leaks or spills will be noted, the source of the spill will be located and corrected, and the oil spill will be cleaned up. During drilling, drillers are continually monitoring the drilling equipment and will stop drilling if unsafe conditions are observed.

2.5.2 Automated Methods

In the ~~drillship~~drilling vessel~~'~~s’ ballast control rooms, automated control systems and visual monitoring of instrumentation are used to control flow rates, pressures, and distribution. Various systems in exploration operations are continuously monitored with a microprocessor-based control system. Rounds are documented daily. Incidents are recorded using the incident reporting and investigation process recognized and approved by the company.

Several independent emergency shutdown systems limit the scope of any single failure. An emergency shutdown can be initiated by process conditions outside set limits or manually initiated by operators at the instrument/control panels and by personnel at strategic emergency shutdown punch-button locations on the facility.

The *Kulluk* Drill Rig Discharge Detection

On the *Kulluk* drill rig, service alarms are tied to the unit service master alarm panel of the Central Control Console. This allows the operator the ability to notify personnel when an equipment alarm occurs. There is also a section on the Central Control Console for emergency shutoff valves on storage tanks.

Located on the bottom left side of the Central Control Console is a graphic display showing water lines, pumps, and valves to the ballast tanks. The ballast pumps (4) can be stopped or started by the stop/start switches located in the graphics. The ballast valves may be opened or closed from the graphics, by pushing the desired open or closed push buttons. Each push button has an indicator light displaying the valve status. By opening the appropriate valves and starting the appropriate pump, each ballast tank level may be raised or lowered. Located on both sides of the graphics are six meters. There are four pumps and three meters for each pump. The meters read suction pressure, discharge pressure, and flow for each pump.

The unit service master alarm panel includes an audible alarm buzzer, flicker stop, and buzzer stop for the unit service alarms located on the console.

To activate an alarm, devices of pressure switches, float switches, and electrical relays are engaged. Some equipment has local alarm panels that contain more than one alarm condition (e.g., high temperature, low oil pressure).

Emergency Equipment Stops are located on the console. A common plastic door protects these push buttons so they cannot be accidentally pushed. When a switch is depressed, it will illuminate and shut down the equipment in the room corresponding to the switch nameplate. There are also emergency shutdown push buttons on the console for saltwater service pump, winch cooling water pump, and open/close push buttons for the saltwater inlet supply valve.

Emergency shut off valve indicators are illuminated when storage tanks are shut.

The console contains an inclination detector that signals a calculation unit. The calculation unit determines the angle of inclination and the X-Y coordinates (0-360°) of the drill rig. If the rig is level, the inclination detector is lit. If the rig is off-center, an indicator light will be lit in the direction in which the rig is tilted.

The *Noble~~Frontier~~ Discoverer* ~~Drillship~~Drilling Vessel Discharge Detection

The *Noble~~Frontier~~ Discoverer* ~~drillship~~drilling vessel has a system of controls, monitors, and procedures to assist in the early detection of potential discharges. For both downhole and surface operations, these detection systems include standard operating procedures governing the monitoring, handling, and containment of fluids. Specifically, visual and manual detection, in combination with drilling policies and procedures, allow for ample discharge detection.

Further discharge detection is allowed by the continuous monitoring of the ship's bilge systems. Potential discharge collects in system where it eventually travels to the pump room. Visual surveillance of this bilge system's piping, valves, and pumps allows for early detection of a spill.

2.6 RATIONALE FOR CLAIMED PREVENTION CREDITS [18 AAC 75.425(e)(2)(F)]

Although Shell considers its well prevention and control measures "best in class," it will not be claiming any prevention credits to offset oil spill response planning requirements, based on exploration well operations as specified in 18 AAC 75.430 through 18 AAC 75.434.

The recovery equipment provided in support of this plan (see Tables 1-9 and 1-10) substantially exceed the mechanical recovery capability needed to contain the worst-case discharge (see Section 1).

2.7 COMPLIANCE SCHEDULE [18 AAC 75.425(e)(2)(G)]

Compliance schedule and waivers have not been requested at this time.

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PART 3 SUPPLEMENTAL INFORMATION [18 AAC 75.425(e)(3), 30 CFR 254.22(a), 30 CFR 254.23(e), AND 30 CFR 254.26]

3.1 FACILITY DESCRIPTION AND OPERATIONAL OVERVIEW [18 AAC 75.425(e)(3)(A)]

3.1.1 Facility Description

Exploration drilling will occur from either of two drilling vessels, the *Kulluk* or the ~~*Frontier*~~ *Noble Discoverer* ~~drillship~~ drilling ~~.~~vessel. Associated with these ~~drillship~~ drilling vessels will be dedicated oil spill response platforms, an oil spill response tug/barge combination (OSRB) using the *Arctic Endeavor*, and a vessel of opportunity. Shell's response capability is ensured by the on-the-water OSRB and vessel of opportunity, allowing timely and immediate response in the event of an oil spill. In addition to these response vessels, Shell will charter an Arctic-class tanker as a storage vessel for recovered fluids. The oil containment, recovery, and storage capacity is more than sufficient to cover the amount of oil potentially released from the worst-case discharge (WCD) arising from a well blowout.

The *Kulluk* Drill Rig

The *Kulluk* is a mobile offshore drilling unit (MODU) designed for drilling in harsh offshore arctic environments in water depths ranging from 24 meters (m) to 55 m. The mobile drilling vessel is towed to and ballasted down at the drill site. When drilling operations at a location are complete, the unit can be deballasted, refloated, and towed to another drill site. Its drilling depth reaches a maximum of 6,100 meters and its flow testing capability is up to 10,000 barrels of oil per day (bopd). It can house up to 108 people. A facility diagram is provided in Section 1.8, Figure 1-20, and the schematics are provided in Section 1.8, Figure 1-21.

The *Kulluk* was constructed in 1982 by Misui Engineering and Shipbuilding Company, Ltd. The floating semi-submersible vessel incorporates a 24-faceted conical shaped hull which has been ice strengthened to meet Arctic Class IV classification. The double hull is shaped in the form of an inverted cone which causes the ice to break downward and away from the vessel, thus protecting its anchor lines and drilling riser system from ice movement.

The bottom of the hull is equipped with a skirt system. The skirt is designed to protect the mooring lines whose fairleads depart from the center of the unit below this skirt. Ice is deflected away from the lines allowing the unit to remain on location during conditions when ice is present.

In previous drilling exploration programs, the *Kulluk* has operated in three characteristic ice scenarios: spring break-up with thick moving first-year ice and some old ice; summer open water with first and multi-year ice intrusions; and freeze-up early winter with a growing first-year ice cover and some old ice. The *Kulluk* has experienced very little down time in these conditions and has commenced drilling operations as early as June 1 and continued working as late as December 11^{th}. The *Kulluk* has also operated through a number of Beaufort Sea storms with maximum wave heights in the 20 foot range, performing in accordance with design expectations.

The *Noble~~Frontier~~ Discoverer* ~~Drillship~~Drilling Vessel

The *Noble~~Frontier~~ Discoverer* ~~drillship~~drilling vessel~~-~~ is designed for drilling in arctic environments and is designed for water depths ranging from 38 meters (m) to 305 m. Its drilling depth reaches a maximum of 6,096 m, and it can house up to 120 people. A facility diagram and schematics are ~~is~~ provided in Section 1.8, ~~Figure 1-15, and the schematics are provided in Section 1~~, Figures 1-~~16~~ 15 through 1-19.

The service facilities on the ~~drillship~~ two drilling vessels are described in Table 3-1.

TABLE 3-1
SERVICE FACILITIES ON THE MODUS

	KULLUK	***~~FRONTIER~~ NOBLE DISCOVERER***
Length	81.0 meters (diameter)	156.7 meters
Capacities		
Bulk Mud and Cement	608 m^3	386m^3
Sack Storage	500 m^3	3,200 kilograms per square meter (kg/m^2)
Total Liquid Mud	416 m^3	368 m^3
Drilling Water	672 m^3	1272 m^3
Potable Water	295 m^3	266 m^3
Fuel Oil	1589 m^3	1346 m^3
Drilling Equipment		
Draw Works	Ideco E-3000	Ideco E-2100
Pumps	2 Ideco T-1600 Triplex	Two Continental Emsco FA1600
Rotary	Ideco LR-495	National C-495
Derrick	Dreco 50 m; 6227 kN hook load	Pyramid 170' x 40' x 40'
Blowout Prevention Equipment		
WP RAM-Type Presenters	Four 18 ¾ -inch 10,000 psi	Four 18 ¾ -inch 10,000 psi
Annular Presenters	Two 18 ¾ -inch 10,000 psi	Two 18 ¾ -inch 5,000 psi
Choke and Kill Lines	YES	YES
Hydraulic Control Systems with Accumulator Back-up Closing	YES	YES

Drilling Support Vessels

The ~~drillship~~ drilling vessel will be accompanied by support vessels for anchor handling, ice management, and general logistical support for the movement of supplies and personnel. Vessels are identified in Appendix A. It is Shell's intent to update this information in the event that changes occur prior to each drilling season.

Oil Spill Response Support Vessels

In the event of an oil spill, it is Shell's intent that the primary response for the purposes of the Oil Discharge Prevention and Contingency Plan (C-Plan) be conducted by the following vessels:

- ~~*Nanuq*, berthing vessel for the OSRB crew (available for oil spill response after crew augmentation);~~
- *Arctic Endeavor;*
- Three 34-foot oil spill response workboats;
- One 47-foot workboat equipped with over-the-side brush skimmer; and
- Oil spill response storage using the oil storage tanker, *Affinity,* or comparable (70,000 gross metric tons, with a de-rated storage capacity of approximately 513,000 barrels). The oil spill response storage tanker will be positioned between 25 nautical miles (nm) and ~~300~~200 nm from the drilling vessel ~~drillship~~ while critical drilling activity is underway.

Fuel Systems

There are four fuel systems on both the *Kulluk* and *Noble~~Frontier~~ Discoverer*. They include the main bunker and fuel transfer, camp and rig utilities, emergency generator, and helicopter fuel systems. Individual characteristics for the ~~drillship~~ separate drilling vessels are included where necessary, along with the following information:

- ~~The camp and rig utilities fuel system includes ten day tanks (2 to 90 barrels) and one settling tank (91 barrels) for secondary storage, as well as pumps and centrifuges to deliver fuel to end-use locations.~~
- ~~The emergency generator fuel system is 9.6 barrels and is filled by the centrifuge from the camp utilities settling tank and overflow returns to that settling tank~~.
- ~~On the *Frontier Discoverer*, there are two fuel tanks for the helicopter; both with 17-barrel holding capacity.~~

On the *Kulluk*, the main bunker and fuel transfer system consists of three large storage tanks and pumps that allow fuel to be received into primary storage and then delivered to secondary storage (Figure 1-14). This system has been fitted with a full recirculation system that will return fuel overflow from the camp and rig utilities fuel system back to the main storage.

The camp and rig utilities fuel system includes ten day tanks (2 to 90 barrels) and one settling tank (91 barrels) for secondary storage, as well as pumps and centrifuges to deliver fuel to end-use locations.

The emergency generator fuel system is 9.6 barrels and is filled by the centrifuge from the camp utilities settling tank and overflow returns to that settling tank

The helicopter fuel system on the *Kulluk* consists of two fuel tanks located below deck and a pump with filter used to transfer fuel to the helicopter on the port side of the heli-deck. Both the Jet Fuel #1 and the Jet Fuel #2 tanks have a capacity of 14 bbl. On the *Noble Discoverer*, there are two fuel tanks for the helicopter; both with 17-barrel holding capacity.

The entire fuel system of the *Noble~~Frontier~~ Discoverer* consists of a 6,500-barrel holding capacity, including main bunker, fuel transfer, and helicopter fuel systems.

Bilge Systems

There are three bilge systems on the *Kulluk* located in the fuel pump room, which is isolated from the rest of the fuel tanks by a hatch combing. Bilge sumps for the below deck fuel compartments make up the bilge system, which normally pumps directly into the oily water surge tank.

The pump room is fitted with a main bilge, emergency bilge, and oily bilge systems. The main system is an extension of the ballast stripping system. An educator, powered by the sea water supply pumps, draws from a single suction in the pump room. The emergency system is made up of a horizontally-mounted submersible pump that discharges directly overboard.

The oily bilge system allows bilge water in the pump room to be processed to an oily water surge tank with 75 bbl capacity. After the bilge water is run through the oily water separator, the treated water (below 15 ppm oil in water) is discharged overboard and the oil and emulsion is contained in the tank.

The primary containment method of oil discharge is the installation of a drain surrounding the entire deck of each vessel. Drainage from the rig floor goes to an observation tank and then through an oily water separator. A maintenance record of the deck drainage is maintained by drilling personnel.

~~-~~On the *Noble~~Frontier~~ Discoverer*, the bilge system consists of a network of piping, a valves strainer, and mud boxes, which are connected to locations where water is likely to collect from environmental or natural leakage from equipment and other systems under normal operations. The bilge system is connected to two electrically driven bilge pumps located in the ship's service pump room.

The oily water separator on the *Noble~~Frontier~~ Discoverer* is located in the propulsion room to treat effluent propulsion room bilges. The oily bilge system allows bilge water in the propulsion room to be processed to an oily water surge tank with 75-barrel capacity. After the bilge water is run through the oily water separator, the treated water (below 15 parts per million oil in water) is discharged overboard, and the oil and emulsion is contained in the tank.

3.1.2 Bulk Storage Containers

Neither ~~T~~the *Kulluk* nor the *Noble~~Frontier~~ Discoverer* ~~drillship does not~~ contain non-integral bulk storage oil tanks equal to or greater than 10,000 gallons.

The largest oil storage facility in the exploration vessel fleet is the 513,000-barrel capacity oil storage tanker that will be located between 25 nm and ~~300~~200 nm away from the ~~drillship~~ drilling vessel while critical drilling activity is underway and will be used for emergency oil spill response.

3.1.3 Transfer Procedures

Fuel transfer procedures are discussed in detail in Section 2.1.5 and Appendix C.

3.1.4 Vessel Plans and Diagrams

See Figure 3-1 for a diagram of the OSRB.

3.2 RECEIVING ENVIRONMENT [18 AAC 75.425(e)(3)(B)]

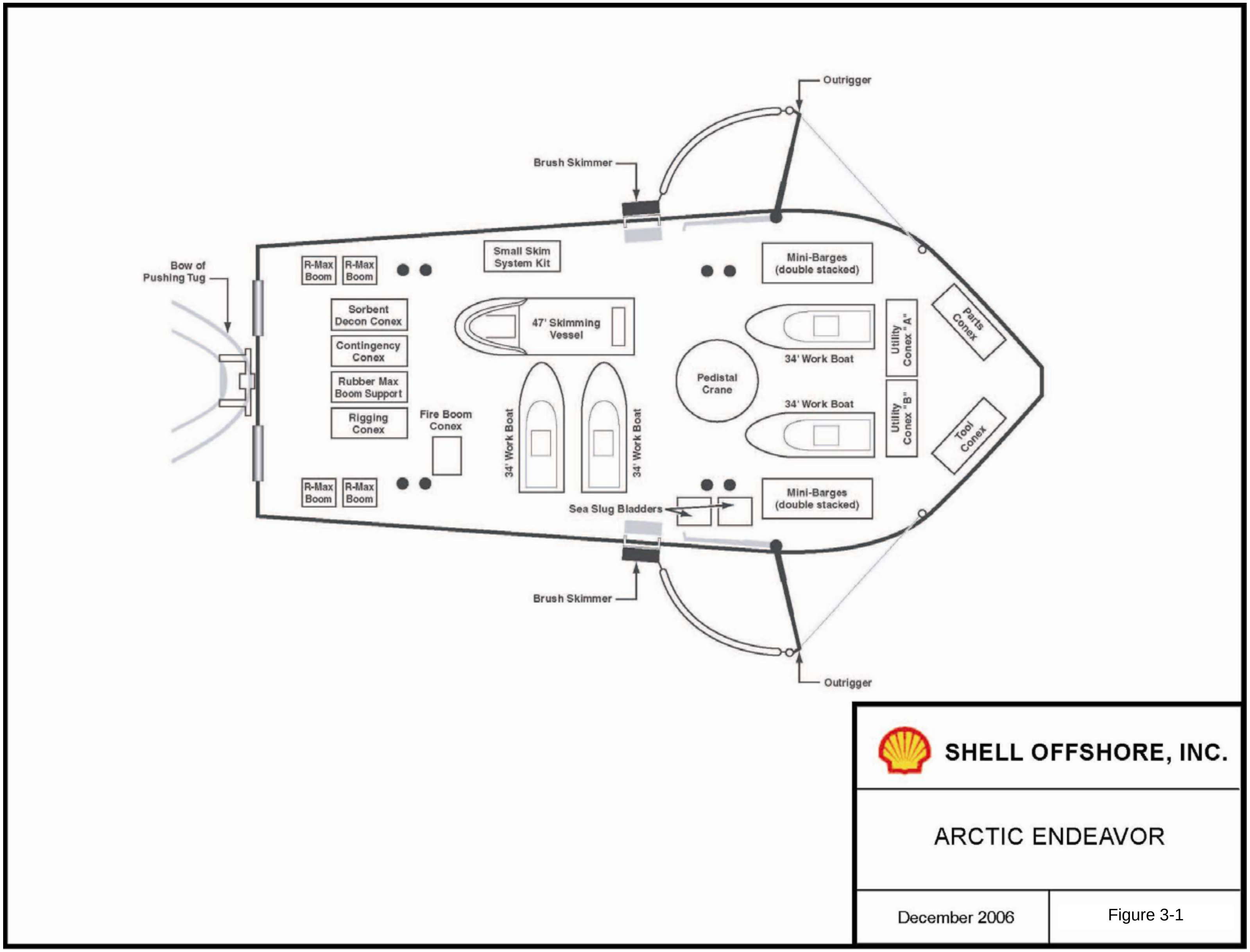
Offshore seasonal exploration well activity in the Beaufort Sea occurs in a few key environments. The *Kulluk* and *Noble~~Frontier~~ Discoverer* will travel to the Beaufort Sea in July with a fleet of support vessels and its dedicated OSRB. The movement and positioning of the fleet is dependent on the break-up of the Arctic sea ice. Ice deterioration begins along the shoreline, initially concentrated in areas affected by local ice overflood at the mouths of major rivers. The flooded ice floats free of the bottom and melts first. An open-water pathway opens along the shore while the thick pack ice off shore continues to melt into an irregular pattern of hummocks and open holes. It is through this window of open water that the vessels and barges move to the exploration area.

Peak exploration activities will commence in July and August and continue into freeze-up in September and October. During the freeze-up period, exploration will occur between the fast ice (contiguous with the shoreline) and the pack ice. When drilling in water depths of 25 m or more, the environment will be dominated by open water throughout the drilling season, with common areas of calved pack ice and rare invasions from the permanent pack. Pack ice beyond the transition zone is subject to unpredictable fracturing and movement and may interfere with drilling in the late season. Although the permanent pack ice usually remains well north of the proposed operational area in the summer months, storm events can rapidly drive multi-year floes south at rates exceeding 12 kilometers per day. The movement of both fast ice and pack ice will be the predominant control over the success of exploration activities.

The Beaufort Sea is primarily free of sea ice from mid-August to early October. The ~~drillship~~drilling vessel and support vessel fleet will exit the exploration sites through the open water pathway before winter ensues and the pack ice encroaches on the shoreline.

~~Wildlife~~ The most likely wildlife expected in the Beaufort Sea offshore exploration area includes: polar bear~~s,~~, bowhead, Beluga, and gray whales, as well as both ringed and spotted seals, and marine birds.

FIGURE 3-1
***ARCTIC ENDEAVOR* BARGE**



3.3 COMMAND SYSTEM [18 AAC 75.425(e)(3)(C)]

The oil spill response command system is compatible with the Alaska Regional Response Team (ARRT) *Unified Plan*. The organizational structure is based on the National Incident Management System and the Alaska Incident Management System. It provides clear definition of roles and lines of command, together with the flexibility for expansion or contraction of the organization. In addition, Shell's *Incident Management Handbook* is followed for the process, organization, and language for incident response management.

In the event that a spill reaches jurisdiction of the North Slope Borough, Shell will abide by the regulatory *North Slope Subarea Contingency Plan* to ensure compliance, including emergency notification of the necessary and affected parties, including federal, state, and local agencies. As required by the *North Slope Subarea Contingency Plan*, or when more than one agency has jurisdiction, Shell will also implement a Unified Command System as described within this plan, including the designation of a representative of the North Slope Borough as the Local On-Scene Coordinator (LOSC) within the Unified Command (see Section 3.3.2).

All emergency response situations will use the Incident Command System (ICS). The ICS defines roles and lines of command, together with the flexibility for expansion of the organization as necessary. The first person discovering or responding to any emergency situation becomes the On-Scene Incident Commander (IC) (person in charge) until that individual relinquishes authority to another person better able to assess the situation.

The Alaska Clean Seas (ACS) *Technical Manual*, Volume 3, Appendix B, contains a description of ICS position responsibilities and checklists. Appendix D of Volume 3 contains many common ICS forms for documenting response decisions and activities. This is consistent with the *Shell Oil Company Incident Management Handbook* and Incident Action Plan (IAP) development process.

In most Tier I incidents, the On-Site Spill Technicians possess the capabilities to effectively control the incident. The On-Site Shell Company Representative will fulfill the role of IC. ACS personnel will be activated to stand by until an assessment is performed. Once the assessment is complete, ACS personnel are either released or mobilized.

For Tier I incidents, rig personnel will report to a designated secure area until completion of an incident assessment by the On-Site Representative. Following that assessment, the rig personnel will be assigned cleanup duties based on their level of training. The On-Site Spill Technician will assist in this effort.

Tier II/III responses are initiated by the Drilling Superintendent who initiates the appropriate Incident Management Teams (IMTs). Once the response level is ascertained, the appropriate IMT begins to provide support to the field responders (Operations Section) and to coordinate the collection and distribution of information. ACS provides personnel and equipment resources from the on-site OSRB, and the North Slope. ACS provides additional personnel and equipment resources from Deadhorse to assist in spill containment and recovery. The drill operators coordinate with ACS to ensure that a reserve of trained personnel is available for an extended spill response.

For Tier II/III incidents, the Drill Foreman is the initial On-Scene IC. The rig personnel will be directed to a secure area to await the arrival of emergency response personnel. Depending on the incident, ~~drillship~~drilling vessel personnel may be incorporated into the IMT, when applicable.

The Qualified Individual (QI) would be notified during callout of the IMT (Tier II or III response). During Tier II events, the Mutual Aid agreements cover resource issues associated with personnel and equipment. During Tier III events, the QI acts as the company representative for commitment of additional resources. The QI can be either the IC or the Deputy IC.

Through the Mutual Aid agreements with ACS, response personnel are available to respond to a Tier II or Tier III incident at a drill site. Shell would arrange for equipment and personnel from contractors beyond the Mutual Aid agreement limits, if necessary, to complete a spill response (see ACS *Technical Manual* Tactics L-8 and L-9). For significant oil spills of Tier II and III magnitude, there may be federal, state, and local on-scene coordinators (FOSC, SOSC, and LOSC); Shell; and the Responsible Party, if it is not Shell. These individuals will become part of the Unified Command, representing their organization. Each contributes to the process of:

- Determining and establishing overall incident objectives and priorities,
- Selecting strategies,
- Planning for tactical activities,
- Conducting integrated tactical operations, and
- Using resources effectively and efficiently.

The IC will represent the Responsible Party in the unified structure unless the SOSC or FOSC determines the response is inadequate. At that time, either the SOSC or FOSC will assume the IC role.

3.3.1 Incident Management Team

The IMT determines strategic objectives and priorities to deal with an emergency incident. They approve spill response tactics and provide overall support to the Spill Response Technicians. Activation of an IMT is dependent on the severity of the incident; if the emergency is serious enough to trigger the direct involvement of several response organizations, an IMT will be activated. Upon activation, a Unified Command structure may be established at Shell’s Anchorage offices.

An organization chart showing the ICS structure is presented in Figure 3-2. Command Staff contact information is presented in Table 3-2, and an IMT checklist is presented in Table 3-3.

3.3.2 Unified Command

Unified Command is a structure that is created at the time of an incident to bring together the ICs of each major organization involved in response operations. In Alaska, the members of Unified Command are usually the FOSC, the SOSC, and the Responsible Party. For this exploration, an LOSC from a neighboring area may join the Unified Command.

FIGURE 3-2
INCIDENT COMMAND SYSTEM

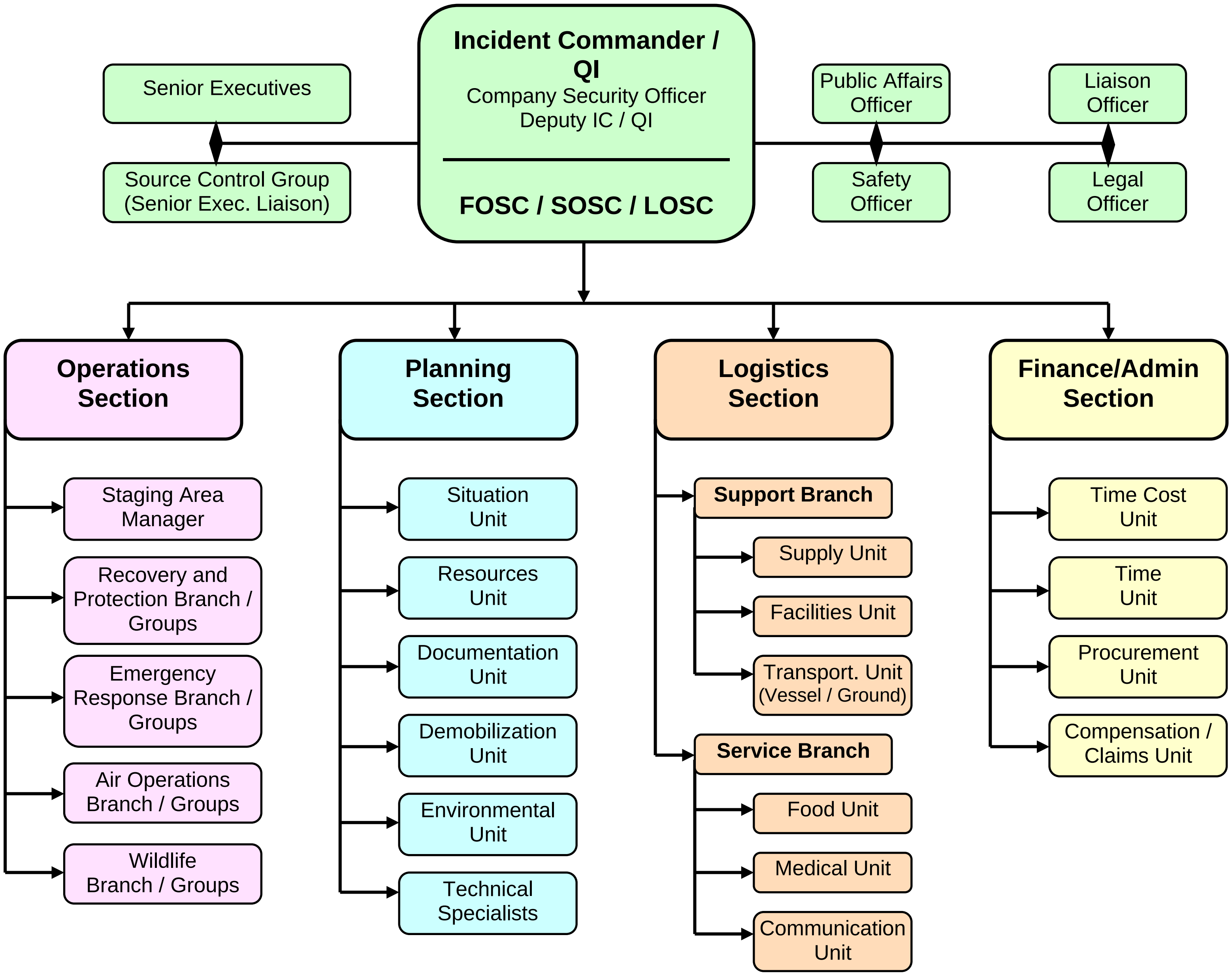


TABLE 3-2
COMMAND STAFF CONTACT INFORMATION

NAME	OFFICE #	PAGER #	CELL #
COMMAND STAFF			
IC/QI			
Brent Ross	907- 771-7217		907-223-0061
Susan Moore	907-646-7119		907-382-5474
Deputy IC /QI			
Susan Moore	907-646-7119		907-382-5474
Geoff Merrell	907-771-7221		907-306-8016
Public Affairs/Information Officer			
Jennifer Taylor	907-646-7178		907-382-5974
Curtis Smith	907-646-7182		907-242-5227
Liaison Officer			
Nicole St. Armand	907-646-7152		907-382-6852
Greg Horner	907-646-7131		907-227-1065
Safety Officer			
Brad Boschetto	907-646-7121		907-382-5050
Mike Corron	907-646-7103		907-223-6878
Legal Officer			
Marc Stone	907-646-7127		713-269-8054
Company Security Officer (IC Support)			
Phil Smith	504-728-4252	888-265- 8113	504-606-4252
Tommy Hutto	504-728-4369	888-264-0024	504-884-1665
Senior Executive (IC Support)			
Pete Slaiby	504-728-6711		281-857-1888
Gary Cameron	907-771-7249		907-230-5329
Source Control Executive Liaison (IC Support)			
Jeff Wahleithner	281-544-4545		303-918-1272
Charlie Williams	832-337-1794		281-685-9088
GENERAL STAFF			
Operations Section Chief			
Geoff Merrell	907- 771-7221		907-306-8016
ACS Staff	907-659-2405		
AES-RO Staff	907-339-6200		
Staging Area Manager			
ACS Staff	907-659-2405		
Operations Section Branch Directors			
Shell Staff	907-770-3700		
ACS Staff	907-659-2405		
AES-RO Staff			

TABLE 3-2 (CONTINUED)
COMMAND STAFF CONTACT INFORMATION

NAME	OFFICE #	PAGER #	CELL #
Planning Section Chief			
Carol Theilen	907-771-7220		713-504-9260
Darla Dare	907-646-7109		907-854-4876
Technical Specialists			
Michael Macrander	907-646-7123		907-317-9314
Al Allen (Spiltec)	425-869-0988		
Ian Voparil	+3 12 0529 5867		+3 16 1596 3775
David Dickins (contractor)	858-453-8688		
ACS Planning and Development Manager (IMT coach/facilitator)	907-659-3220		
Logistics Section Chief			
Karen Spring	907-646-7111		907-306-6038
Lev Yampolsky	907-646-7160		907-306-2574
Support Branch Director			
John Maketa	907-646-7172		907-980-5146
Finance Section Chief			
Zach Reigle	907-646-7105		517-944-1502

~~NAME~~	~~OFFICE #~~	~~PAGER #~~	~~CELL #~~
~~**COMMAND STAFF**~~	-	-	-
~~**Incident Commander/QI**~~			
~~Brent Ross~~	~~907-770-3700~~		~~907-360-4813~~
~~Susan Childs~~	~~907-646-7112~~		~~907-301-5792~~
~~**Deputy Incident Commander/QI**~~			
~~Susan Moore~~	~~907-646-7119~~		~~907-382-5474~~
~~Jon Edmondson~~	~~907-646-7110~~		~~907-952-7769~~
~~**Public Affairs/Information Officer**~~			
~~Jennifer Taylor~~	~~907-646-7178~~		~~907-382-5974~~
~~Terzah Poe~~	~~907-646-7103~~		~~907-360-5718~~
~~**Liaison Officer**~~			
~~Susan Childs~~	~~907-646-7112~~		~~907-301-5792~~
~~Nicole St. Armand~~	~~907-646-7152~~		~~907-382-6852~~
~~**Safety Officer**~~			
~~Brad Boschetto~~	~~907-646-7121~~		~~907-382-5050~~
~~Grantt Bedford~~	~~907-771-7201~~		~~907-382-2808~~
~~**Legal Officer**~~			
~~Marc Stone~~	~~281-544-2596~~		~~713-269-8054~~
~~**Company Security Officer (IC Support)**~~			
~~Phil Smith~~	~~504-728-4252~~	~~888-265-8113~~	~~504-606-4252~~
~~Tommy Hutto~~	~~504-728-4369~~	~~888-264-0024~~	~~504-884-1665~~

TABLE 3-2 (CONTINUED)
COMMAND STAFF CONTACT INFORMATION

~~NAME~~	~~OFFICE #~~	~~PAGER #~~	~~CELL #~~
~~Senior Executive (IC Support)~~			
~~Frank Glaviano~~	~~504-728-6711~~		~~281-857-1888~~
~~Pete Slaiby~~	~~907-771-7210~~		~~907-382-7247~~
~~Source Control Executive Liaison (IC Support)~~			
~~Paul Goodfellow~~	~~281-544-2151~~		~~281-857-4014~~
~~Chandler Wilhelm~~	~~713-546-6157~~		~~713-444-3811~~
~~GENERAL STAFF~~	~~-~~	~~-~~	~~-~~
~~Operations Section Chief~~			
~~Geoff Merrell~~	~~907-771-7221~~		~~907-306-8016~~
~~ACS Staff~~	~~907-659-2405~~		
~~O'Brien's Oil Pollution Services (OOPS) Staff~~	~~800-910-3778~~		
~~Staging Area Manager~~			
~~ACS Staff~~	~~907-659-2405~~		
~~Operations Section Branch Directors~~			
~~Shell Staff~~	~~907-770-3700~~		
~~ASRC Energy Services (AES) Staff~~	~~907-339-6200~~		
~~Planning Section Chief~~			
~~Jon Edmondson~~	~~907-646-7110~~		~~907-952-7769~~
~~Brad Boschetto~~	~~907-646-7121~~		~~907-382-5050~~
~~Planning Section Unit Leaders~~			
~~Technical Specialists~~			
~~Michael Macrander~~	~~907-646-7123~~		~~713-907-8136~~
~~Al Allen (Spiltec)~~	~~425-869-0988~~		~~(425) 503-6111~~
~~Ian Voparil~~	~~281-544-6906~~		~~281-222-8472~~
~~Dave Dickins (Contractor)~~	~~858-453-8688~~		
~~ACS Planning and Development Manager (IMT Coach/facilitator)~~	~~907-659-3207~~		
~~Logistics Section Chief~~			
~~Kate Miner~~	~~907-646-7111~~		~~907-382-2755~~
~~Jack Wallis~~	~~907-646-7168~~		~~907-980-2934~~
~~Support Branch Director~~			
~~John Maketa~~	~~907-646-7172~~		~~907-980-5146~~
~~Service Branch Director~~			
~~Finance Section Chief~~			
~~JoAnn Spears~~	~~907-646-7191~~		~~907-229-5501~~

TABLE 3-3
IMT CHECKLIST

POSITION	RESPONSIBILITIES			COMMENTS
INCIDENT COMMANDER	❑	Fill in Spill Report Form		
	❑	Assist field personnel (medivac)		
	❑	Assemble Spill Response Team		
		❑	Brief team	
		❑	Assign duties (organization chart)	
		❑	Remind team to keep logs	
	❑	Establish objectives (chart)		
	❑	Name Incident		
	❑	Determine response strategies		
	❑	Conduct air surveillance		
	❑	Establish meeting times (chart)		
	❑	Notify agencies (chart)		
QUALIFIED INDIVIDUAL (IC or Deputy IC)	❑	Status of incident, facility, and personnel		
	❑	Evaluate level of response required and activate IMT support as required		
	❑	Conduct internal/external notifications as required		
	❑	Authorize the use of response resources		
	❑	Participate in Incident Command briefings		
LIAISON OFFICER	❑	National Response Center		
	❑	Notify appropriate state agencies		
	❑	Notify federal agencies		
	❑	Request safety zones air/water (U.S. Coast Guard [USCG])		
	❑	Request Notice to Mariners (USCG)		
	❑	Submit In Situ Burn request to USCG		
	❑	Obtain approval to decant (USCG)		
	❑	Prepare written reports to agencies		
HUMAN RESOURCES	❑	Notify family of injured (if company employee)		
	❑	Follow up on injured		
	❑	Coordinate volunteer activities		
	❑	Notify corporate executives		
PUBLIC AFFAIRS OFFICER	❑	Notify partners		
	❑	Notify company personnel		
	❑	Prepare for media interest		
	❑	Keep the public informed		
	❑	Coordinate media efforts through the Joint Information Center		
	❑	Coordinate efforts with USCG		
	❑	Identify community concerns		
	❑	Evaluate/monitor hazards		

TABLE 3-3 (CONTINUED)
IMT CHECKLIST

POSITION	RESPONSIBILITIES			COMMENTS
SAFETY OFFICER	❑	Notify offset operators		
	❑	Obtain material safety data sheet (MSDS)/prepare initial Site Safety Plan		
	❑	Establish first aid posts		
	❑	Coordinate search and rescue operations		
	❑	Coordinate post-incident debriefing		
	❑	Conduct air monitoring as may be needed		
	❑	Ensure hazardous waste operations and emergency response (HAZWOPER) compliance		
	❑	Investigate safety-related accidents and report to IC		
	❑	Conduct safety inspections		
	❑	Commence source control operations		
SOURCE CONTROL	❑	Verify amount spilled		
	❑	Calculate total potential		
	❑	Mobilize source control specialist		
	❑	Develop/obtain approval for repair plan		
	❑	Direct surveillance operations		
OPERATIONS	❑	Mobilize ACS (and AES if needed) and other available equipment deemed necessary to response efforts by the Unified Command.		
		❑	Equipment/operators/supervisors	
		❑	Take air monitoring equipment	
		❑	Obtain samples of spilled material	
		❑	Prepare shoreline for impact (pre-clean)	
		❑	Contact Airborne Support, Inc.	
		❑	Spray/spotter aircraft and personnel	
		❑	Vessel for USCG SMART Team	
		❑	For assistance contact OOPS See Appendix B for equipment (potential services not under contract).	
WILDLIFE BRANCH/GROUPS	❑	Send company representative to site/staging		
	❑	Consider night time spill tracking - RTTI		
	❑	Consider pre-cleaning the shoreline prior to impact		
	❑	Assist in Shoreline Cleanup and Assessment Team (SCAT) process to determine shoreline response		
	❑	Contact wildlife specialist/ refuge mgrs. for info.		
	❑	Consider scare cannons (ACS)		
	❑	Call Wildlife Rehab		
	❑	Prepare air operations plan		
	❑	Develop waste disposal plans		
	❑	Set up decontamination stations		

TABLE 3-3 (CONTINUED)
IMT CHECKLIST

POSITION		RESPONSIBILITIES	COMMENTS
LOGISTICS	❑	Locate utility/crew boats, helos	
	❑	Identify/set up staging areas	
	❑	Ensure temporary storage-recovered oil capacity	
	❑	Request mechanics/parts trailers	
	❑	Prepare medical plan, source emergency medical technicians	
	❑	Prepare communications plan (ICS 205)	
	❑	Obtain security at Incident Command Post/staging areas	
	❑	Establish services	
	❑	Housing	
	❑	Catering	
	❑	Parts trailers/mechanics	
	❑	Fueling facilities	
PLANNING	❑	Call The Response Group	
	❑	Request trajectories	
	❑	Show dispersant timeline	
	❑	Shoreline impact? Request sensitive areas	
	❑	Update w/weather forecasts/ surveillance	
	❑	Prepare dispersants/in situ burning request form	
	❑	Post/Update charts in Incident Command Post	
	❑	Commence natural resource damage assessment operations (sampling)	
	❑	Determine sensitive areas as identified in the Area Contingency Plan	
	❑	Call out technical specialists as needed	
	❑	Prepare ICS 201 and IAP	
	❑	Set up secured filing system	
	❑	Obtain USCG approval for decanting	
FINANCE	❑	Issue AFE (application for expenditure) element	
	❑	Prepare for claims	
	❑	Review contracts with Logistics/vendors	

The priorities of the Unified Command are to select tactics and strategies and determine the operations for using all available resources effectively and efficiently. Further objectives come from state and federal government participation. Using the Unified Command, governments will coordinate the responsibilities specific to them, such as taking over containment, control, and cleanup operations, when necessary. These regulatory operations are managed simultaneously throughout the incident.

When an incident occurs, the Unified Command structure may be established and superimposed at the top of the IMT. In this position, the On-Scene Commanders are ideally situated to carry out the responsibilities cited above. They provide overall direction by establishing strategic objectives and response priorities addressed by the IMT through the planning process. Moreover, they review and approve the products of the planning process (e.g., IAPs) developed by the IMT to address the objectives and priorities.

The Unified Command position at the top of the IMT also facilitates the appropriate integration of response resources. For the agency representatives, it allows them to determine the appropriate role(s) for agency personnel and to position them optimally within the IMT structure. For the Responsible Party, it ensures members of the IMT have access to valuable expertise without diluting their ability to manage response operations.

3.4 REALISTIC MAXIMUM RESPONSE OPERATING LIMITATIONS [18 AAC 75.425(e)(3)(D) AND 30 CFR 254.26(D)]

The realistic maximum response operating limitations are described in the ACS *Technical Manual,* Tactic L-7. The most probable factors that could result in the curtailment of critical operations and can sometimes limit response activities are heavy weather, sea ice, and structural icing. Some limitations are based on safety and equipment effectiveness. Tactic L-7 analyzes the frequency and duration, expressed as a percentage of time, of limitations that would render mechanical response methods ineffective, as required by 18 AAC 75.425(e)(3)(D) and 30 CFR 254.26(d). That analysis considers weather, sea conditions, ice, daylight hours, and other environmental conditions that might influence the efficiency of the oil spill response in the Beaufort Sea nearshore zone where landfast ice is always present during the winter period. The timing and characteristics of ice conditions at Shell's drilling locations differ in a number of respects from the descriptions and dates presented in ACS Tactic L-7, for example: break-up dates, summer season duration, and the lack of landfast ice for most of the year. Additional information on seasonal ice conditions in both nearshore and offshore areas is provided in Section 3.4.3.

Importantly, the limitations for response operations are directly related to those of drilling operations. Shell will follow an ice management plan for drilling operations. These adverse weather drilling restrictions will lessen the likelihood of a spill. Included in the *Beaufort Sea Ice Management Plan* are strict procedures for continuous weather surveillance and heavy weather policies designed to aid operations personnel in determining the correct procedures to follow when storm conditions are expected. Should it become necessary to cease critical operations, methods will be followed for securing the well and rig, ceasing drilling operations and hanging off the drill pipe. Critical operations will not recommence until the Shell Drilling Foreman deems it safe. As part of that decision, the Shell Drilling Foreman will assess the risks associated with drilling, including:

- Evaluating the forecast for weather conditions;
- Fuel and water sustainability;
- Safety of operations: type of operation needed, hazards, and the risks involved; and
- Availability of emergency equipment.

The procedures for ice management include identifying the alert status and conditions of ice movement and the site-specific procedures for the support vessels. See Table 3-4 Ice Alert Levels and Table 3-5 Ice Alert Roles and Responsibilities.

For discussion and details on response equipment operating in varying ice conditions, see ACS *Technical Manual*, Tactic L-7; also see Table 1-7, Table 1-11~~10~~, and Section 1.6.13 of this plan. Under certain conditions, response efforts could be accelerated with the use of in situ burning in conjunction with manual recovery. See Section 1.7.3 for a list of the procedures for implementing this response tactic and Section 3.4.3 for a discussion of in situ burning response measures in ice.

TABLE 3-4
ICE ALERT LEVELS

ALERT LEVEL	TIME CALCULATION	ACTION
Green	(HT – T-Time) is greater than 24 hrs	Normal operations
Blue	(HT – T-Time) is greater than 12 hrs	Heightened awareness
Yellow	(HT – T-Time) is greater than 6 hrs	Limited well operations in line with Critical Operations Contingency Plan, possibly commence securing well
Red	(HT – MT) is less than 6 hrs	Secure well and commence anchor recovery operations
Black	HT is less than 2 hrs	Move ~~drillship~~drilling vessel to a safe location

Definitions:

Ice Alert Level: The Ice Alert Level, designated by color in this plan, is a simple means to depict and communicate the immediacy of a hazardous ice-related event and the required level of preparedness to respond effectively to the threat.

Hazard Time (HT): HT is the estimated arrival time of hazardous ice.

Secure Time (ST): ST is the time required to temporarily abandon the well and make ready for departure of the rig from location.

Move Off Time (MT): MT is the time to clear decks on the anchor handler, recover the moorings, and move the ~~drillship~~drilling vessel off location prior to the arrival of the hazardous ice either under its own power or by towing the ~~drillship~~drilling vessel to a safe site. The move off time varies depending on the method of anchor recovery, which in turn depends on changing environmental conditions. MT can be as much as 24 hours to recover all anchors and moorings in case of trouble to a much shorter time if circumstances dictate. A very short MT can be achieved in an emergency by actuating the RARs or by simply running the anchor lines off the winches, dropping the entire mooring system on the seafloor for later recovery.

Total Time (T-Time): T-Time is the sum of MT and ST, and represents the total time required to terminate drilling operations, safely secure the well, and move the rig off the drill site.

Hazardous Ice: Hazardous ice is any ice considered to be a threat to the continued safe operation of the rig. Hazardous ice is commonly moving multi-year ice that is larger than 500 m across, or ridge remnants, or unusual thickness first-year ice, or any combination of these that could exceed the ability of the ~~drillship~~drilling vessel or ice management vessels to withstand the impact of the ice feature.

TABLE 3-5
ICE ALERT ROLES AND RESPONSIBILITIES

ALERT	CONDITION	SHELL DRILLING FOREMAN	*NOBLE*~~FRONTIER~~ DRILLING OFFSHORE INSTALLATION MANAGER (OIM)	MARINE SUPERINTENDENT (BARGE CAPTAIN)	ICE ADVISOR	ICE PILOT/ICEBREAKER VESSEL CAPTAINS
Green	Hazardous ice is not expected to arrive at location within T-Time plus 24 hours	Establishes potential well ST in conjunction with the Valdez Marine Terminal (VMT). Advises OIM and Frontier Drilling Superintendent regarding any critical operations and curtailment plans. Approves Ice Alert Level.	Monitors ice reports and forecasts, directs ice management operations. Determines Ice Alert Level in conjunction with VMT.	Establishes potential MT.	Monitors ice conditions and predictions, reports HT to the OIM and VMT, provides link to Ice Pilots for ice management vessel deployment and recon.	Conducts ice recon as directed by OIM through the Ice Advisor, or designee, and reports to Ice Advisorand IIC.
Blue	Hazardous ice is not expected to arrive at location within T-Time plus 12 hours	Monitors well operations relative to ice forecast. Establishes potential well ST in conjunction with the VMT. Advises OIM and Frontier Drilling Superintendent regarding any critical operations and curtailment plans. Approves Ice Alert Level.	Monitors ice reports and forecasts, directs ice management operations. Determines Ice Alert Level in conjunction with VMT.	Establishes potential MT.	Monitors ice conditions and predictions, reports HT to the OIM and VMT, provides link to Ice Pilots for ice management vessel deployment, recon and ice management operations.	Conducts ice recon as directed by OIM, or designee; reports potential hazardous ice conditions and location to Ice Advisor and IIC. Provides ops link from OIM to Vessel Captain.
Yellow	Hazardous ice is not expected to arrive at location within T-Time plus 6 hours	Approves Ice Alert Level. Establishes potential well ST and, if required, initiates well secure operations.	Determines Ice Alert Level with VMT. Monitors and controls ice operations.	Continuously updates all the potential MTs. Ensures anchor handling and rig anchor release (RAR) capability.	Monitors ice conditions and predictions, reports HT to the OIM and VMT, provides link to Ice Pilots for ice management operations.	Supports ice management operations. Continues to provide ice data to Ice Advisor and IIC. Assists in predicting HT.
Red	Hazardous ice is expected to arrive at location within MT plus 6 hours	Approves Ice Alert Level. Manages well secure operations and updates OIM on well status. Establishes availability of additional support for site departure operations.	Monitors ice conditions and directs ice management operations for return to drill site. Confers with the Shell Drilling Foreman on course of action to be taken	Manages mooring recovery operations	Monitors ice conditions and predictions, reports HT to the OIM and VMT, provides link to Ice Pilots for ice management operations.	Supports ice management and anchor handling operations.
Black	Hazardous ice is expected to arrive at location within 2 hours	Approves Ice Alert Level. Confers with OIM and monitors ice conditions for return to drilling location. Prepares well re-entry prognosis with Drilling Engineers, and reviews with Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) ~~Minerals Management Services (MMS)~~ Field Representative.	Monitors conditions for return. Confers with Shell Drilling Foreman on the return Ice Alert Level and tentative timing.	Safely clears drilling location with ~~drillship~~drilling vessel. Prepares for return	Continues to monitor ice conditions, prepares new estimates of HT for any hazardous ice features, assist in establishing time to return to drill site.	Supports ice management, anchor handling, and towing operations. Conducts ice recon as directed; assists in estimating return time.

3.4.1 Adverse Weather Conditions

BOEMRE~~Mineral Management Service (MMS)~~ regulations [30 CFR 254.23 and 30 CFR 254.26(d)] for a facility response plan require consideration of how a spill response will be managed during adverse weather conditions. The single most limiting factor of mechanical containment and response effectiveness at a drill site is extreme weather conditions. Activities at the drill site may be curtailed due to safety considerations. Temperatures below minus 35 ºF may cause failures in hydraulic equipment. Winds above 15 knots with 30-knot gusts are strong enough to make hoists and lifts unsafe at 10 feet to 20 feet above ground, with whiteouts restricting visibility to a few feet. Drill site activity may also be curtailed if crucial materials or supplies cannot be delivered.

The oil spill response recovery equipment used in this exploration program can:

- Be deployed in seas in the 5- to 6-foot range,
- Continue to operate 8- to 10-foot seas, and
- Operate in 20-knot winds after deployment.

If conditions should arise that effectively prohibit the recovery or containment of an oil spill as per the USCG *Marine Safety Manual* and 30 CFR 254.23, the Drill Foreman will lead a risk assessment with the participation of the Toolpusher, location personnel, and Shell Management. The Drill Foreman is responsible for making the final decision as to the level of risk in accordance with Shell's *Beaufort Sea Ice Management Plan*.

Weather and ice conditions during the drilling season are described in the Response Strategy in Sections 1.6.13, 2.4.2, and 2.4.3, and below in Section 3.4.3. Also see ACS *Technical Manual*, Tactic L-7.

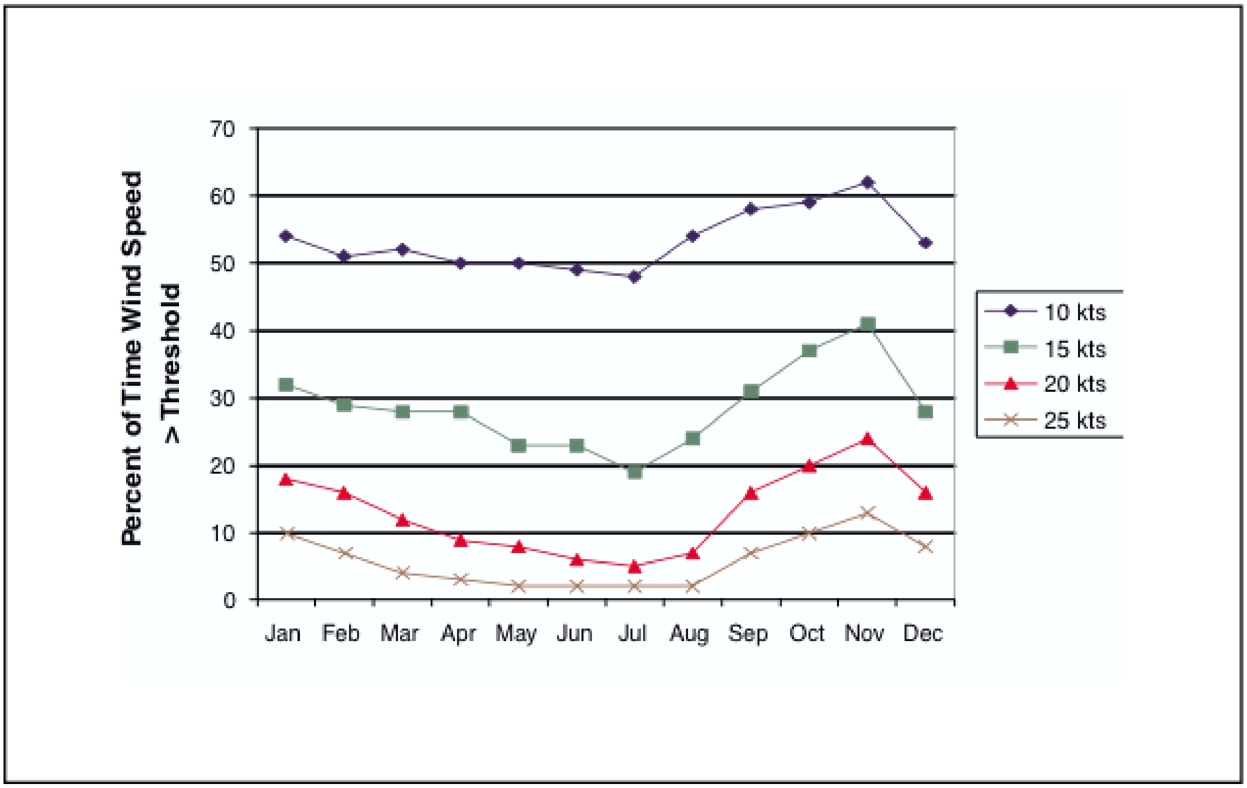
3.4.2 Sea States, Tides, and Currents

In general, winds in the area are considered gentle to moderate and generally from the east-northeast (predominant at 40 to 60 percent of the time) or west-southwest (20 to 40 percent of the time). Northerly or southerly winds occur less than 7 percent of the time. The strongest winds (and storm winds) tend to be westerly. In terms of wind speed, a moderate breeze of 15 knots or more can be expected in the range of 24 percent of the time in August to 37 percent in October. Gale force winds in the range of 34 to 40 knots (Beaufort Force 8) are extremely rare, occurring less than 2 percent of the time in the windiest months (September to February) and less than 1 percent of the time for the rest of the year. Figure 3-3 shows the monthly wind speed exceedance based on data presented by Vaudrey (2000).

Circulation conditions include nearshore currents, shelf currents, and subsurface currents. Nearshore circulation is heavily influenced by the complexities along the Beaufort coastline as described below. Continental shelf currents in the Beaufort Sea are wind driven. As a result, currents generally flow to the west, but reversals are common.

Tides in the Beaufort Sea are mixed semidiurnal with a very small range, about 6 to 12 inches. The coastline in proximity to the exploration area is generally a low wave-energy environment. Waves are primarily from the east and northeast and are generated predominantly during the open-water season. For much of the summer period (July to August), the close proximity of sea ice will effectively prevent sea states from developing to an extent predicted from the Beaufort wind scale and sea state standard relationship (http://www.srh.noaa.gov/). The appearance of new ice in October will rapidly diminish the wave heights within a few weeks after initial freeze-up along the coast. Potential sea

FIGURE 3-3
MONTHLY WIND SPEED EXEEDANCE



VAUDREY (2000) BASED ON LONG-TERM DATA FOR THE PRUDHOE BAY AREA

states during the period of maximum open water (mid-August to mid-October) can be estimated from this standard relationship. For example a moderate breeze of 11 to 16 knots (Force 4) will result in a wave height of 3.5 to 5 feet, a condition which would be exceeded approximately 30 percent of the time in September (Figure 3-3) – the month with the maximum extent of open water off the Alaskan Beaufort Sea coast.

In the event that a storm surge occurs, critical drilling operations would be curtailed and continuous monitoring of the weather forecast would ensue. For specific limitations on response equipment due to sea states, see ACS *Technical Manual*, Tactic L-7.

3.4.3 In Situ Burning Response Measures in Ice

Introduction

One of the most important factors that influence drilling activities is the movement and amount of sea ice in the Beaufort Sea. Sea ice can pose a significant challenge for spill response; however, experience has shown that low temperatures and ice can often enhance spill response and reduce environmental impacts. For example:

- Low air and water temperatures often result in greater oil equilibrium thicknesses, thereby reducing spreading rates and areas of coverage. These reductions greatly reduce the potential for impact with natural resources while providing the potential for much higher oil encounter rates for mechanical recovery and burning operations.

- Evaporation rates are reduced, leaving the lighter and more volatile components in the oil longer, thereby enhancing the ease with which the oil could be ignited.
- The wind and sea conditions in the Beaufort Sea are considerably less dynamic than most open-ocean environments; and the presence of ice can actually dampen wave action and limit the fetch over which winds might otherwise create large waves.
- While ice, even in low concentrations, can preclude the effective use of oil containment boom, responders may still operate with short boom extensions and skimmers to maneuver among ice pieces and intercept oil.
- When ice concentrations preclude the use of any boom, the ice will often serve as a natural barrier to the spread of oil and help concentrate the oil for pocket-recovery operations with stationary skimmers. The natural containment of oil against ice will often result in thicknesses that could significantly enhance the efficient removal of oil with burning.
- When high ice concentrations (very close pack) and/or continuous stable ice conditions prevail, any spilled oil (especially from a subsea blowout) will likely become immobilized and encapsulated within the ice and, therefore, isolated from any contact with airborne or waterborne resources.
- Oil locked up and captured within the ice will be preserved physically and chemically so that its unweathered state upon release (deliberately exposed, or naturally released during break-up) will support combustion.

In addition to the above environmental factors, there are other spill source considerations that should be recognized because they influence the full potential for elimination of spilled oil with burning:

- The spill scenarios associated with Shell's operations in the Beaufort Sea involve the release of oil and gas from a subsea blowout (in contrast to an above-water release such as from a fixed drilling structure). Oil would therefore be released to a relatively small area on the water with initial slicks with widths of typically a few hundred meters or less. Even with the gas-induced flow of oil and water toward the surface and the resulting radial spread of oil outward from the source, the initial area of involvement will be localized and relatively easy to contain and/or deflect with booms.
- Because of the likely release of large quantities of natural gas and vapors from the surfacing oil, it is likely that early ignition of that gas would be desirable as soon as the ~~drillship~~drilling vessel is moved off location. The vapor cloud could be readily ignited using standard ignition procedures, thereby eliminating the accidental ignition of the source when vessels are in close proximity. The early ignition of the source would not only be prudent for safety reasons, it is possible that significant quantities of oil could be eliminated through combustion at or near the source.
- With or without ignition of the blowout, prevailing atmospheric conditions in the Beaufort Sea will support safe operating conditions at or beyond a few hundred meters downwind of the source.

To summarize key points: the nature of oil released to the surface; the oil's limited spread due to reduced temperatures (and possible ice); and the potential for responders to access the oil before it moves far from the source and begins to weather, all enhance the potential for successful recovery and/or burning operations.

Key Combustion Processes

The following discussion summarizes the current state of understanding the scientific principles and physical processes involved with in situ burning of oil on water and ice.

For an oil slick on water or ice to become ignited, the oil must be thick enough to insulate itself from the water beneath it. The igniter can heat the surface of thickened oil to the flash point temperature at which the oil produces sufficient vapors to ignite. The rules of thumb for minimum ignition thickness are listed in Table 3-6.

TABLE 3-6
MINIMUM IGNITABLE OIL THICKNESS ON WATER
(ADAPTED FROM BUIST ET AL., 2003)

OIL TYPE	MINIMUM THICKNESS
Light Crude and Gasoline	1 mm* (0.04 inch)
Weathered Crude and Middle-Distillate Fuel Oils (Diesel and Kerosene)	2 to 3 mm (0.08 to 0.12 inch)
Residual Fuel Oils and Emulsified Crude Oils	10 mm (0.4 inch)

*mm – millimeters

The oil removal rate for in situ oil fires is a function of fire size (or diameter), slick thickness, oil type, and ambient environmental conditions. For most large (greater than 3 m diameter) fires of unemulsified crude oil on water, the “rule- of-thumb” is that the burning consumption rate is 3.5 mm per minute (mm/min). Lighter fuels burn faster while heavier oils and emulsions burn slower, as shown in Table 3-7.

TABLE 3-7
BURN REMOVAL RATES FOR LARGE FIRES ON WATER
(ADAPTED FROM BUIST ET AL., 2003)

OIL TYPE/CONDITION	BURN/REMOVAL RATE
Gasoline >10 mm (0.4 inch) thick	4.5 mm/min (0.18 in/min*)
Distillate Fuels (diesel and kerosene) >10 mm (0.4 inch) thick	4.0 mm/min (0.16 in/min)
Crude Oil >10 mm (0.4 inch) thick	3.5 mm/min (0.14 in/min)
Heavy Residual Fuels >10 mm (0.4 inch) thick	2.0 mm/min (0.08 in/min)
Slick 5 mm thick[1]	90 percent of rate stated above
Slick 2 mm thick[1]	50 percent of rate stated above
Emulsified oil (percent of water content)[2]	Slower than above rates by a factor equal to the water content percent
Estimates of burn/removal rate based on experimental burns and should be accurate to within ±20 percent.	

* inches per minute

1 Thin slicks will naturally extinguish, so this reduction in burn rate only applies at the end of a burn.

2 If ignited, emulsions will burn at a slower rate almost proportional to their water content (a 25-percent water-in-crude-oil emulsion burns about 25 percent slower than the unemulsified crude).

Burn rate is also a function of the size of the fire. Crude oil burn rates increase from 1 mm/min with 3-foot diameter fires to 3.5 mm/min for 15-foot fires and greater. In situ burns on meltwater pools typically consume oil at 1 mm/min. For very large fires, on the order of 50 feet in diameter and larger, burn rates may decrease slightly because there is insufficient air in the middle of the fire to support combustion at 3.5 mm/min. As fire size grows to the 50-foot range, oil type ceases to affect burn rate for the same reason.

An in situ oil fire extinguishes naturally when the slick burns down to a thickness that allows enough heat to pass through the slick to the water to cool the surface of the oil, below the temperature required for sustained combustion. The thickness at which an oil fire on water extinguishes is related to the type of oil and initial slick thickness. The rules of thumb are presented in Table 3-8. Other, secondary factors include environmental effects such as wind (winds greater than 20 knots preclude in situ burning in most cases) current herding of slicks against barriers, and oil weathering.

TABLE 3-8
FIRE EXTINGUISHING SLICK THICKNESS
(ADAPTED FROM BUIST ET AL., 2003)

OIL TYPE/INITIAL SLICK THICKNESS	EXTINGUISHING THICKNESS
Crude Oil up to 20 mm (0.8 inch) thick	1 mm (0.04 inch)
Crude Oil 50 mm (2 inch) thick	2 to 3 mm (0.08 to 0.12 inch)
Distillate Fuels any thickness	1 mm (0.04 inch)

With an estimate of the initial thickness of a fully contained slick, or a measure of the burn time, it is relatively easy to estimate oil removal efficiency by burning. If not all of the slick area is on fire; the calculations need to account for this.

Oil-removal efficiency by in situ burning may be summarized as a function of the following key factors:

- Initial thickness of the slick,
- Thickness of the residue remaining, and
- Amount of the slick's surface that was on fire.

The water current maintains the oil thickness in the apex of a fire-resistant boom under tow, or against an ice edge in wind. When burning in a current, the fire slowly decreases in area until it reaches a size that can no longer support combustion. This herding effect can increase overall burn efficiencies, but it extends the time required to complete each burn.

The residue from a typical, efficient (greater than 85 percent removal) in situ burn of crude oil 10 to 20 mm thick is a semi-solid, tar-like layer that has an appearance similar to the skin on an old can of latex paint that has gelled. For thicker slicks, typical of what might be expected in a towed fire boom (about 150 to 300 mm), the residue can be a solid. Burn residue is usually denser than the original pre-burn oil, and usually does not spread due to its increased viscosity or solid nature.

Most unburned oil or burn residue following combustion would be transported from the vicinity of the blowout by wind or currents. Should any residue remain on the surface in the immediate area, it could be recovered by various means, including the use of booms in open-water conditions downstream of the burn area, or by response personnel using nets, poles, or other simple equipment over the side of small workboats, subject to safe working conditions, weather, and available time. Disposal of any recovered residue would be in accordance with Appendix D.

Tests indicate that the burn residues from efficient burns of heavier crude oils (less than 32 degrees API gravity) may sink once the residue cools, but their acute aquatic toxicity is very low or nonexistent. The *In Situ Burning Guidelines for Alaska* (ADEC, U.S. Environmental Protection Agency [EPA], and USCG, March 2001) state, “The environmental advantages of in situ burning outweigh the potential environmental drawbacks of burn residue, including the possible environmental harm if the burn residue sinks. Therefore, the on-scene coordinators do not consider the potential impacts of burn residue when deciding whether to authorize an in situ burn.” As required under 18 AAC 75.445(h) and 18 AAC 75.425(e)(3)(G), Shell will also submit an Regional Response Team In Situ Burn Application Form to the Unified Command (See Section 1.7), which will include its plans for residue collection and disposal.

Compared with unemulsified slicks, emulsions are much more difficult to ignite and, once ignited, display reduced flame spreading and more sensitivity to wind and wave action. Stable emulsion water contents are typically in the 60 to 80 percent range with some up to 90 percent. The oil in the emulsion cannot reach a temperature higher than 100 degrees Celsius (°C) until the water is either boiled off or removed. The heat from the igniter or from the adjacent burning oil is used first, mostly to boil the water rather than heat the oil.

The following points summarize the effect of water content on the removal efficiency of weathered crude emulsions:

- Little effect on oil removal efficiency (i.e., residue thickness) for water contents up to about 12.5 percent by volume;
- A noticeable decrease in burn efficiency with water contents above 12.5 percent, the decrease being more pronounced with weathered oils;
- Zero burn efficiency for emulsion slicks having water contents of 25 percent or more; and
- Some crudes form meso-stable emulsions that can burn efficiently at much higher water contents; Paraffinic crudes appear to fall into this category.

Fortunately, emulsion formation is slowed dramatically by high ice concentrations and may not be a significant operational factor in planning in situ burns on solid ice or naturally contained in higher concentrations of broken ice.

SL Ross et al. (2003) provides guidelines for burning thin slicks in broken ice with brash and slush, particularly relevant during the break-up and freeze-up shoulder seasons. General rules for minimum ignitable thickness and oil removal rates for burning thin slicks of crude oils on brash and/or slush with broken ice are as follows:

- The minimum ignitable thickness for fresh crude on frazil ice or small brash ice pieces is up to double that on open water, or about 1 to 2 mm.
- The minimum ignitable thickness for evaporated crude oil on frazil ice or small brash ice pieces can be higher than on open water, but is still within the range quoted for weathered crude on water, about 3 mm with gelled gasoline igniters.
- For a given spill diameter, the burn rate in calm conditions is about halved on relatively smooth frazil/slush ice and halved again on rougher, brash ice. Wave action slightly reduces the burn rate on open water, but the halving rule seems to also apply in waves.
- The residue remaining on broken ice in calm conditions is about 50 percent greater than that on open water, or 1.5 mm. The residue remaining on brash or frazil ice in waves is slightly greater than in calm conditions, at about 2 mm.

In summary, in situ burning of oil is efficient and rapid in broken ice conditions under the following conditions:

- The spilled oil is thicker than the minimum required for ignition (a thickness of 2 to 3 mm results in 50 to 66 percent removal efficiency: 10 mm thickness, a typical thickness for wind-herded slicks on melt ponds on ice, gives 90 percent removal efficiency);
- Larger areas can be ignited – a 100-square foot slick on a meltwater pool will burn at 3.5 barrels of oil per hour (boph); a 50-foot diameter, 10-mm thick slick will burn at 300 boph; and a 100-foot diameter slick will burn at 1,200 boph;
- The oil is not more than 25 percent emulsified; and

- Herding in a current and enlarging fire diameters can increase burning rates.

The potential for efficient oil spill response (with or without burning) is strongly tied to the nature and amount of ice present. The following section addresses the seasonal ice conditions in Shell's area of interest in the Beaufort Sea during the proposed drilling season.

Seasonal Ice Conditions

The following general description of the ice environment applies to the nearshore and offshore marine environments in the Alaskan Beaufort Sea, from shore out to the approximate 100-foot isobath representative of Shell's drilling locations. Descriptions cover typical conditions and the variability in ice coverage and timing of the seasonal ice cycles. The focus is on a chronology most applicable to Shell's exploration program, starting with the first evidence of ice melt and clearing along the coast, and ending with the establishment of a stable fast ice cover nearshore and very close pack (9/10 or more) offshore in the November/December period. A brief description of the overall morphology and dynamics of winter ice conditions offshore is provided for completeness. See Dickins and Oasis (2006), Vaudrey (2000), and Atwater (1991) for further details.

May

The major river systems (Colville, Kuparuk, Sagavanirktok, and Colville) overflood the nearshore sea ice between mid-May and early June (average last week in May), based on 16 years of analysis presented in Atwater (1991). In any given year, the different rivers tend to flood within three to four days of each other. The maximum seaward extent of the floodwater reaches the 20-foot isobath between Stump Island and Northstar and the 10-foot isobath off Endicott and Niakuk.

The ice overflood along the coast triggers a rapid progression of local ice decay and break-up, fanning out in shallow water east and west from the major river deltas and eventually leading to an almost continuous open corridor from Harrison Bay to Camden Bay (see June below).

Ice concentrations in the offshore area (outside of the fast ice zone) in May are classified as very close pack ice of 9 to 9.5/10 (90 to 95 percent ice coverage). Recent analysis for the period 1996-2004 by Eicken et al. (2006) shows water depths at the fast ice edge in May off Flaxman Island ranging from 56 feet to more than 150 feet (averaging 98 feet). At this time, a broad open flaw lead often separates the fast ice inshore from the mobile pack ice offshore. This lead is highly variable in width and east/west extent and tends to become much less prevalent towards the end of May, and into June and July.

June

June 1 to July 15: Within the overflood zones, previously bottomfast (grounded) ice in shallow water (less than 6-foot depth) lifts off the seabed and rapidly melts in place. The sea ice overflood often peaks at this time curtailing routine ice road operations. The influx of relatively warm water discharge into the inshore lagoons leads to early opening along shore in June, several weeks ahead of break-up offshore. First open water appears offshore of the Sagavanirktok and Kuparuk rivers in the period June 6 to June 13 and expands to include the lagoon side of West Dock (PM1) by June 17 on average. Fast ice beyond the overflood zones and outside the Barrier Islands is still intact at this time and often more than 5 feet thick in the first half of the month. Melt ponds usually cover less than 10 percent of the floating fast ice.

June 15 to July 25: Nearshore lagoon areas between Oliktok and West Dock, and in shallow waters off the Sagavanirktok delta, are mostly free of ice, and ice is starting to fracture and open south of the Endicott causeway. Further to the east, the initial clearing associated with flooding from the Staines and West Canning rivers expands around Brownlow Point to become contiguous with the much larger clearing off the Canning delta. This connection generally occurs by late June.

The fast ice, still intact outside of the Barrier Islands gradually melts but is typically still 4 to 5 feet thick in many areas. The soft ice surface at this time is often 25 percent covered by meltwater pools that are rapidly deepening and expanding, with visible cracks and fractures. Ice deterioration is accelerated in areas where the surface is contaminated with dirt either left from drainage of overflood waters, or windblown off the nearby land (Vaudrey 2000).

Air temperatures at this time of year average 35 °F and range from 20 to 40 °F. The wind is variable, but blows 60 percent of the time from the east and northeast, averaging 10 knots.

The fast ice can still support heavy equipment and low ground-pressure response vehicles up to the third week of June. The ability to achieve continued mobility on deteriorating sea ice with specific equipment is illustrated in ACS *Technical Manual,* Tactic L-7, based on field trials by Coastal Frontiers (2001).

The offshore area (100-foot water depth and beyond) still experiences 9/10th or greater ice concentration until the last week of June in most years.

<u>July</u>

July 1: By the beginning of July, the open-water areas that originated from the Colville and the Kuparuk rivers typically join to form a continuous band of open water stretching from the south shore of Atigaru Point in Harrison Bay to West Dock (Dickins and Oasis, 2006). By this time, the open water areas, which initially formed off the Shaviovik, Kadleroshik, and Sagavanirktok rivers further west, have also joined to become a continuous coastal pathway of open water. The last nearshore area to clear (one to two weeks later) tends to be the coastal section between Point Thomson and Bullen Point (a coastal area not directly impacted by river overflood). The fast ice at this time is broken and mobile with drifting thick floes of variable concentration out to approximately 5 miles from shore.

In deeper water (Northstar vicinity or 30-foot water depths and beyond), the fast ice is still intact but badly deteriorated and vulnerable to break-up and fracturing by wind action. The ice at this time can still be 3 to 4 feet thick with many visible cracks and approximately 40 to 50 percent of the surface covered by meltwater pools and holes.

July 1 to July 7 (Typical): Break-up begins with fracturing and movement in the remaining floating landfast ice outside the Barrier Islands. The onset of break-up with fast ice in a severely weakened state is usually triggered by a wind event acting on parts of the sheet separated by natural lines of weakness indicated by a series of deep melt ponds or old thermal or stress cracks (Vaudrey in Dickins et al. 2000).

Pack ice concentrations in deeper water offshore (100 feet and vicinity) are typically in the range of 7-8/10th, a 20-percent reduction from the full winter concentration.

July 8 to July 12: Remaining fast ice remnants outside the Barrier Islands, off the Sagavanirktok River delta and in Prudhoe Bay, survive as drifting floes in less than 7/10th concentration. As the winds shift direction, the broken ice floes and pans move back and forth in belts and patches of varying concentrations, all the while melting with a reduction in average floe size. First-year ice continues to deteriorate and break into smaller floes, creating large, highly variable openings in the remaining ice cover (Dickins *et al*. 2000).

July 15 to July 30: Ice-free water exists from shore out to Northstar and sites in equivalent water depths off the Endicott causeway and further east into Mikkelsen Bay. Ice invasions in the nearshore areas after this date are possible, but unlikely (Vaudrey, 2000). Ice concentrations in deeper water steadily diminish through melting and wave and floe interactions over a period of two to three weeks. Remaining broken ice at this time moves back and forth in response to wind shifts, in belts and patches of varying concentrations. By the end of July or the first week of August, the study area typically becomes open water (defined as less than 1/10th ice concentration) out to water depths in the 40- to 65-foot range. Nearshore ice floe diameters rapidly shrink as the remaining fast ice decays and clears, starting out at 500 to 1,000 feet in the early stages and becoming ice cakes 30 to 40 feet in diameter by the third week in July.

Conditions in deeper water sites in the last half of July are highly variable, ranging from open water in unusually mild years (two years in ten) to a more typical condition of 7 to 8/10th thick first-year ice with floe sizes in the medium to big category (300 to 1,500 feet and 1500 to 6500 feet). Periods of intermediate concentrations (4 to 6/10th) can occur in mid- to late July, but these conditions tend to be short lived.

August to September

Offshore, the first half of August typically encompasses the last stages of break-up, with open drift ice concentrations ranging from 2 to 6/10th. Extreme years can see variable patches of close pack ice in high concentrations during this period. Floe sizes range from small to medium for the predominantly first-year ice (60 to 300 feet and 300 to 1,500 feet). Multi-year ice is often present in trace amounts (a few percent in coverage or much less than 1/10th) and rarely occurs in significant concentrations in the vicinity of Shell's drilling locations at this time of year (maximum reported 4/10th in two of the last ten years; Source: Canadian Ice Service charts). Summer multi-year floe sizes tend to be larger than the surviving first-year pack (up to thousands of feet in diameter).

The nearshore area previously covered in stable ice, the winter fast ice zone, is completely open by the beginning of August in most years. Once established, open-water conditions in the coastal nearshore lagoon areas and adjacent to the Barrier Islands (typically in less than 10-foot water depths) generally prevail until freeze-up (see below). For example, there are no reported instances of drift ice entering the lagoon areas between Brownlow Point and Bullen Point during the summer months of August or September. The median duration of open water in the lagoon areas is 12 weeks, with a variability of up to two weeks representing summers better or worse than average in terms of break-up and freeze-up (Dickins, 1984). Immediately outside of the Barrier Islands (out to approximately the 50-foot water depth), the duration of open water drops by about two weeks, and in some summers can be further reduced by several weeks through temporary pack ice invasions.

In the vicinity of the Shell's drilling locations, the average duration of open water (defined as 1/10th or less pack ice) is 7.5 weeks, with the most consistent period of continuous open water beginning mid-August and ending with first complete coverage of new ice in deep water in mid- to late October (based on a review of historical ice charts from 1997 to 2006).

Air temperatures average 40 °F in July and August, dropping to 30 °F in September. Wind blows from the east and northeast 50 percent of the time, and west and southwest 20 percent of the time, averaging 13 knots.

October

Freeze-up begins along shore in shallow water on October 4, ±8 days (Vaudrey, 2000). Ice becomes fast for the season within one week following freeze-up in the nearshore lagoons and at coastal locations such as Point McIntyre 2 and Niakuk. In deeper water north of the Barrier Islands (10 to 50 feet), the first continuous sheet forms on average by October 15 (Dickins and Oasis, 2006). By late October, ice movements inshore of the 30-foot water depth are infrequent, and the sheet is considered relatively stable. Air temperatures at freeze-up range from 5 °F to 15 °F. Daylight in October is typically 9 to 10 hours per day (longer if twilight is included).

Additional time is required for the young fast ice sheet to gain sufficient thickness and stability to be judged safe for over-ice operations. Depending on location, the total time from initial freeze-up to being able to commence on-ice operations with response equipment ranges on average from 40 to 43 days at coastal or nearshore locations such as Niakuk and Endicott, to 55 days at the Northstar Production Island (Vaudrey, 2000).

November to December

An expanding fast ice zone, increasing in stability as the ice grows, characterizes this period. The young floating fast ice sheet outside the Barrier Islands is still vulnerable to break-up by storm events and positive surges in water levels until December in extreme years. At the nilas stage (defined as new ice less than 10 centimeters thick) a moderate storm with winds over 20 knots can quickly break up the entire ice sheet.

For grey and grey-white ice between 4 and 12 inches, there is potential for break-up and/or substantial deformation and movement in strong winds over 27 knots. Storms of this severity in October and November are uncommon, on the order of two events during a ten-year period (Vaudrey, 2000).

The risk of substantial ice movements decreases sharply once the ice is greater than 12 inches. Extreme cases have been documented where portions of the land-fast ice have experienced substantial movement in early winter, but these are considered rare events. Vaudrey (2000) recounts only one year in 12 when a 20-inch thick ice sheet (a condition reached by late November in most years) moved 100 to 200 feet in the vicinity of Northstar. Movements of this magnitude would not result in visible open water, with the ice motion being absorbed by ridging and rubble formation.

During December when the floating fast ice reaches between 1.5 to 3 feet thick, ice motions are reduced to a range of 10 to 15 feet, based on measurements in 20 feet of water off the Barrier Islands to the west of Prudhoe Bay (Vaudrey, 1996).

The fast ice edge in early winter expands seaward from an average water depth of 15 feet in October and November, to 40 to 45 feet in December (Eicken et al., 2006 based on data at 146 deg W Long).

Beyond the fast ice edge and active shear zone, the pack ice can be divided into a highly active, often constantly deforming transition zone (seasonal pack) comprised of mostly first-year ice of highly variable age and thickness, and a more homogeneous polar pack with predominantly old (multi-year) ice. The polar pack edge (50 percent or greater coverage of multi-year ice) occurs in much deeper water well north of all of the proposed drilling locations.

In the early winter period (November to December) the transitional pack ice zone in the vicinity of the 100-foot water depth is comprised almost totally of first-year ice. No multi-year ice beyond trace amounts (much less than 10 percent coverage) was reported in the October to December time frame over the past ten years (1997-2006). The early winter pack ice consists of a mix of ice ages, from young ice less than 12 inches thick to thin first-year ice up to 27 inches. Once the ice begins to raft and rubble in November, level ice becomes the exception and much of the ice surface will represent some form of deformation process including the active formation of pressure ridges in December.

Pack ice moves in a meandering, net westerly drift in response to wind and currents. As the winter progresses and the pack becomes thicker and more consolidated, there are periods when little or no ice movement occurs in deep water. For example, a long-term ice drift record over seven seasons shows that the monthly incidence of no ice motion typically increases from around 20 percent in November to between 30 and 40 percent in December (Melling and Reidel, 2004). During these periods of static offshore ice, the boundary between the fast ice and pack ice zones can become blurred and indistinct. In these situations, mapping the boundary becomes a matter of interpreting the significance of a particular lead or crack.

When the pack ice is in its more typical dynamic drift mode, the fast ice boundary is clearly defined by a zone of massive shear and compression ridges stretching for hundreds of miles off the Alaskan North Coast. Many of these ridges can be grounded in water depths out to 80 feet with dramatic surface elevations up to 50 feet in some cases. The most active shear zone of severe ice deformation tends to be fairly narrow and concentrated between about 50 and 70 feet of water with no distinct east/west trends in severity (in some years it can extend into greater depths). In some areas a string of known shoals (e.g. Stamukhi off Oliktok) act to nucleate islands of grounded ice with dramatic fields of severe ridges and rubble (Kovacs, 1976; Reimnitz, 1984).

January to April

During the winter period of active ice growth, the fast ice continues to expand seaward reaching beyond 70 feet of water by February. The maximum fast ice extent occurs during the months of March to May when the water depths at the average edge position (off Flaxman Island) reach 100 feet, much deeper than the 60 feet boundary often discussed in earlier references (Eicken et al., 2006).

During the winter, east/west oriented leads (shore following) are common within the seasonal pack ice zone in water depths from 100 to 150 feet. Many of these leads will have widths ranging from hundreds of meters to miles and continue without blockage for long distances. In one study (Dickins, 1979), over half of all satellite images collected in the March to May time period showed distinct leads in this zone, becoming more frequent from west to east. Eicken et al. (2006) provides an extensive analysis of lead distributions, orientations, and dimensions within the pack ice zone.

The net mid-winter pack ice drift off the North Slope is to the west. On an hourly basis, pack ice motion tends to be episodic and meandering. In general, ice speeds are at a maximum (5 to 7 nm per day) with large expanses of young ice offshore in November and December, and decrease as the ice pack thickens and becomes more consolidated through January and February. Average pack ice drift speeds reach their minimum in March and April with typical values of 1.5 to 2.7 nm per day (Melling and Riedel, 2004). Four buoys were deployed by the USCG in the Beaufort nearshore between 1980 and 1985 in the winter period with high ice concentrations. Most of the buoy drift tracks of interest fell between 142°W and 150°W longitude in water depths from 60 to 200 feet. Results are summarized in Dickins (1984). The general movement trend and net drift was predominantly to the northwest, but there were also substantial periods when the buoys moved in other directions. For 40 to 60 percent of the recorded periods, the ice appeared to move without a persistent sense of direction (wallowing, meandering, or static). Vaudrey (2000) summarized the available historical ice movement data from a range of sources utilizing satellite drifter buoys from 1975 to 1996. Table 3-9 shows daily averages for longer-term ice movements. Short-term ice drift speeds (over periods of 2 to 6 hours) can be significantly higher, in the range of 1 to 2 knots using 4 to 5 percent of the wind speed, as a rule of thumb.

TABLE 3-9
EXCEEDANCE PROBABILITY DISTRIBUTIONS OF ICE DRIFT SPEEDS

	PERCENT > NET DAILY ICE MOVEMENT RATE (knots)							AVERAGE
SEASON	>0.2	>0.4	>0.6	>0.8	>1.0	>1.5	>2.0	SPEED (knots)
Freeze-Up	50.0	17.7	8.1	3.8	1.9	0.4	0.3	0.3
Break-Up	34.0	14.4	6.2	2.8	0.8	0	0	0.2

Operational Preparedness

Shell and its contractor, ASRC Energy Services (AES), together with ACS maintain a comprehensive inventory of equipment to initiate and sustain in situ burning operations throughout the proposed drilling season. The Shell *Beaufort and Chukchi Seas Regional Tactics Manual* and the ACS *Technical Manual* contain specific tactical guidelines for the offshore operations with and without ice. Many of these tactics (e.g., Regional Tactics OR-1B, OR-2B, and OR-4B and ACS Tactic R-20) illustrate ways to intercept oil with an open-apex U-boom configuration so that thin or scattered oil slicks can be concentrated for recovery or captured downstream of the open-apex for burning within a fire boom.

Some of the tactics within each manual are specific with guidelines for implementing and sustaining burning on open water and in the presence of ice (e.g., Regional Tactic OR-7 and ACS Tactics B-3, B-4, B-5, B-6 and B-7). These tactics are incorporated here by reference, along with shoreline concepts for burning nearshore in Section 1.6.12, Shoreline Cleanup.

ACS conducts in situ burn training seven to eight times a year at different North Slope locations. Typical courses involve at least one hour of classroom instruction and one hour of field exercises involving basic combustion theory, guidelines for safe operating procedures, and gelled fuel mixing and Heli-Torch deployment. Shell/AES personnel are also instructed on these same guidelines and procedures as they relate to the potential use of controlled burning offshore. ACS and AES maintain an inventory of specialized response equipment to support a large-scale burn operation as follows:

TABLE 3-10
INVENTORY OF IN SITU BURNING EQUIPMENT (ACS AND AES)

EQUIPMENT	QUANTITY
ACS	
Fire Boom (20”, 30” and 40” skirts)	19,000 feet
Heli-Torch (55 gal.)	6
Heli-Torch (300 gal.)	2
Heli-Torch SureFire gel	1,200 lb.
Air Deployable Igniters	>1,400
Heli-Torch Batch Mixers (gelled fuel)	2
AES	
HydoFire Boom (500’ per system)	2
Cooling Water Pumps and Hoses	2

In addition, ACS and AES maintain all appropriate logistical support for controlled burning, including boom-tending vessels, helicopters, and vessels to transport and deploy equipment and ignition systems and fire extinguishers.

Regulatory approval must first be obtained before using in situ burning, depending on whether the burning operations will be conducted in federal or state waters. The ACS *Technical Manual* (Tactic B-1) contains steps that should be followed in reaching the decision to use in situ burning. As part of the approval process the Regional Response Team In Situ Burn Application Form will be submitted to the Unified Command according to the ARRT Unified Plan for Alaska, Appendix 2, Annex F, *In Situ Burning Guidelines for Alaska*. An incident-specific burn plan is contained within the application.

Once relevant state and federal approval have been obtained, the following steps are normally taken to implement the response:

- Use towed open-apex boom configuration(s), as necessary, to concentrate and release oil directly into fire-resistant booms. Conventional boom may be used for this operation.
- Collect and contain the oil using fire-resistant booms. Re-locate the contained oil a safe distance from the open-apex configuration and other vessels.
- In light ice cover (with ice-deflection/management support), collect and contain oil using fire-resistant booms.
- In higher ice concentrations, locate naturally occurring pools of thick oil.
- As appropriate, use fire monitors and/or prop-wash to gently direct oil into heavier concentrations against ice floes or densely packed ice cakes. Wind may provide such desired herding of oil naturally.
- Ignite the oil using the Heli-Torch or hand-held igniters, following established safety procedures to avoid flashback or ignition of any ongoing spill source.
- Monitor the burn, maintaining constant watch on the fire and smoke plume. Maintain a careful assessment of fire boom condition (if used) and other safety hazards and issues as appropriate.
- Make every effort to recover and dispose of the burn residue.

Safety procedures and planning in accordance with established guidelines are emphasized throughout the training, preparation, and conduct of in situ burning operations.

In situ burns are monitored to ensure fire does not spread to any uncontained oil nearby and burns are conducted at safe operating distances from all vessels and personnel on location. Personnel and equipment used in conducting the operation are kept at safe distances from the spill source (ongoing natural gas normally already ignited). The safe working distances from an in situ fire on water depend on the size of the fire and the exposure time, and are summarized in Table 3-11.

TABLE 3-11
SAFE WORKING DISTANCES FROM THE FIRE

PERSONNEL EXPOSURE TIME	PERSONNEL MINIMUM DISTANCE FROM FIRE (FIRE DIAMETERS)
Indefinite	4
30 minutes	3
5 minutes	2

Aerial ignition with gelled fuel from a Heli-Torch, or with other ignition devices, is coordinated, taking into account prevailing weather conditions, oil pool size and distribution, and the need for strict adherence to established safety practices.

ACS and AES personnel practice the techniques involved with controlled in situ burning at sea that could involve several vessels and aircraft working in close proximity.

Effectiveness of In Situ Burning in Open Water and in Ice

The consensus of research on spill response with in situ burning of oil on open water and with ice is that burning is an effective technique with removal rates of 85 to 95 percent in most situations (Shell et al. 1983; SL Ross 1983; SL Ross and DF Dickins 1987; Allen 1990; Allen 1991; Allen and Ferek 1993; and Singsaas et al. 1994). A considerable amount of research has demonstrated the success of in situ burning in broken ice. The research includes several smaller-scale field and tank tests (SL Ross et al. 2003; Shell et al. 1983; Brown and Goodman 1986; Buist and Dickins 1987; Smith and Diaz 1987; Bech et al. 1993; and Guénette and Wighus 1996) and one large field test (Singsaas et al. 1994). Most of the tests involved large volumes of oil placed in a static test field of broken ice resulting in substantial slick thicknesses for ignition. Tests in unrestricted ice fields or in moving ice have indicated that the efficacy of in situ burning is sensitive to ice concentration and dynamics, and thus, the tendency for the ice floes to naturally contain the oil, the thickness (or coverage) of oil in leads between floes, and the presence or absence of brash or frazil ice which can absorb the oil.

The feasibility and efficiency of burning oil from a subsea blowout in the Beaufort Sea will depend in large part on the nature of the oil as it surfaces and upon the nature and amount of ice present (if any). Studies within Shell have revealed that oil and gas from a subsea blowout (best represented by gas and oil flow rate characteristics from nearby reservoirs) could result in the atomization of oil due to turbulence from the gas plume. With this type of release, small droplets of oil would rise, along with the expanding gas, toward the surface where induced currents would then carry the oil droplets out radially from the source. Little, if any, emulsification is expected during the transport of oil toward the surface; however, within hours (depending upon the actual oil, wind/sea conditions) emulsification could reach levels that would make ignition difficult to impossible. The potential emulsification of the oil, together with the initial distribution of the oil droplets are factors that must be considered as one considers the potential use of in situ burning for the elimination of oil at or immediately downstream of the blowout.

The following information addresses the practicality of burning in open water and with varying concentrations of ice while recognizing the effects currents (primarily wind-driven) could have on the distribution of oil and, therefore, the feasibility of collecting and igniting the oil.

Open Water with Current

The initial distribution of the surfacing oil droplets in open water could involve a surface area with a diameter of several hundred meters. The outer reaches of this area would involve a relatively small percentage of the total blowout release as the largest droplets would surface more quickly near the center; and the smallest droplets would rise more slowly, riding with the induced currents to the outer regions of the slick. Depending on the current moving over the blowout, the oil droplets could surface into a clean (or relatively clear) water surface, where their initial spread would result in slicks that are too thin to support combustion (likely on the order of a tenth of a millimeter). Under these conditions (open water with current), combustion could effectively consume the free gas surfacing at the blowout; however, the relatively thin slicks would not support sustained combustion of the oil (typically requiring a 2 to 3 mm layer thickness). Authorization for ignition of the gas cloud directly over the blowout would normally be requested as early as possible to avoid any risk of exposure to personnel on location and any accidental ignition that could expose personnel and equipment to fire.

Burning of the oil in this situation would require containment or deflection with boom to concentrate and thicken the oil while it is relatively fresh and unemulsified. Towed open-apex boom configurations could be used downstream of the blowout to thicken and release concentrated bands of oil into fire boom being towed in a U-configuration. Once such fire booms reach their holding capacity, they could be moved a safe distance from the open-apex, where ignition and sustained combustion could be quite successful.

While burning the contained oil, a second fire boom could be positioned downstream of the open-apex to collect oil for a second burn. The elimination of oil at the first boom could easily be completed in time to relieve the second collection effort before the fire boom reaches its holding capacity.

Open Water with Little or No Current

Should oil and gas be released from the seabed with little or no current, it is likely that authorization would have been secured (as in the previous scenario) to ignite the free gas directly over the blowout to avoid harmful exposures to personnel and any accidental ignition of the gas plume. Without current to sweep surfaced oil away from the blowout, there would be an accumulation of oil droplets at the surface allowing for the build up and re-coalescence of those droplets into a layer that could support combustion. In this case, it is likely that the heat generated by the burning of free gas would be sufficient to ignite vapors from the surfacing oil, thereby enlarging the burn area and removing a substantial portion of the blowout.

In this situation, it would not be necessary to use fire boom or to position personnel and equipment anywhere near the surfacing oil. The efficiency of removal by burning, however, could be improved if it was safe to deploy fire boom in a U-configuration at and immediately downstream of the surfacing oil and gas. The positioning of fire boom in this mode could be carried out safely if there was at least a light wind and/or a slight current that could carry the burning oil back into the apex of the U-configuration. Two boom-towing boats could be positioned well upstream of the surfacing oil and gas (using longer than normal tow lines) at a distance that would preclude any unsafe exposure to heat and smoke from the fire. Effective burning could be carried out without personnel, boats, and boom when the surfacing oil is held naturally at and near the spill source. In fact, the heated air rising above the blowout would produce a thermally-induced wind along the surface working radially in toward the fire. Even a very light breeze of this kind could help reduce spreading of the oil and maintain oil thickness for improved combustion. If currents less than 1 knot and/or light winds were available to move the burning oil away from the source, boom-tending boats could work at a safe distance from the burning source, and substantially improve the efficiency of burn.

Low-to-Moderate Ice Concentrations (with and without current)

Even at ice concentrations of a couple of tenths, there could be sufficient ice (depending on the size and distribution of the ice pieces) to reduce the effectiveness of conventional fire booms for the collection of oil. If the distribution of ice is such that ice could not be avoided or deflected away from the opening of a boom configuration, and ice could therefore accumulate to high concentrations within the boom, then boom could not be used effectively. Often, however, low ice concentrations are present as discontinuous wind-consolidated strips separated by broad open-water areas that may allow for the limited use of boom to capture oil. In more scattered ice concentrations, responders could access oil at low speeds and encounter rates between ice floes. At such low ice concentrations, there are times when burning could be conducted with fire boom.

Should broken ice (from as little as 2 to 3/10th to as high as 7 to 8/10th concentration) move into and over the blowout, the ice could actually help in a number of ways. The ice would tend to dampen waves, reduce surface spreading radially over the blowout, and promote re-coalescence of the surfacing oil droplets in the reduced water surface between ice cakes or floes. Under these conditions, there would be an increased potential for the accumulation of oil on water at thicknesses that could support sustained combustion.

As long as the ice concentrations do not become excessive (greater than 8 to 9/10th) and/or the ice is under pressure, there should remain sufficient oil-on-water area to support combustion. Also, as in the previous open-water scenarios, if water movement over the blowout drops to little or no current, the increased accumulation of oil between oil floes would only enhance the overall efficiency of burn. Induced radial currents over and adjacent to the blowout may prevent much of the oil from sticking to the underside of ice cakes and small floes. Most oil would therefore be exposed for combustion while it is fresh and relatively unemulsified. Should the natural floes be large enough to entrap some of the oil beneath them and keep the oil from surfacing, efforts could be initiated with icebreakers well upstream of the blowout to break such ice into smaller pieces or deflect large floes away from the blowout. Ice management is a proven technique that can completely modify the composition of the ice moving over a drilling location. For example, the successful 2004 coring program at 88°N saw two icebreakers work to maintain the ~~drillship~~drilling vessel on location in high concentrations of 7- to 9-foot ice. Floes drifting towards the drill site were over 3,000 feet in diameter. By the time they arrived, the icebreakers had reduced the average ice piece size to between 35 and 43 feet (Keinonen et al., 2006). In addition to managing the floe sizes, oil could be dislodged from the underside of ice (before it becomes encapsulated within the ice) using prop-wash from vessels on location.

Another approach that could enhance combustion with moving ice concentrations involves the use of large ice deflection barriers such as a barge with tug assist or a vessel with dynamic positioning. Shell has conducted extensive mathematical and ice-tank modeling efforts to show that such large-scale deflection of ice appears safe and feasible for the creation of a relatively ice-free surface downstream of the deflection operation. Pending the results of full-scale trials with ice, it is likely that moving broken ice and early freeze-up ice (new ice, nilas) could be deflected with a barge or vessel positioned sideways to the current/ice flow. Temporary paths of relatively open water several hundred feet wide could be created downstream of the deflection system to facilitate the use of conventional containment and recovery tactics and/or the use of fire boom in a conventional burn mode.

High Ice Concentrations and Continuous Layers of New Ice in Early Winter

The movement of a continuous layer of new ice or very high ice concentrations of ice over a subsea blowout could reduce the effective use of in situ burning. There could be a reduction in the air/water surface area to accumulate oil and allow for efficient sustained combustion. This could be remedied in two ways: one involving the natural processes, and the other involving ice management. Experience has shown that large gas accumulations beneath ice will accumulate and rupture continuous ice layers (Dickins and Buist, 1981) during early freeze-up. The ice would likely break up and move out and away from the blowout, rafting and accumulating to create a natural barrier within which burning of the oil and free gas could take place. The other remedy involves the use of large ice deflection systems upstream of the blowout as described above. Such deflection would provide an opening for burning on ice until prevented by excessive ice thickness. If the ice was continuous (even at relatively thin layers of 3 to 6 inches) tank test results suggest that it would be necessary to use icebreakers forward of the deflection system. As long as the ice could be broken, and it is not too thick or pressured, it is possible that a relatively ice-free path could be opened just forward (or upstream) of the blowout. Oil (even widely scattered particles) surfacing within the cleared path downstream of the deflection system would soon be trapped within the downstream opening bounded on each side by ice. Even if bounded by broken ice and slush, these “walls of ice” would help contain and limit the spread of oil. The ice boundaries would provide considerable natural containment for the oil and enhance the potential for elimination by burning.

As the ice boundaries continue to collapse inward on the cleared path of nearly open water, any contained oil would build in thickness, improving its condition for sustained and efficient combustion. Burning could take place in that ice-contained pocket as it moves away from the blowout. If the blowout was sufficient in flow rate and/or the currents were low, the ~~build up~~buildup of oil at and immediately downstream of the blowout could be thick enough to support an ongoing, efficient elimination of oil..

If conditions make it impossible or impractical to use the ice-deflection system, oil could surface beneath the continuous or solidly-packed ice field where it would quickly become immobilized at the ice/water interface. If left undisturbed, new ice growth would soon provide a “lip” around the oil (typically within hours to a day, depending on air temperature and ice thickness), further ensuring that the oil would not migrate out over a larger area. Typically within a day or two, new ice would completely surround the oil, encapsulating, immobilizing, and preserving the condition of the oil. One could elect to simply mark and track the oil-encapsulated ice for removal when the ice is safe to work on, or the oil could be tracked until spring. At that time, the oil would become exposed at the surface through brine-channel migration or through surface meltdown to the small, entrapped oil droplets. The location and “mining” of oil from solid ice continues to be tested and enhanced; and, as long as it is safe to access the oiled ice by helicopter, these tactics could be implemented throughout most of the winter months. Of equal importance is the success with which oil has been burned after surfacing into meltwater pools in the spring. The elimination of evaporation, emulsification, and other weathering phenomena while the oil is frozen within the ice, makes it possible to burn the exposed oil safely and efficiently using well-established aerial ignition techniques.

Another tactic during this early freeze-up phase involves the use of vessels to break the newly formed ice with oil beneath or about to be encapsulated within the ice. By breaking the ice and using the vessel’s prop-wash to dislodge oil from below the ice, oil can be flushed to the surface and trapped on or between pieces of ice. If there is sufficient oil present, the oil could be ignited and burned.

Very Close Winter Pack Ice (greater than 9/10th)

There is the possibility that an incursion of older, multi-year ice could move in over a subsea blowout; and a blowout could continue into the winter months, exposing it to a mix of growing first-year and multi-year ice. While highly unlikely (noting the lack of significant multi-year ice incursions at Shell’s drill sites discussed in the previous section), this scenario could involve the deposition of oil and gas beneath the closely packed ice floes. Depending on the ice thickness and the volume of gas released with the blowout, the ice cover could fracture, thereby exposing both oil and gas at the surface. Depending on the current and the rate of ice transport over the blowout, the rupturing of the ice could provide sufficient oil/gas exposure to support combustion. Previous studies of the possible effects of gas bubbles under the ice concluded that ice rupturing and gas/oil venting was likely with ice sheets up to 3 feet thick (Dickins and Buist, 1981).

In this situation, it might be possible to keep some of the larger icebreakers on location until it is no longer feasible to physically break the ice forward and/or downstream of the blowout. Between natural rupturing of the ice (gas lift) and deliberate break-up with icebreakers, every effort would be made to entrap oil at or near the surface for immediate combustion or for enhanced combustion later during break-up.

As in the previous scenario with high ice concentrations, a mid-winter response could (if it is safe to access the oiled ice) involve the location and recovery of oil using on-ice “mining” techniques. Promising results of tests with ground-penetrating radar and other remote sensing systems could lead to the development and refinement of detection and tracking techniques for oil that is trapped deep within a thick ice layer (Dickins et al., 2006). Should the location and removal of oil be impractical during the winter months, oil deposited beneath and trapped within the ice in this way could be dealt with (as described above) when it becomes naturally exposed in the spring/summer period.

3.4.4 Hours of Daylight and Visibility

In the event of adverse weather, flight limitations caused by adverse ceiling and visibility combinations may restrict offshore operations and response. For example, Shell's company policy on visual flight rules (VFR) sets the lower limits at 500-foot cloud ceiling and/or one mile forward visibility. In the Prudhoe Bay area, the break-up period in July and August has the highest probability of low visibility conditions (approximately 25 percent cumulative probability less than one mile). In contrast, the freeze-up period in October is characterized by a lower probability of low visibility (17 percent less than one mile). Hours of daylight are close to their greatest extent during break-up in August (21 hours average for the month) and reduce through the summer to average 11 hours in October. In practice, twilight increases the available operational time beyond the strict definition of daylight (sunrise to sunset). Strict adherence to the Ice Management Plan and continuous risk assessment allows for the safety of both equipment and personnel.

See ACS *Technical Manual*, Tactic L-7. Also see Section 2.4.5 for further discussion.

3.5 LOGISTICAL SUPPORT [18 AAC 75.425(e)(3)(E)]

The Logistics Section Chief is responsible for providing facilities, transportation, and communications services and material in support of the incident. The Logistics Services Branch may include communications, information technology, medical, and food units. The Support Branch may include transportation, personnel, equipment, facilities, and supplies.

Logistical support for spill response is provided through response contractors. Table 3-12 contains a list of vendors in Alaska that may be called upon to support Shell's spill response operations.

Depending on the severity of a situation, federal and state logistics may also support the response. Examples of these functions include ordering, tracking, and servicing government resources; arranging for transportation and lodging for government response staff; providing communications to government oversight staff; and performing other logistical functions specifically in support of the government oversight role. These governmental functions may become an integral part of the overall Logistics Section should Shell establish a Mutual Aid agreement with government agencies.

TABLE 3-12
LOGISTICAL SUPPORT CONTRACTORS

COMPANY	SERVICES	CONTACT
TRANSPORTATION		
Era Helicopters 6160 Carl Brady Drive Anchorage, AK 99502	Rotary-wing Passenger Transport, Medivac, Small Cargo, Aerial Ignition	(907) 248-4422 (907) 550-8600
Peninsula Airways, Inc. 6100 Boeing Avenue Anchorage, AK 99502	Fixed-wing Passenger Transport, Cargo Transport, Medivac	(907) 243-2485
Frontier Flying Service 5245 Airport Industrial Road Fairbanks, AK 99709	Fixed-wing Passenger Transport, Cargo Transport, Medivac	(907) 450-7250 800-478-6779
Carlile Transportation Systems 1800 East 1st Avenue Anchorage AK 99501	Ground Transportation	(907) 276-7797 800-478-1853
Lynden Transport 3027 Rampart Drive Anchorage, AK 99501	Ground Transportation	(907) 276-4800 800-326-5702
COMMUNICATIONS		
Alaska Telecom 6623 Brayton Drive Anchorage, AK 999507	Remote Site Systems, Microwave/Satellite Radio Systems, VHF/UHF handheld radios, satellite and cellular telephones	(907) 344-1223
Wire-Com - UIC 6700 Arctic Spur Road Anchorage, AK 99518	Communications, Data & Electrical	(907) 563-2240
ProComm/Motorola 4831 Old Seward Hwy Suite 111 Anchorage, AK	Radio Communications Motorola Service Wireless	(907) 563-1176
North Slope Telecom 2020 E Dowling #3 Anchorage, AK	Telecommunications Services Feasibility Studies & System Design Operations and Maintenance Services Aviation, Marine, & Power Systems	(907) 562-4693
GCI 2550 Denali Street Suite 1000 Anchorage, AK 99503	Cellular Services, Local and Long-distance telephone service, wide area network (WAN) connectivity within AK and lower 48 states. Internet service (dial, DSL, T1)	(907) 265-5600
ASTAC 4300 B Street Suite 500 Anchorage, AK 99503	Local & long-distance telephone service, Internet service (DSL, dial, wireless) cellular service	(907) 563-3989
AT&T Alascom 505 E. Bluff Drive Anchorage, AK 99501	Long-distance telephone service, Internet service, and WAN connectivity within AK and lower 48.	800-620-6520
FACILITIES		
Marsh Creek LLC 2000 E. 88th Avenue, Suite 100 Anchorage, AK 99507	Housekeeping and Catering	907-258-0050
Arctic Structures 9312 Vanguard Dr Anchorage, AK 99507	Planning, Design, and Construction of Remote Camps Metal and Modular buildings.	(907) 522-2425

TABLE 3-12 (CONTINUED)
LOGISTICAL SUPPORT CONTRACTORS

COMPANY	SERVICES	CONTACT
Taiga Ventures 2700 S Cushman St Fairbanks, AK 99701	Remote Camps Camp Services Drilling Supplies	(907) 452-6631
PacificRim Logistics 737 W. 5th Ave Suite 209 Anchorage, AK 99501	Remote Logistics Transportation Services	(907) 277-5191
Bering Marine 6441 S. Airpark Place Anchorage, AK 99502	Barge Camps	(907) 248-7646
Doyon Universal Services, LLC 701 W Eighth Ave Suite 500 Anchorage, AK 99501	Camps and Catering	(907) 522-1300

~~COMPANY~~	~~SERVICES~~	~~CONTACT~~
~~TRANSPORTATION~~		
~~Era Helicopters~~ ~~6160 Carl Brady Drive~~ ~~Anchorage, Alaska 99502~~	~~Rotary-wing passenger transport, medivac, small cargo, aerial ignition~~	~~907-248-4422~~
~~Peninsula Airways, Inc.~~ ~~6100 Boeing Avenue~~ ~~Anchorage, AK 99502~~	~~Fixed-wing passenger transport, cargo transport, medivac~~	~~907-243-2485~~
~~Frontier Flying Service~~ ~~5245 Airport Industrial Road~~ ~~Fairbanks, AK. 99709~~	~~Fixed-wing passenger transport, cargo transport, medivac~~	~~907-450-7250~~
~~Carlile Transportation Systems~~ ~~1800 East 1st Avenue~~ ~~Anchorage AK 99501~~	~~Ground transportation~~	~~907-276-7797~~ ~~1-800-478-1853~~
~~Lynden Transport~~ ~~3027 Rampart Drive~~ ~~Anchorage, AK 99501~~	~~Ground transportation~~	~~907-276-4800~~ ~~1-800-326-5702~~
~~COMMUNICATIONS~~		
~~Alaska Telecom~~ ~~6623 Brayton Drive~~ ~~Anchorage, AK 999507~~	~~Remote site systems, microwave/satellite radio systems, vhf/uhf hand-held radios, satellite, and cellular telephones~~	~~(907) 344-1223~~
~~GCI~~ ~~2550 Denali Street~~ ~~Anchorage, AK 99503~~	~~Cellular services, local and long-distance phone service, WAN connectivity within Alaska and Lower 48 states; internet service (dial, DSL, T1)~~	~~(907) 868-7000~~
~~ASTAC~~ ~~4300 B Street~~ ~~Anchorage, AK 99503~~	~~Local and long-distance phone service; internet service (DSL, Dial, wireless); cellular service~~	~~(907) 544-2663~~
~~AT&T Alascom~~ ~~505 E. Bluff Drive~~ ~~Anchorage, AK 99501~~	~~Long-distance phone service, internet service, and WAN connectivity within Alaska and Lower 48.~~	~~(800) 478-9000~~
~~FACILITIES~~		
~~Marsh Creek LLC~~ ~~2800 E. 88th Avenue, Suite 200~~ ~~Anchorage, AK 99507~~	~~Housekeeping and catering~~	~~907-258-0050~~

The equipment described in the logistics tactics of the ACS *Technical Manual* and the response equipment is discussed in Section 1.6. ACS *Technical Manual* Tactic L-9 provides technical information on aircraft.

Please refer to Appendix A for additional technical information regarding the helicopters to be used for offshore services.

3.6 RESPONSE EQUIPMENT [18 AAC 75.425(e)(3)(F)]

This section is intended to provide additional information and lists of equipment to be used to conduct mechanical recovery of oil spill fluids and other response activities as discussed in Section 1.6.

A list of the mechanical response equipment is also provided in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual* and in the ACS *Technical Manual.*

3.6.1 Equipment Lists

Spill response equipment is available for offshore operations and through ACS for nearshore and shoreline activities. The major pieces of on-site response equipment are catalogued in Tables 1-16~~15~~, 1-17~~16~~, and 1-18~~17~~ in Section 1.6.13. Additional available equipment is listed in the ACS *Technical Manual*. A list of typical on-site response equipment pre-staged at a drill site is provided in Table 3-13.

TABLE 3-13
TYPICAL ON-SITE SPILL RESPONSE EQUIPMENT
DRILLING CONNEX AND OTHER CRITICAL SUPPLIES

DESCRIPTION	QUANTITY	UNIT
GENERAL SAFETY		
Small first aid kit	1	Each
PPE		
Rubber boots	3	Pair
Rain gear (top and bottom)	6	Set
Goggles, splash	6	Pair
Rubber gloves	6	Pair
Cotton gloves	6	Pair
Tyvek® suits, XXX-large	1	Box
SORBENT		
Sorbent roll (36-in. x 150-ft.)	4	Each
Sorbent boom (5-in. x 40-ft.)	4	Each
18-in. x 18-in. sorbent pads/bale	5	Bale
18-in. x 18-in. glycol sorbent pads/bale	2	Bale
RECOVERY		
Large Brush Skimmers	1	Each
Vertical Rope Mop	2	Each
Mini Brush Skimmers	2	Each
Rubber-Max Boom – 200m Boom Sections	8	Each
Rubber-Max Boom – Boom reels	8	Each
Rubber-Max Boom – Power Packs	4	Each
Rubber-Max Boom – Tow Gear Kits	9	Each
Fire Boom System – In Situ Burning	2	Each
Fire Boom System – Hand Held Igniters	10	Each
MISCELLANEOUS		
Offloading pumps – Mini-barge Offloading Pump	1	Each
Offloading pumps – Annular Injection System	1	Each
Fendering and Lines	8	Each
Off-loading Hoses	4	Each
Transfer Hoses	4	Each

As necessary, on-site equipment will be contained in heated storage units to ensure its operability during cooler temperatures which may be expected while drilling is underway. There are a number of connexes included in the vessel fleet. Connexes will include contingency materials, tools, personal protective equipment (PPE), and spare parts.

3.6.2 Maintenance and Inspection of Response Equipment

Response equipment will be stored and maintained in such a manner that it can be deployed rapidly and in a condition for immediate use. The on-site response equipment will be routinely tested and inspected monthly.

ACS and AES conduct inspections and maintenance on all offshore oil spill response equipment. These inspections and maintenance procedures are contained in the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.

ACS performs routine inspection and maintenance of all ACS response and pre-staged land-based equipment. ACS holds the following USCG oil spill removal organization (OSRO) classifications:

- River/canal environments: Classes MM, W1, W2, and W3;
- Inland environments: Classes MM, W1, W2, and W3;
- Nearshore environments: Classes MM, W1, and W2; and
- Offshore environments: Class W3.

ACS has fulfilled the equipment maintenance and testing criteria that these classifications require.

3.7 NON-MECHANICAL RESPONSE INFORMATION [18 AAC 75.425(e)(3)(G)]

In situ burning will be considered as a secondary response.

3.7.1 Assessment of Environmental Consequences and Monitoring

Shell is taking a number of steps to safeguard the area for in situ burning, including defining safe operating distances relative to a wellhead, once ignited (Ian Buist, S.L. Ross), and an application for a USCG exclusion zone as part of normal operations. In addition, any burning would be conducted in accordance with the State of Alaska guidelines for in situ burning and the SMART protocols.

Although the burn residue itself is low volume (less than 3 percent) and low toxicity, batch samples of the floating residue will be analyzed to confirm composition and toxicity.

3.7.2 Non-Mechanical Response Equipment

Non-mechanical response equipment and supplies are included in the ACS *Technical Manual* and the Shell *Beaufort and Chukchi Seas Regional Tactics Manual*.

3.7.3 Identification of Necessary Approvals and Application for In Situ Burning

In situ burning in the Outer Continental Shelf (OCS) waters is under the command of the FOSC, in this case, the USCG. Shell will comply with FOSC requirements, including the use of the State of Alaska checklists prior to the use of in situ burning (e.g. size of burn, use of fire boom, trained personnel, ignition, etc). Shell also expects to comply with the recently revised State of Alaska in situ burn guidelines (updated August 2008), and the SMART protocols, although historically, the FOSC may waive some of them, in the event the proposed burning is located away from populated areas.

3.7.4 Identification of Permits, Approvals, or Authorizations

Shell's technical advisors have contacted the USCG to clarify the USCG position on its approval requirements for burning in federal waters and conditions under which it would be approved or instructed. The USCG has issued no formal permits or guidelines that Shell is aware of. At the time in situ burning is requested in response to a specific event, the Regional Response Team In Situ Burn Application Form will be submitted in accordance with ACS Tactic B-1A.

3.7.5 Plan for Protection Environmentally Sensitive Areas and Areas of Public Concern

Burn residue which reaches State waters will be addressed as part of nearshore and shoreline response efforts under Section 1.6.12.

3.8 RESPONSE CONTRACTOR INFORMATION [18 AAC 75.425(e)(3)(H)]

Shell will activate ACS to provide the initial manpower and resources required to respond to a large or lengthy spill response. If additional resources are required, they will be accessed through master services agreements maintained by AES, ACS, and through other contracts, as needed, established by Shell during the spill.

ACS will lead spill response operations as the primary response contractor for all nearshore, shoreline, and offshore activities.

Contact information for ACS can be found in Table 1-4.

3.8.1 Statement of Contractual Terms

Shell has developed Statement of Contractual Terms with primary response action contractors for the proposed exploration activity. Supporting documentation of the Statements of Contractual Terms is provided in Appendix B.

3.9 TRAINING PROGRAM [18 AAC 75.425(e)(3)(I)]

Shell and ACS provide training for Health, Safety, and Environment (HSE) programs for all employees.

ACS is responsible for coordination of the oil spill training for Shell employees and contractors including all response tactics that may be used in the field. This includes ensuring all requirements for pre-deployment site training to ensure personnel proficiency, both in open water and broken-ice conditions. Spill response training is based on the National Preparedness for Response Exercise Program (NPREP) guidelines (August, 2002).

ACS coordinated spill response training includes:

- Federally mandated: HAZWOPER; and
- Company directed: Shell, Edison Chouest, Crowley, and others, which include North Slope Training Co-operative topics, First Aid, employee orientation, and oil spill-specific and technical training (including fate and behavior of oil, site characterization, specialized equipment and tactics, non-mechanical response for in situ burning, and C-Plan overview).

All required training for site personnel who will be participating in oil spill response activities will be completed prior to commencement of operations and will include classroom as well as actual field deployment.

ACS offers an ADEC-approved spill prevention and response training program available for Shell and ACS oil spill response personnel. This training includes regulatory-required training and training specific to aspects of spill response. As new training needs are identified, ACS will develop and incorporate these needs into the training program. At a minimum, all North Slope spill response personnel will receive the following required training: Initial Emergency Response (24-Hour Hazmat Technician), and Hydrogen Sulfide Training. ACS holds contracts with other response action contractors and OSROs that will provide additional trained and qualified spill responders. Some examples of general training courses offered or coordinated by ACS (ACS *Technical Manual* Tactic A-4) include:

- Arctic Cold Weather Survival
- Open Ocean Water Survival
- Summer Spill Operation
- ICS (all sections)
- Wildlife Hazing
- Helicopter Slinging Operations
- Shoreline Response Training Workshop
- Swiftwater First Responder

A complete list of available training courses can be found on the ACS website at www.alaskacleanseas.org.

3.9.1 North Slope Spill Response Team Spill Response Training

The North Slope Spill Response Team (NSSRT) consists of workers who volunteer as emergency spill responders and skilled technicians. Each team member is required to have initial emergency response training and annual refresher training, which meets or exceeds the requirements in the HAZWOPER regulations, 29 CFR 1910.120(q). All "qualified responders" must have a minimum of 24-Hour HAZWOPER training and annual requirements for HAZWOPER refreshers, medical clearance (physicals), and a valid respiratory fit test, in addition to required training within each individual labor category. The ACS Training Department tracks these requirements and distributes a monthly "Readiness Report" generated from the ACS database for responder status. The ACS Area Supervisor can generate a report at any time (see Section 3.9.4, Recordkeeping).

General Laborer and Equipment Operators

The NSSRT training program is available to responders from all production units on the North Slope. Responders to an exploration spill are classified into the labor categories of General Technician, Skilled

Technician, Team Leader, Nearshore Boat Operator, and Offshore Boat Operator. Each responder has minimum training requirements as noted in the ACS *Technical Manual* Tactic A-4. The NSSRT maintains a minimum staffing level designed to ensure response capability and to maintain compliance with all North Slope C-Plan response scenarios.

Active Member Requirements

All NSSRT members must complete the following minimum annual training activities in order to be considered an active member of the NSSRT:

- 8-Hour HAZWOPER refresher certification,
- C-Plan review, and
- Completion of five equipment proficiency checks.

The NSSRT training program offers weekly classes at each field. These classes emphasize hands-on experience, field exercises, and team-building drills. Table 3-14 lists typical NSSRT training courses. Due to operational time constraints, many of the courses are divided by subject area and are taught in the 2- or 3-hour timeframe of an NSSRT meeting. The training and attendance is documented and available for review. The yearly training schedule is also available at the facility and at ACS. Current NSSRT training schedules are posted on the ACS web site.

TABLE 3-14
TYPICAL NORTH SLOPE SPILL RESPONSE TEAM
TRAINING PROGRAM COURSES

CATEGORY	COURSE TITLE
Communication	Incident Command System Basic Radio Procedures
Decontamination	Decontamination Procedures
Environmental	Environmental Awareness Wildlife Hazing
Equipment	Boom Construction and Design Fastanks and Bladders Skimmer Types and Application Snow Machines and All-Terrain Vehicle Operations 90+ Spill Response Equipment Proficiency Checks
Management	Incident Command System Management and Leadership During an Oil Spill Quarterly Drill and Exercises Staging Area Management
Miscellaneous	Global Positioning System Tundra Cleanup Techniques Spill Volume Estimation
Response Tactics	In Situ Burning Oil Under Ice Detection Winter Oil Spill Operations Winter Response Tactics
Safety/Survival	Arctic Cold Weather Survival Arctic Safety HAZWOPER Spill Site Safety Weather Port and Survival Equipment Ice Safety Awareness Air Monitoring

3.9.2 Incident Management Team Member Training

Shell will provide IMT training for required personnel prior to deployment and during the active drilling season. This training will follow the National Incident Management System (NIMS)-required training guidelines. NIMS training that will be conducted for Shell personnel and includes on-line courses and classroom training. In addition, Shell will sponsor IMT workshops that focus on the planning cycle for oil spill response. Shell, through ACS, will conduct equipment training in the field (e.g., boom deployment, skimmer and lightering equipment operation) and on-the-job training to ensure response personnel are trained and kept current in the specifics of plan implementation, equipment deployment, and mobilization of personnel and resources. Examples of ICS training courses include:

- ICS/100, ICS/200, and ICS/700 (on-line training);
- ICS/300 as a 2-day training event; and
- ICS/400 that will cover Command Staff and Section Chiefs' training.

Shell's training management system includes an in-house training database that is maintained for all personnel.

ACS provides IMT training for ACS IMT personnel. A description of this IMT training program is provided in Volume 3, Section 6.0, of the ACS *Technical Manual*.

3.9.3 Other Training

There may be specific departmental training requirements for Shell's exploration activities. Shell's HSE Training Department maintains and conducts frequent training for HSE awareness.

3.9.4 Recordkeeping

Training records for Shell IMT training are kept at the Command Post. These records will be maintained for a minimum of five years. The Command Post is located in Shell's Deadhorse, Alaska warehouse and office facility, located along the airport runway at the Deadhorse Airport. Depending on the severity of the spill, additional support may be provided at secondary command posts located in Anchorage and at Shell Headquarters.

ACS maintains a database as a record of the response courses taken by each response member. The course description, date completed, and the employee's or contractor's current status are available from the database. The ACS instructors' training records and qualifications are also maintained in the database. Records are kept for a minimum of five years, or for the duration of time that the employee or contractor is assigned responsibilities in this C-Plan.

3.9.5 Spill Response Exercises

Shell intends to conduct internal oil spill response exercises to test the C-Plan and its interaction of the various Shell oil spill response vessels, equipment, and personnel. These exercises will be conducted to test the coordination between Shell and ACS, including the mobilization of ACS equipment or personnel on a call-out basis. See ACS *Technical Manual,* Volume 2.

Shell will notify the BOEMRE~~MMS~~ Alaska Region 30 days in advance of any exercises that meet the requirements of 30 CFR 254.42(b)(2) or (4).

The NPREP guidelines (August, 2002) is the basis for Shell's spill response exercises. Section 6 of these guidelines describes the expected participants, scope, and objectives of exercises for offshore facilities.

The current plan for internal Shell response exercises includes:

- Pre-mobilization training exercises using the oil spill response equipment and selected vessels prior to the mobilization of personnel and equipment to the Beaufort Sea.
- Pre-startup exercises prior to the commencement of critical drilling activity, to be conducted in the vicinity of the first drilling location.
- Regularly scheduled exercises to maintain response capability while drilling is underway.

Monthly IMT and Spill Management Team tabletop exercises will also be conducted during active drilling seasons.

Additional drills, both scheduled and un-scheduled, may be conducted at the request of BOEMRE~~MMS~~ or other authorities.

As a member of Mutual Aid through ACS, Shell may be called upon to participate in a Mutual Aid Drill (MAD) to be conducted once a year as per NPREP guidelines. The MAD exercise satisfies the NPREP requirements to exercise all aspects of the response plan at least every three years.

3.10 PROTECTION OF ENVIRONMENTALLY SENSITIVE AREAS AND AREAS OF PUBLIC CONCERN [18 AAC 75.425(e)(3)(J)]

For the protection of environmentally sensitive areas, the IMT will plan for mitigation of impacts of a spill, or to monitor over-season migration of oil in the ice.

Section 1.6 details these response strategies and how they pertain to the protection of environmentally sensitive areas.

A number of sites of archeological or cultural significance exist on the nearby shorelines. Because the proposed exploration activities will be offshore, these sites should not be impacted. If, at some point, onshore activities are required to support response actions, the Alaska Office of History and Archeology will be consulted in order to avoid archeological disturbances to these sites.

3.10.1 Sensitive Wildlife Areas

The environmental sensitivities for this exploration are summarized in both the ACS *Technical Manual,* Volume 2, and in the North Slope coastal environmental sensitivities maps (Sheets 1-12) published by the National Oceanic and Atmospheric Administration. Primary areas of sensitivity are the migration routes of polar bears, bowhead whales, and sea birds. In the event of a major spill, sensitive areas along the coastline will also be affected.

Forty-three marine species of fish, 18 species of terrestrial mammals, and at least 10 species of marine mammals have been identified in the Beaufort Sea and along the coastline. There are several million birds of approximately 150 species on and near the North Slope, although they tend to concentrate in the Arctic Coastal Plain and in nearshore waters of less than 20 m in depth. Section 1.6.12 provides detail on the identification and protection of sensitive sites during response efforts.

3.11 ADDITIONAL INFORMATION [18 AAC 75.425(e)(3)(K)]

Please refer to the following appendices for additional information:

APPENDIX A: General Specifications for Marine and Aerial Support Vessels

APPENDIX B: Contractual Terms with Primary Responders

APPENDIX C: Fuel Transfer Procedures

APPENDIX D: Oil and Debris Disposal Procedures

APPENDIX E: Wildlife Capture, Treatment, and Release Programs

APPENDIX F: Production Specification for Low Sulfur Diesel Fuel Oil

In addition, Shell acknowledges that BOEMRE~~MMS~~ will review proposed Shell exploration well locations as part of the application package for individual well(s) and will determine whether the Shell C-Plan is applicable for each well. Additional information regarding reservoir modeling, well plans, and derivation of WCD volumes are available from Shell upon request.

3.12 BIBLIOGRAPHY [18 AAC 75.425(e)(3)(L)]

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PART 4 BEST AVAILABLE TECHNOLOGY [18 AAC 75.425(e)(4)]

This section discusses the best available technology (BAT) requirements contained in 18 AAC 75.425(e)(4)(A), (B), and (C) to address technologies not subject to response planning standards or performance standards in 18 AAC 75.445(k)(1) and (2). The discussion of each technology covers the requirement to analyze applicable technologies and to provide a justification that the technology is BAT.

Additional information about BAT is also provided in the Alaska Clean Seas (ACS) *Technical Manual*, Volume 1.

In addition, Shell has reviewed the ADEC *Best Available Technology 2004 Conference Report* issued in June 2006 and has adopted the following recommended technologies for the purposes of this Oil Discharge Prevention and Contingency Plan (C-Plan):

- Annular water injection – Annular water injection is considered a proven breakthrough technology. It can be used during a spill response to expedite the transfer of discharged oil from a temporary storage tank to a more permanent storage facility. The technology involves reducing the discharge line pressure of a discharge hose by injecting a sleeve of water through the hose as the oil is pumped. The reduced pressure results in faster transfer rates and therefore, faster recovery time.
- GT-A Pumps – GT-A Pumps are considered BAT and are used for lightering of viscous oil. During a spill response, the pumps significantly aid in the recovery efforts by accelerating the transfer rate for the discharge.

Shell has also selected response equipment for the containment and recovery of oil and the potential burning of oil that is considered to be the best available for conditions commonly found in the Beaufort Sea. Brief descriptions of these systems follow:

- The Transrec 150 weir skimmer is a well-proven recovery system and selected by major response organizations, including SERVS, and MSRC, and the Norwegian Clean Seas Association for Operating Companies (NOFO), as the primary open-ocean-skimming device. NOFO has performed extensive field tests of the Transrec skimmer both in actual spill events and open ocean trials using free crude oil. Shell's vessel of opportunity is equipped with one skimmer unit that is capable of being mounted near the stern of the vessel. This configuration permits the self-propelled, floating skimmer heads attached to a 95-m (312-ft) umbilical hose to be maneuvered into the thickest oil layers within the apex of the containment boom for optimum recovery. The Transrec 150 has a name-plate recovery capacity up to 400 m3/hr (approximately 2,516 bbl/hr).
- LAMOR-LORI brush skimmers, each consisting of five parallel, stiff-brush chains, have proven nameplate capacities of 41 cubic meters per hour (m^3/hr). Shell's Oil Spill Response Barge (OSRB) is equipped with two of these over-the-side skimming packages, giving a total nameplate recovery capacity of 410 m^3/hr (or approximately 2,580 barrels per hour [bbl/hr]) for the OSRB. The unique LAMOR-LORI Recovery Channel design recirculates surface water back into the recovery area, increasing the system's overall throughput efficiency. The skimmer automatically separates oils, emulsions, and oily debris/ice from sea water, making efficient use of onboard storage. Recovered oil normally contains less than 5 percent free water.
- LAMOR-LORI brush skimmers were also selected as the primary recovery system for Shell's 47-foot, self-propelled skimmer that will be stored on, and launched from, the OSRB, *Arctic Endeavor*, (or similar) ~~(OSRB)~~. This skimmer is capable of operating effectively at vessel speeds

of 2 to 3 knots, which results in much higher oil encounter rates than other types of advancing skimmers. The built-in skimmers, one on each side of the vessel, with a nameplate recovery capacity of 82 m^3/hr, give this system a total potential recovery of 164 m^3/hr (or approximately 1,032 bbl/hr). This skimming system is ideally suited for a broad range of oil viscosities, it can operate in adverse weather and sea conditions, and it is sufficiently maneuverable for the recovery of oil trapped or herded in pockets against ice.

- Vertical rope mop skimmers, by Crucial Inc., have been selected as part of Shell's backup recovery system. Each skimmer has eight continuous loops of oleophilic fiber mops with a combined nameplate capacity of 80 m^3/hr. Stored aboard the OSRB, two of these skimmers provide an additional 160 m^3/hr (or approximately 1,000 bbl/hr) recovery potential. Operated from a crane over the side of a skimming vessel or barge, these skimmers allow for the placement of the mops directly into heavy pockets of oil contained within a boom or trapped by ice.
- Small Vikoma brush skimmers (with a floating Lobe pump) provide for the careful placement of a skimming device into smaller pockets of oil (within a boom or trapped among ice cakes). Two of these brush skimmers, each rated at 14 m^3/hr, will be located aboard the OSRB, giving flexibility for the recovery of oil from isolated pools. Their combined recovery potential represents 28 m^3/hr (or approximately 176 bbl/hr).
- RuberMax boom is made of vulcanized neoprene and hypalon, and is a durable, inflatable boom for use in open water and light ice conditions. The boom is manufactured to International Organization for Standardization (ISO) Standards 9001 through 2000, has a high buoyancy to weight ratio, and comes with a high-visibility orange color. A complete system consists of a reel, power pack and 200 meters of boom. The height of the boom is 170 centimeters (cm), (67 inches), with a freeboard of 60 cm (24 inches) and a draft of 110 cm (43 inches). Eight of these systems will be available on site for use as large open-apex deflection systems; deflection booms secured to, and providing deflection for, an OSRB; and as independent U-boom configurations for the collection of oil.
- Two water-cooled, Hydro-Fireboom packages, each with 500 feet of inflatable boom (with 14-inch floatation and 18-inch skirt) are stored on Shell's OSRB. Each package is supported by two water pumps, along with long tow lines and fire hose assemblies to provide each of the booms in a U-configuration with adequate cooling seawater to keep the boom from being damaged by the intense (approximately 1,000 ^{o}C) flames of a contained oil fire. The boom is towed in a U-configuration to capture and burn spilled oil, or it can be held (in a station-keeping mode) at a surfacing blowout, providing enough burn area to eliminate 10,000 to 15,000 barrels oil per day. This boom has undergone rigorous testing with pit burns and in large tanks (Ohmsett Facility in New Jersey).

4.1 COMMUNICATIONS [18 AAC 75.425(e)(4)(A)(i)]

The communications system for use in a spill response at drill sites is described in the ACS *Technical Manual*, Volume 1, and in Section 1.4 of this plan. As described in Section 1.4, satellite communications systems will be used to maintain compatibility with communication systems of ACS, all North Slope operators, and the worldwide telephone network. Specifically, the ~~drillship~~drilling vessel will be equipped with the Very Small Aperture Terminal (VSAT) communication system.

On-site communications systems are believed to be adequate for most Tier 1 response efforts. In the event of a major or moderate Tier II/Level III spill response, the Global Maritime Distress and Safety System (GMDSS) will be used to communicate with authorities. In the event of a major blowout, the existing on-site systems might not be accessible for safety reasons. However, blowout conditions require that an operations center is established.

4.2 SOURCE CONTROL [18 AAC 75.425(e)(4)(A)(i)]

The following sections provide an analysis of BAT as it relates to source control for a well blowout, and the avoidance of piping and valve failures on the diesel tanks located on the ~~drillship~~drilling vessel. In addition to the narrative contained in these sections, loss of well control (i.e., a blowout) is also addressed in Sections 1.6.3 and 2.1.8, which includes a discussion of preventive measures that may be taken, along with other possible methods of well control. Shell's Well Control Plan provides a detailed assessment of various methods of well control including surface control measures, relief well drilling, blowout ignition, and the services of a professional well control firm, if well control is not regained by conventional mechanical means or natural bridging.

4.2.1 Well Source Control

The BAT analysis for well source control (Table 4-1) reviews the techniques and methods to control a deep well blowout that has the potential to release liquid hydrocarbons to water surface. Inherent to this analysis are the assumptions that the first three layers of prevention (see Section 2.1.8) have failed or have not been sufficient to control the well:

- A kick occurred, even with the proper well planning and preparation (Layer I).
- Early kick detection and timely implementation of kick response procedures were not sufficient to kill the well (Layer II).
- A mechanical barrier (e.g., the blowout prevention equipment [BOPE], casing, or cement) failed (Layer III).

Operations are also monitored by Shell's Real Time Operations Center (RTOC), which assists in monitoring operations, analyzing penetrated formations, and analyzing pressure trends. The Houston RTOC supplements the mud-logging capabilities of the ~~drillship~~drilling vessel.

There are three methods of regaining well control once an incident has escalated to a blowout scenario; implementation of dynamic surface control measures, well capping, and relief well drilling. This analysis indicates that for the planned wells, regaining control via surface control measures is the preferred method whenever possible. Well capping is not feasible for offshore wells from moored vessels with BOPE sitting below the mud line in a well cellar (glory hole); and killing a well by relief well drilling can take significantly longer to implement, increasing the duration of discharge. Given the uncertainties of the success of implementing surface control measures in these situations, relief well drilling mobilization efforts will begin immediately upon the incident escalating to a blowout.

Surface Control Measures

Regaining primary control through the use of dynamic surface control measures consists of increasing the weight of the drilling fluid or reestablishing the column height in the wellbore. Depending on what caused the influx of formation fluids into the wellbore, the circulation of kill weight drilling fluid, formation plugging material (e.g., nut plug), and/or cement would be indicated.

Reestablishing an uncontaminated, full column of appropriately weighted mud usually requires the use of the choke to maintain a constant bottomhole pressure to prevent further formation fluids from entering the wellbore. The hydrostatic head of the column is increased by holding back pressure on the well using the choke. This may not be possible if BOPE has failed. If the cause of the well control incident was loss of fluid in an under-pressured formation, reducing the hydrostatic pressure, allowing an influx of formation fluid from a higher pressured formation, then circulation of plugging material or cement will be required to stop flow into the fluid loss zone.

TABLE 4-1
BEST AVAILABLE TECHNOLOGY ANALYSIS
WELL BLOWOUT SOURCE CONTROL

BAT EVALUATION CRITERIA	PROPOSED METHOD: DYNAMIC SURFACE CONTROL	ALTERNATE METHOD: RELIEF WELL DRILLING	ALTERNATE METHOD: WELL CAPPING
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	Dynamic surface control is in use globally.	Relief well drilling equipment (rigs, downhole tools, etc.) is widely available aside from a few specialty providers (e.g. honing services).	Equipment is not available for wells drilled from moored vessels.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	Technique is directly transferable, and equipment is the same as is used on the vessel during normal operations.	Relief well drilling is transferable, and Shell has evaluated that this method can be accomplished with one ~~drillship~~drilling vessel.	Proven technology is not available.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	In the majority of cases, the technique is highly effective. Application of dynamic surface control provides the best opportunity for minimizing pollution impacts since most blowout wells are controlled with dynamic surface controls while other methods are being mobilized. Technique would not be effective if BOPE had failed, and a safe work environment could not be ensured in the event of extensive vessel or equipment damage, or if the vessel had to move from the location.	Technique is generally understood to be effective in a wide range of situations.	Proven effective technology is not available.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant	The costs are relatively low, assuming that the vessel is available to kill the well and consumables, such as drilling fluids and cement, are readily available	The cost of permitting, mobilization, and executing relief wells is high. Costs include day rate of the vessel to drill the relief well, casing, drilling fluids, and other consumables, as well as the cost of lost opportunity should the vessel have to prematurely end work on its intended prospect.	Not applicable, since proven technology is not available.
AGE AND CONDITION: The age and condition of technology in use by the applicant	The age and condition of the drilling equipment is appropriate for the operation. Equipment is the same as is used on the vessel during normal operations.	The age and condition of the ~~drillship~~drilling vessel and associated equipment available for a relief well are appropriate for the operation.	Not applicable, since proven technology is not available.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Technology is compatible and equipment is the same as is used on the vessel during normal operations.	Technology is compatible. The relief well rig has comparable equipment onboard.	Not applicable, since proven technology is not available.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Method is feasible for all drilling operations. Would not be a feasible option if the BOPE had failed. Applied at the surface, the technology is not sensitive to well type. Demonstrated success in historical well control efforts.	Method feasibility is contingent upon geographical access near area of blowout. Lack of year-round access to some locations (e.g., offshore Beaufort) limits application to the open-water season.	Proven technology is not available.

TABLE 4-1 (CONTINUED)
BEST AVAILABLE TECHNOLOGY ANALYSIS
WELL BLOWOUT SOURCE CONTROL

BAT EVALUATION CRITERIA	PROPOSED METHOD: DYNAMIC SURFACE CONTROL	ALTERNATE METHOD: RELIEF WELL DRILLING	ALTERNATE METHOD: WELL CAPPING
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land, water pollution, and energy requirements, offset any anticipated environmental benefits	Technology provides the best proven opportunity to quickly reduce environmental impacts.	Technology provides additional exposure and environmental risks during application (additional well control problems). Additional environmental costs would include the resource consumption (e.g., fuel, casing, and drilling fluids), waste generated, and emissions associated with drilling the relief well. Technology application may be seasonally limited, leading to durations of 60 to180 days. Drilling a relief well is accompanied by the additional risk of a second well control event.	Not applicable, since proven technology is not available.

The following factors could limit the effectiveness of surface control measures:

- BOPE element failure.
- Insufficient pump rate. In the event that the available pump capacity is insufficient to kill the well, other methods with lower rates can be applied to kill the well (e.g. weight and wait).
- Inability to divert the blowout fluid and ensure a safe environment for workers.

In the unlikely event of a blowout, Shell would attempt to kill the well via dynamic surface control methods while mobilizing to drill a relief well as a contingency. Factors that would make this method infeasible include:

- Any situation where the BOPE has failed and was not available to hold back pressure on the well,
- Efforts were implemented to divert the blowout fluids to create a safe work environment,
- The ~~drillship~~drilling vessel or drilling equipment were damaged to an extent to make them ineffective, or
- The ~~drillship~~drilling vessel had to move off the location for safety and/or vessel stability reasons.

Well Capping

Well capping techniques have improved, especially since its frequent application during the Iraq-Kuwait conflict in the early 1990s, and the recent Macondo incident. Well capping techniques have been proven to be both efficient and effective in regaining control of damaged wells and reducing the associated environmental impacts for wells with accessible BOPE or wellheads. However, similar techniques for performing well capping in mud-line cellars constructed on the sea floor from moored vessels have not been proven. ~~Therefore, well capping would not be an effective option for regaining well control while operating from a moored vessel.~~

Relief Well Drilling

A relief well could be drilled by the on-site ~~drillship~~drilling vessel ~~-~~(see Section 1.6.3 and the Blowout Scenario in Table 1-13 and Table 1-14).

Relief well drilling in a blowout zone can be a time-consuming and costly process. The lead-time involved in relocating a rig and drilling a relief well necessitates early planning. Within Shell's exploration, it is reasonable to drill a relief well within 30 days for true vertical drilling depths up to 12,000 feet. The relief well plan may be initiated concurrently with the implementation of control methods. The total time to regain well control via a relief well would depend on the depth of well interception required, availability of a vessel capable of drilling the relief well, as well as ice and water conditions. Based on historical data for oil blowouts in the U.S. and Norway (see Figures 2-5 through 2-7), 54 percent of blowouts were brought under control within 12 hours, and 84 percent within 5 days – within the timeframe a relief well drilling rig could be mobilized.

Relief well drilling technology is compatible with Beaufort Sea drilling operations, although it may be sensitive to both the well location and well type. Downhole and surface equipment (tubulars, wellheads, or similar equipment) to support relief well drilling operations are also available.

Relief well drilling has been attempted only once as a mitigation measure to control a blowout in a nearby environment on the North Slope. This was the ARCO Cirque blowout in 1992, where well control was regained by a combination of well capping techniques and an assist from natural bridging**.**

Since Shell's well plan does not include extended reach wells, the operations of drilling a relief well would not be relatively straightforward in comparison to the original well, apart from ensuring well intersection. The differences between the two wells would be:

- There is no mud-line cellar for the relief well;
- There is no open-hole logging on wireline at casing points for relief well; and
- The use of directional/honing services to specifically locate the original wellbore.

Relief well drilling in the Beaufort Sea is similar to current methods used to drill offshore wells elsewhere in the world. Advances in directional technology that allow for more precise wellbore placement increase the likelihood of success of drilling a relief well.

4.2.2 Tank Source Control

~~Drillship~~Drilling vessel tanks are inspected in accordance with American Petroleum Institute (API) Standard 653 by the ~~Minerals Management Service~~Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) and U.S. Coast Guard as part of the ~~drillship~~drilling vessel inspection prior to exploration activities.

Fuel storage tanks are equipped with manual shutdown valves that remain closed except during fuel transfer operations. Remote temporary exploration sites will be staffed 24 hours a day. Best management practices (BMPs) indicate two operators present and in direct line of sight and in constant communication for the duration of the fuel transfer, with one person having the ability to shut down the fuel transfer in the event of an emergency.

4.3 TRAJECTORY ANALYSES [18 AAC 75.425(e)(4)(A)(i)]

As exploration is offshore, oil reaches the mud water interface immediately, under the blowout scenario. Various techniques for monitoring the spill trajectory include the use of the established oil spill trajectory models and use of aerial reconnaissance.

Computer-based trajectory analyses (see Section 1.6.13, Scenario 1) were performed using predominant wind directions (those that occur greater than 10 percent of the time indicated), as depicted by a wind rose polar coordinate plot, required under 18 AAC 75.425(e)(1)(I)(iv), for the purposes of overall response planning. Vector-based trajectory analyses as described in the ACS *Technical Manual*, Volume 1, Tactic L-11B, were used to calculate minimum response times to deploy shoreline protection at sensitive environmental sites between Barter Island and Prudhoe Bay (see Section 1.6.12).

4.4 WILDLIFE CAPTURE, TREATMENT, AND RELEASE PROGRAMS [18 AAC 75.425(e)(4)(A)(i)]

Wildlife capture, treatment, and release programs are described in the ACS *Technical Manual, Volume 1*, Tactic L-11C, and related Tactics W-1 through W-5, and the Alaska Regional Response Team (ARRT) *Wildlife Protection Guidelines for Alaska* (Annex G of the ARRT Unified Plan). These programs are considered BAT for this exploration program.

Additional information is provided in a report prepared by Shell, with the assistance of ASRC Energy Services (AES), *Wildlife Capture, Treatment and Release Programs, Beaufort Sea Oil Spill Response Planning* program. This report is found in Appendix E of this plan.

The ~~*Frontier*~~ *Noble Discoverer* ~~drillship~~drilling vessel will have marine mammal observers on board at all times. This is considered the BAT for wildlife monitoring.

4.5 CATHODIC PROTECTION [18 AAC 75.076(h)(4)(A)(II)

Not applicable.

4.6 LEAK DETECTION TANKS [18 AAC 75.425(e)(4)(A)(II)]

Visual inspection is BAT for newly installed tanks at exploration sites that are staffed 24 hours a day. Standard operating procedures and BMPs provide for daily inspections of fuel tanks. Because this is not a permanently fixed facility, daily visual inspections as outlined in Section 2.5, provide the most reliable, feasible, and cost-effective means to determine leaks.

These inspections are evaluated in Table 4-2, in accordance with the criteria as set forth in 18 AAC 75.445(k)(3) and ACS *Technical Manual*, Tactic L-11.

4.7 TANK LIQUID LEVEL DETERMINATION [18 AAC 75.425(e)(4)(A)(ii)]

Tank liquid levels are manually measured to determine the required volume prior to any fuel transfer occurring. The levels are determined either by visual observation through the tank opening using sight glass readings or by manual soundings with an applicable sounding tape. Manual soundings are taken any time there is uncertainty with other sounding methods. Fluid transfers follow the inspection and procedures noted in Sections 2.1.5 and Appendix C.

Tank liquid levels in temporary and deck-mounted equipment will be checked primarily by visual means prior to filling (e.g., by direct observation through the hatch or fill cap using a flashlight). Direct visual observation using a flashlight is highly reliable, as a functional check is performed on the flashlights prior to use and actual liquid levels are noted. Visual observation may be more accurate and reliable than other devices such as sight glasses, float gauges, or tank strapping, due to the tendency for these devices to fail under arctic conditions (Table 4-3). BMPs indicate two operators present, in direct line of sight of each other, or at least in constant communication via radio or hand signal, for the duration of the fuel transfer, with one person having the ability to shut down the fuel transfer in the event of an emergency. Tank liquid levels will be monitored visually (e.g., by direct observation through the hatch using a flashlight) throughout the duration of the filling process. Key times for visual observations include the refueling of both the Schlumberger wireline unit and the crane fuel tanks.

This method is as good as, or better than, and provides the most reliable, feasible, and cost-effective alternative to, the alternative methods presented in Table 4-3.

Although visual inspection is considered BAT for determining tank levels, other methods on board the ~~drillship~~drilling vessel include level alarms and metritape. The tank level and temperature indicators consist of 23 metritape level/temperature (L/T) and level sensors (LS) for tank level, temperature, and draft measurement. Tank level and temperature values are displayed on individual analog meters. Level meters are located on the deck (by tanks) and in the control console (readings are in meters). Temperature meters are located in the control console only and are in Celsius. Digital values for tank levels are selectively displayed on a digital panel located in the cover of the metric circuit enclosure (in data equipment room). Digital values for draft levels are displayed on individual digital meters located in the control console (readings are in meters). Level alarm contacts for specified tanks are located in the metric circuit enclosure. These contacts are used to illuminate alarm lights on the control console, near the associated tank level indicator.

The drilling vessel has strict procedures for fuel transfer and discharge prevention. Fuel transfers normally occur once or twice a day, depending on equipment and usage, and include manual opening of valves, filling the tanks, and manually closing the tanks. Visual inspection and proper communication between the pump operator and the person supervising the tank fueling is considered BAT for these transfers. High-level alarms are placed on most tanks (see Section 2.1). If alarms fail to sound, the overflow from the electro-motive diesel day tank is directed through piping to the 5P-10C fuel storage tank. Overflow from the temporary or deck equipment fuel tanks is captured in drip pans and deck drains.

All fuel transfers to temporary or deck fuel tanks are executed under the permit-to-work system following an associated job safety analysis. Preventative maintenance measures of control include careful planning of equipment placement for the storage tanks. For example, temporary and deck equipment are not positioned over open grating if they are equipped with fuel tanks or associated fueling facilities.

TABLE 4-2
BEST AVAILABLE TECHNOLOGY ANALYSIS
LEAK DETECTION FOR TANKS

BAT EVALUATION CRITERIA	CURRENT METHOD: VISUAL INSPECTIONS AND ALARMS
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	This approach has been extensively used for similar exploration rigs and is currently proposed by Shell.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	This approach is directly transferable for Shell operations.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	Effective with strict adherence to BMPs and local 24-hour staffing at drill sites provides a reliable and effective method of leak detection.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant	No cost.
AGE AND CONDITION: The age and condition of technology in use by the applicant	Not applicable.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Compatible and widely used on remote drilling operations. Requires no change.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Currently planned to be used and is feasible. With 24-hour operations on the rig, this provides a practical and reliable method of leak detection.
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land, water pollution, and energy requirements, offset any anticipated environmental benefits	None.

TABLE 4-3
BEST AVAILABLE TECHNOLOGY ANALYSIS
TANK LIQUID LEVEL DETERMINATION SYSTEM

BAT EVALUATION CRITERIA	PROPOSED METHOD: VISUAL INSPECTION/ALARMS	ALTERNATIVE 1: SIGHT GLASS WITH BALL CHECK VALVE CONTROL SYSTEM	ALTERNATIVE 2: FLOAT LEVEL GAUGE (VAREC) CONTROL SYSTEM	ALTERNATIVE 3 MANUAL (TANK STRAPPING) CONTROL SYSTEMS
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	Proposed method.	Sight glass with ball check valve systems are used today, but less frequently than other devices.	Float-actuated level gauges, such as Varec devices, are widely used in the industry today.	Tank strapping devices are used in the industry.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	Transferable.	Undetermined.	Transferable.	Transferable.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	Highly effective with strict adherence to BMPs and local procedure. Tank liquid levels will be determined from direct observation through the hatch using a flashlight, As good as, or better than, other "low tech" devices.	Not effective in this application. Sight glass systems are prone to breaking, becoming obstructed, and freezing if moisture buildup occurs in the tubing. In addition, the ball check valves are prone to freezing and sticking in either the open or closed position.	Effective in this application. However, condensation or freezing conditions may obscure the measurement reading window. In addition, this system will provide inaccurate measurements if there is uneven sedimentation buildup in the tank.	Effective in this application. However, this system will provide inaccurate measurements if there is uneven sedimentation buildup in the tank.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant	Not applicable.	Undetermined.	Undetermined.	Undetermined.
AGE AND CONDITION: The age and condition of technology in use by the applicant	Procedures have been in place since 1993 for fuel transfer operations.	Sight glass devices have been used in the industry for over 20 years, mostly on permanent tanks.	Float-actuated devices have been used in the industry for over 20 years.	Tank-strapping devices have been used in the industry for over 50 years.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Compatible and widely used. Requires no change.	Compatible but preferably not used on portable tanks and tanks on rigs due to breakage potential.	Compatible and used in the industry on tanks in Alaska.	Compatible and used in the industry.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Feasible and preferred due to potential for electronic or pneumatic systems to experience damage from rough handling.	Rig tanks are frequently moved over rough roads. Rough handling has the potential to break the sight glass. Sight glass devices are typically not used in exposed areas, as they can become a source for a leak if damaged.	Feasible, but would require some engineering modifications to install and operational modifications. There is concern over the use of float devices due to several failures of float devices within the state.	Feasible, but would require some operational modifications.
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land or water pollution, and energy requirements offset any anticipated environmental benefits	None.	None.	None.	None.

~~located in the control console (readings are in meters). Level alarm contacts for specified tanks are located in the metric circuit enclosure. These contacts are used to illuminate alarm lights on the control console, near the associated tank level indicator.~~

~~The drillship has strict procedures for fuel transfer and discharge prevention. Fuel transfers normally occur once or twice a day, depending on equipment and usage, and include manual opening of valves, filling the tanks, and manually closing the tanks. Visual inspection and proper communication between the pump operator and the person supervising the tank fueling is considered BAT for these transfers. High-level alarms are placed on most tanks (see Section 2.1). If alarms fail to sound, the overflow from the electro-motive diesel day tank is directed through piping to the 5P-10C fuel storage tank. Overflow from the temporary or deck equipment fuel tanks is captured in drip pans and deck drains.~~

~~All fuel transfers to temporary or deck fuel tanks are executed under the permit-to-work system following an associated job safety analysis. Preventative maintenance measures of control include careful planning of equipment placement for the storage tanks. For example, temporary and deck equipment are not positioned over open grating if they are equipped with fuel tanks or associated fueling facilities.~~

4.8 MAINTENANCE PROCEDURES FOR BURIED STEEL PIPING [18 AAC 75.425(e)(4)(A)(ii)]

Not applicable.

4.9 PROTECTIVE WRAPPING OR COATING FOR TANKS AND PIPELINE [18 AAC 75.425(e)(4)(A)(ii)]

Not applicable.

4.10 CORROSION SURVEYS FOR AN EXISTING INSTALLATION

Not applicable.

4.11 PIPELINE LEAK DETECTION

Not applicable.

PART 5 RESPONSE PLANNING STANDARD [18 AAC 75.425(e)(5)]

This section discusses the applicable response planning standards (RPS) used in this plan, as set forth in 18 AAC 75.430 through 18 AAC 75.440 and 18 AAC 75.442.

~~Well Blowout~~Exploration Facility (18 AAC 75.434)

The Alaska Department of Environmental Conservation (ADEC) regulations (18 AAC 75.434) require the default RPS volume for a well blowout at an exploration facility to be 5,500 barrels of oil per day (bopd), or best-producing well data, for the duration of 15 days. ~~Because~~ Since this plan is under the ~~jurisdiction~~ purview of both ADEC and Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)~~U.S. Department of the Interior, Minerals Management Service (MMS)~~ regulations, and since BOEMRE has recently changed the way worst case discharge volumes are calculated, this default RPS may no longer be valid. Additionally, 18 AAC 75.434(d) makes provision to increase the RPS to take into account the actual well flow rate. Although these wells have not yet been drilled (and there is no plan to flow test these exploration wells once they are drilled) and the actual flow rates have yet to be determined, Shell is demonstrating a response scenario matching the daily worst case rate required by BOEMRE as if it were the RPS. ~~it will include an RPS volume of 5,500 bopd for a total duration of 30 days.~~

The total release will involve ~~165,000~~240,000 barrels (bbl) of oil during the entire ~~30~~ 15 days (~~5,500~~16,000 x ~~30~~ 15 = ~~165,000~~240,000). ~~This value represents the Worst-Case Discharge Scenario to meet ADEC regulations for the Oil Discharge Prevention and Contingency Plan (C-Plan) and the regulations of BOEMREMMS.~~ See Section 1.6.13, Scenario 1 for a discussion of reservoir characteristics.

For storage purposes, an emulsion factor of 1.54 and a percentage of free water (20 percent) has been added to the initial 240,000 RPS volume ~~of 165,000 bbl~~ [(~~165,000~~240,000 x 1.54 = ~~254,100~~369,600) + (~~165~~240,000 x 0.20 = ~~33~~48,000) = ~~287,100~~417,600] for a total storage volume of ~~287,100~~417,600 bbl.

Fuel Transfer Strategy (18 AAC 75.025)

The worst-case discharge (WCD) for the fuel transfer strategy prepared for this C-Plan is based on the definition contained in 33 CFR 154.1029(b)(2), using the following values:

- Maximum Time to Discover Release: 5 minutes
- Maximum Time to Shutdown Pumping: 0.5 minutes (30 seconds)
- Maximum Transfer Rate: 320 gallons per minute (gpm) (based on representative fuel transfer pumps on the oil spill response vessel [OSRV] = 7.6 bbl per minute [bbl/min])
- Total Line Drainage Volume: 163 gallons (premising 4-inch by 250 meter [m] marine hose between the pump manifold on the barge and the delivery flange on the inlet piping at the drilling vessel) or 3.9 bbl

Rationale for Claimed Prevention Credits [18 AAC 75.425(e)(2)(F)]

Although Shell considers its well prevention and control measures “best in class,” it will not be claiming any prevention credits to offset oil spill response planning requirements, based on exploration well operations as specified in 18 AAC 75.434.

The recovery equipment provided in support of this plan (see Tables 1-~~9~~ 15 and 1-~~10)~~16 substantially exceed the mechanical recovery capability needed to contain the WCD (see Section 1).

APPENDIX A:
GENERAL SPECIFICATIONS FOR MARINE AND AERIAL SUPPORT VESSELS

1. **MARINE VESSELS IN SUPPORT OF BEAUFORT EXPLORATORY DRILLING PROGRAM**
2. **AERIAL SUPPORT OF BEAUFORT EXPLORATORY DRILLING PROGRAM**

1. MARINE VESSELS IN SUPPORT OF BEAUFORT EXPLORATORY DRILLING PROGRAM

LIST OF MARINE VESSELS IN SUPPORT OF BEAUFORT EXPLORATORY DRILLING PROGRAM

	KULLUK	~~*FRONTIER*~~ *NOBLE DISCOVERER*
Anchor-handling	***Hull 247* or *Tor Viking II****	~~*Fennica*~~*Hull 247 or Tor Viking II*
Ice-management	~~***Vladimir Ignatyuk***~~***Fennica* or *Noridca***	***Fennica* or *Noridca***~~Kapitan Dranitsyn~~
Oil spill response platform:		Crowley Pt. Barrow / Pt. Oliktok Arctic Tug
	Barge *Arctic Endeavor*	
~~**Oil spill response work boats:**~~	~~**(3) 34-foot Kvichak workboats**~~	
	~~**(1) 47-foot Kvichak workboat w/ brush skimmer**~~	
Other:	~~***Nanuq* (berthing vessel for OSRB crew)**~~ **Arctic tanker (*Affinity*)** **Deck barge and tug (mud and cuttings)** **Offshore supply vessels (2)** **West Dock shuttle (*Arctic Seal*)** **Misc. short-term support** **Vessels (crew changes, supplies, etc.)**	

*Vessel names as provided may change but would be similar in type to the vessel listed.

Table 13.a-1 Specifications of Support Vessels (Not Including OSR Vessels)

Specification	Nordica[1]	Hull 247[1]	Harvey Spirit[1,2]	Arctic Seal[1,3]	Southeast Provider Barge & Ocean Ranger Tug[1,4]	
					Barge	Tug
Length	380.5 ft (116 m)	360.6 ft (110 m)	280 ft (85.4 m)	134 ft (50.3 m)	360 ft (110 m)	117 ft (35.7 m)
Width	85 ft (26 m)	80 ft (24.4 m)	60 ft (18.3 m)	32 ft (11.6 m)	100 ft (30.5 m)	32 ft (.8 m)
Draft	27.5 ft (8.4 m)	24 ft (7.3 m)	16.5 ft (5.0 m)	7 ft (2.1 m)	14 ft	-
Berths	82	64	26	17	-	10
Maximum Speed	16 knots (30 km/hr)	15 knots (27.8 km/hr)	13.5 knots (25 km/hr)	10 knots (18.5 km/hr)	-	10 knots (18.5 km/hr)
Fuel Capacity	11,070 bbl	12,575 bbl	6,235 bbl (normal)	667 bbl	-	2,381 bbl

1 or similar vessel

2 supply vessel/waste removal

3 West Dock supply vessel

3 if necessary, will be mobilized for storage for drilling vessel resupply and waste streams removed from the drilling vessel

Photo - *M/V Nordica*

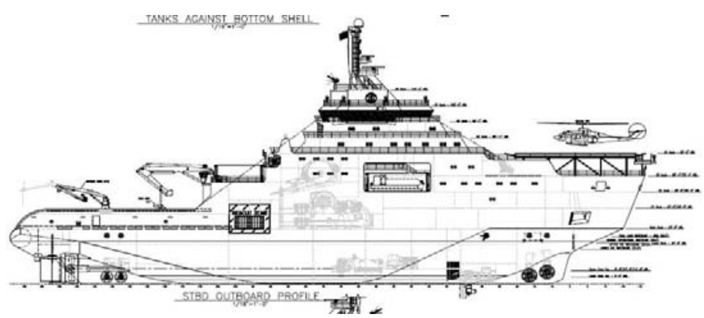


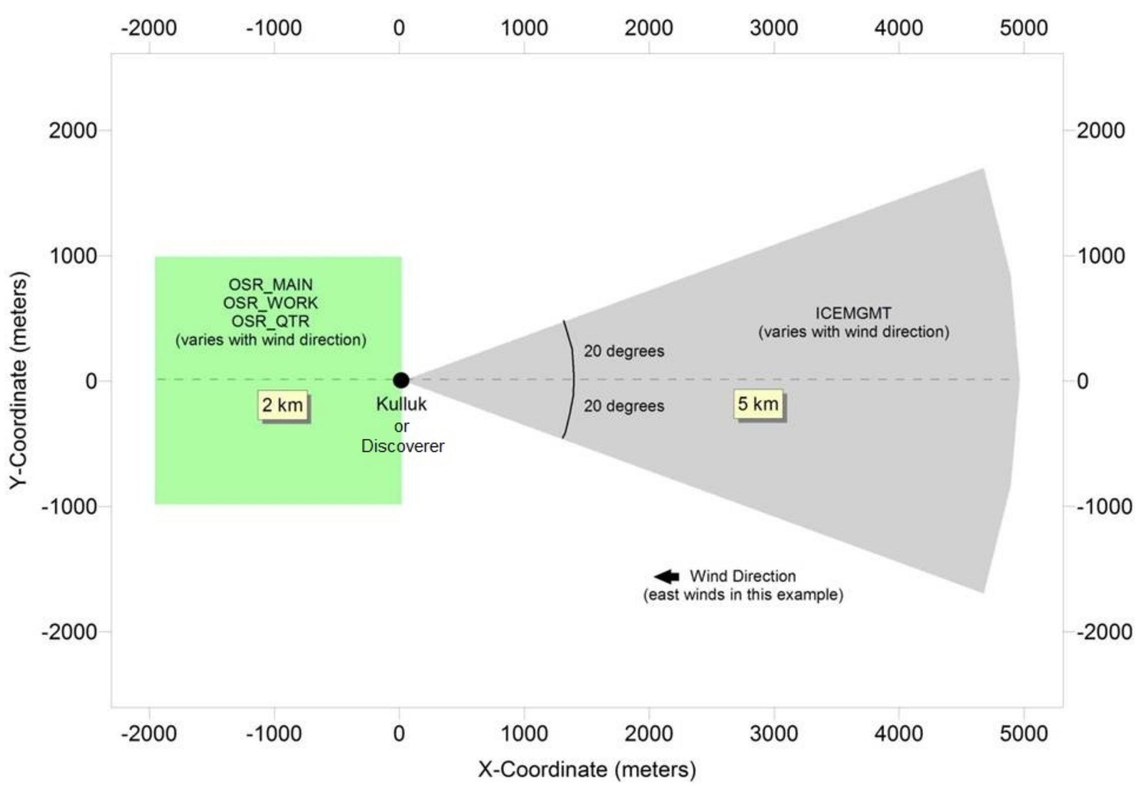
Diagram – Hull 247

Ice Management

The M/V *Nordica* or a similar vessel, will serve as the primary ice management vessel in support of the *Kulluk* or *Discoverer*. *Hull 247* will provide anchor handling duties, serve as the berthing (accommodations) vessel and will also serve as a secondary ice management vessel. When managing ice, the *Nordica* (or similar vessel) and *Hull 247* will generally be confined to a 40° arc up to 3.1 mi (5 km) upwind originating at the drilling vessel (Figure 13a-1). It is anticipated that the ice management vessels will be managing ice for up to 38 percent of the time when within 25 mi (40 km) of the *Kulluk* or *Discoverer*. Active ice management involves using the ice management vessel to steer larger floes so that their path does not intersect with the drill site. In some instances, the ice management vessel may have to break ice that is an immediate safety hazard for the drill site. Around-the-clock ice forecasting using realtime satellite coverage (available through SIWAC) will support the ice management duties. When the *Nordica* is not needed for ice management, it will reside outside the 25 mi (40 km) radius from the *Kulluk* or *Discoverer* if it is safe to do so. The vessel will enter and exit the Beaufort Sea with the *Kulluk* or *Discoverer*.

As anchor handler, Hull 247's duties include setting and removing anchors, berthing (accommodations) vessel, providing supplemental oil recovery capability (VOSS) and managing smaller ice floes that may pose a potential safety issue to the *Kulluk* or *Discoverer* and the support vessels that will service the *Kulluk or Discoverer*.

Figure 13.a-1 Ice Management Vessels Configuration for the *Kulluk* or *Discoverer*

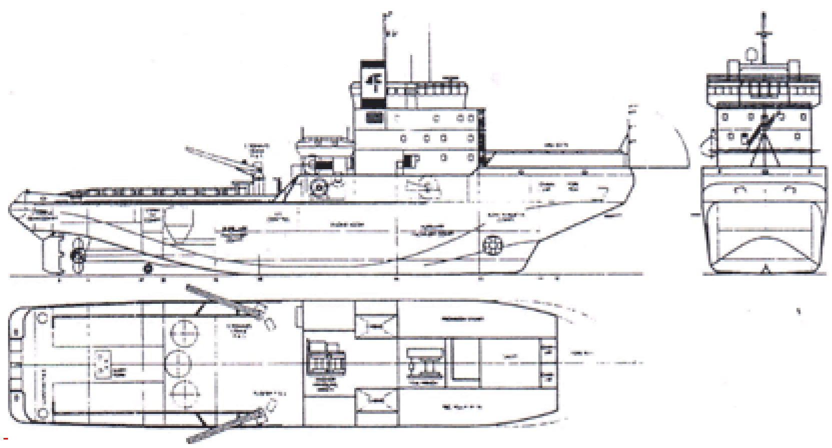


Resupply and Waste Removal

The drilling operations will require the transfer of supplies between the Deadhorse/Westdock shorebase and Dutch Harbor with the *Kulluk* or *Discoverer*. While the *Kulluk* or *Discoverer* is anchored at a drill site as an OCS-source under the EPA air permit, Shell has allowed for 24 visits/tie-ups (if the *Kulluk* is the drilling vessel being used) or 8 visits/tie-ups (if the *Discoverer* is being used) throughout the drilling season from support vessels. The *Harvey Spirit* (or similar vessel) will shuttle supplies from the *Arctic Seal* (or similar vessel) and/or the *Southeast Provider* (or similar vessel) to the *Kulluk* or *Discoverer*. During the resupply trips, the *Harvey Spirit*, or similar vessel, will be used to remove the mud/cuttings and other waste streams. The mud/cuttings will be transported to the *Southeast Provider* (or similar vessel) for storage until the barge is brought south for disposal at the end of the drilling season. Other waste streams (sanitary waste, domestic waste, bilge water, ballast water) will also be transferred to the *Southeast Provider* (or similar vessel), for temporary storage. In the event that there is not enough storage capacity on the *Southeast Provider* (or similar vessel) an additional waste storage tug and barge will be mobilized for added storage capacity. These waste streams will also be brought south for disposal at the end of the drilling season.

Photo – *Harvey Spirit*

~~The *Vladimir Ignatyuk* Diesel Icebreaker~~



~~**Wharf - builder**: Victoria Yard, Burrard Yarrrows Corporation, Canada~~

~~**Purpose**: Multifunctional icebreaker-tow~~

~~**Class**: Lloyd's Register of Shipping + 100 A1 Icebreaker Tug + LMC~~
~~Lloyd's Register of Shipping 100 A1 LMC, icebreaking tow, ice class - 1A Super~~

~~**Max. length**: 88.02 m~~

~~**Width**: 17.51 m~~

~~**Draught**: 8.3 m~~

~~**Deadweight capacity**: 2,113 t~~

~~**Displacement**: 7,077 t~~

~~**Main engine**: Two-shaft diesel-reduction gear engine with 4 main engines and variable-pitch propeller. GD type - 8TM410, Stork Werkspoor Diesel~~

~~**Capacity of engine**: 4 x 5,800 h/p~~

~~**Maximal speed in clear water**: 15.5 knots~~

~~**Navigation area**: unlimited~~

~~**Vessel Owner:** Murmansk Shipping Company~~

~~The *Kapitan Dranitsyn* Diesel-Electric Icebreaker~~

~~Apart from her main activity – cargo ships piloting on the routes of the Northern Sea route, the *Kapitan Dranitsyn* icebreaker participates in tourist voyages in high polar latitudes. Since 1994, the voyages to Frants Joseph's Archipelago, Spitsbergen, New Land, and Chukotka, to Bering Strait and even to the North Pole were carried out. The *Captain Dranitsyn* made the first around-the-world voyage in 1996 and brought 665 passengers around the Earth. Also, in 1996, the icebreaker participated in a rescue operation. As a result of nautical fault, the German passenger *HANSIATIK* motor ship was in low water. There were 135 passengers aboard. The maximal number of passengers the *Captain Dranitsyn* could manage (128 people) were taken off the motor ship.~~

~~In 2000, the icebreaker made the Arctic around-the-world voyage on the following route Hammerfest (Norway), Keflavik (Iceland), Stromfiord (Greenland), Canadian Arctic regions, Alaska, Chukotka and Murmansk. In 2002, the icebreaker participated in the research expedition of the in the Laptev Sea with the University of Alaska (USA) and with the Ecoshelf company (St.-Petersburg), researching the sea bottom shelf.~~

~~In the summer of 2002, the *Captain Dranitsyn* participated in shooting an advertising film for the Ford company in the area of the Spitsbergen Archipelago.~~

~~For all voyages the vessel transported about 5,000 passengers from more than 40 countries.~~

~~The *Captain Dranitsyn* is the only icebreaker in the world certified as passenger carrier, according to the international standards.~~

~~Displacement~~	~~12,228 tons~~
~~Power~~	~~24,000 hp~~
~~Length~~	~~131.00 m~~
~~Width~~	~~26.50 m~~
~~Draft~~	~~8.50 m~~
~~Cruising Speed~~	~~15 knots~~
~~Crew~~	~~60~~
~~Passengers~~	~~102~~

MSV *Fennica* Multi-Purpose Icebreaker

The first of the Fennica-class multipurpose icebreakers built by Aker Finnyards operate during the open water period as global offshore construction vessels.

~~3.1.1.1.1.1~~

FENNICA PICTURE.JPG

DNV ID:	17723	IMO No:	9043615
Operational Status:	In Operation	Class Relation:	In DNV Class
Speed:	16 knots (Approx.)	**Engine Output:**	21,000 kW Diesel Electric

Dimensions:

Loa:	116 m	GT (ITC 69):	9,088-tonnes
Lbp:	96.7 m	NT (ITC 69):	2,727
Lload:		DWT:	1,650
Lwl:			
Bext:		GT (pre 69):	
B:	26 m	NT (pre 69):	
D:	12.5 m	Freeboard:	I
Draught:	8.415 m		

Flag:	Finland	Signal Letters:	OJAD
Port:	HELSINKI		
Owner:	Shipping Enterprise (120131)		
Manager:	Shipping Enterprise (120131)		
Yard:	Finnyards Ltd.(104590)	Year of Build:	1993
Type:	630 – Supply Vessel/Tug		
Class Notation:	✠1A1POLAR-10 Icebreaker Tug Supply Vessel SF HELDK EPR E0 DYNPOS-AUTR		
Register Information:	bp 224 dat(-30oC) dk(+) ern(99,99,99) ram		

MSV *Tor Viking II* Multi-purpose Icebreaker

DNV ID:	21779	IMO No:	9199622
Operational Status:	In Operation	Class Relation:	In DNV Class

Speed: 16 knots – Abt. 42.7 MT

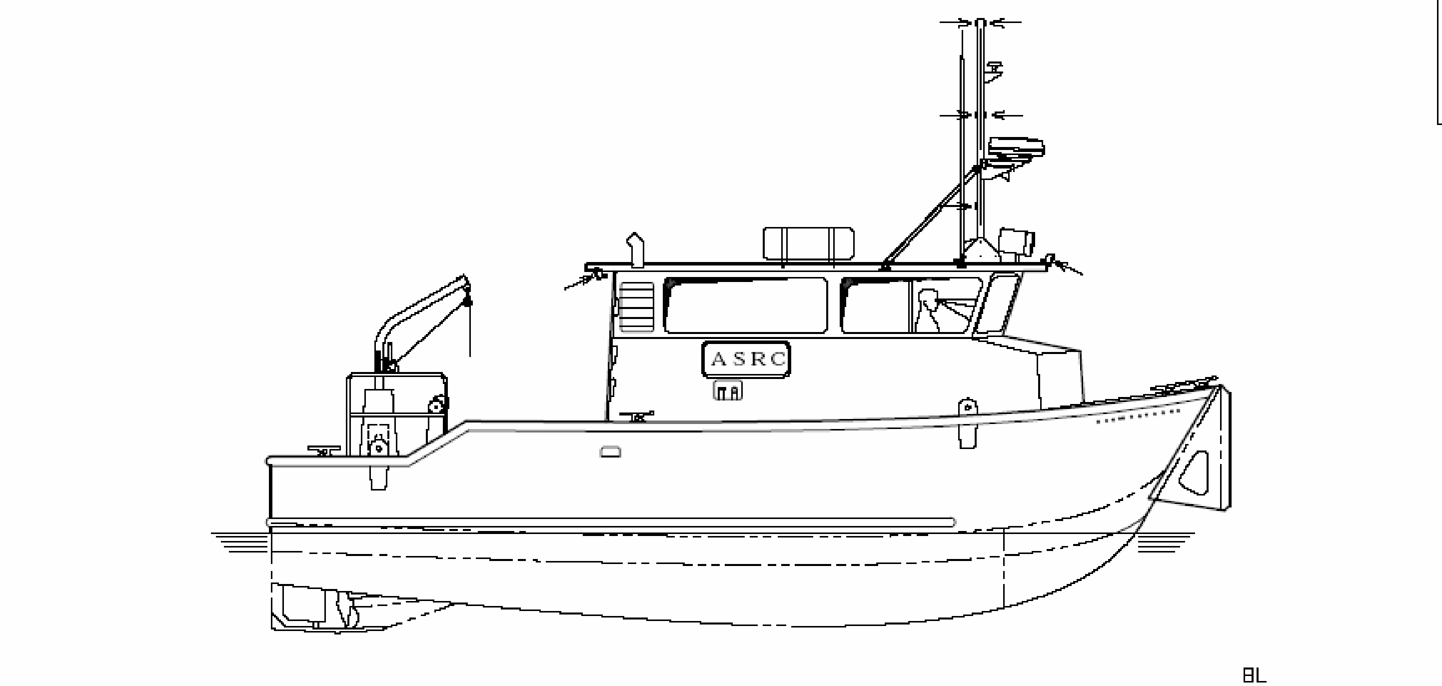
Engine Output: 13,440 kW

Dimensions:

Loa:	83.7 m	GT (ITC 69):	3,382
Lbp:	77.76 m	NT (ITC 69):	1,145
Lload:	75.1 m	DWT:	2,528
Bext:	18 m	GT (pre 69):	
B:	18 m	NT (pre 69):	
D:	8.52 m	Freeboard:	
Draught:	7.2 m		

Flag:	Sweden	Signal Letters:	SLJT
Port:	SKÄRHAMN		
Owner:	Transviking Icebreaking & Offshore AS	GT (ITC 69):	3,382
	(189468)	NT (ITC 69):	1,145
Manager:	Viking Supply Ships AS Kristiansand, Norway	DWT:	2,600
	(191173)		
Yard:	Havyard Leirvik A.S.(108910)	Year of Build:	2000
Type:	630 - Supply Vessel/Tug		
Class Notation:	✠1A1 ICE-05 Icebreaker Tug Supply Vessel SF HELDK-SH E0 DYNPOS-AUTR NAUT-OC DK(+) HL(2.8)		

Kvichak 34-foot Oil Spill Response Work Boat



SPECIFICATIONS

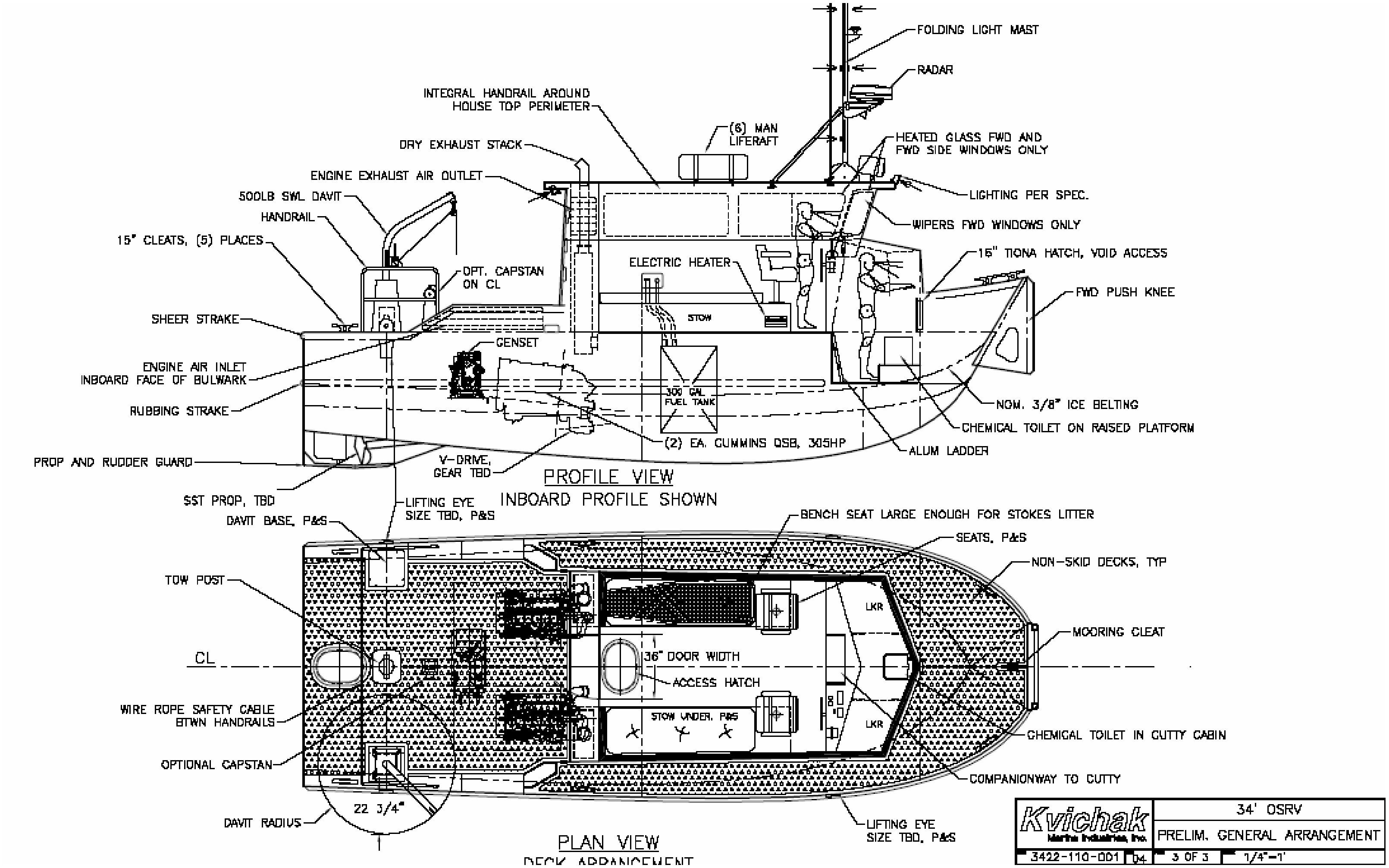
LWL: ~31'-7"
LOA: ~34'-2"
BEAM: ~12'
DRAFT: ~55"
DISPLACEMENT: ~24,000LBS
FUEL: 300 GALLONS
MAX SPEED: 18KN
ENGINES: (2) CUMMINS QSB @ 305HP EA.
GEAR: TWIN-DISC V-DRIVE CONFIG. OR SIMILAR
GENSET: (1) ~8kW
EXHAUST: DRY W/ MUFFLER
COOLING: KEEL COOLED

OUTBOARD PROFILE
REFER TO DETAILS ON FOLLOWING PGS

ALL DIMENSIONS FOR REFERENCE ONLY

Kvichak Marine Industries, Inc.		34' OSRV	
		PRELIM. GENERAL ARRANGEMENT	
3422-110-001	04	2 OF 3	1/4"=1'

Kvichak 34-foot Oil Spill Response Work Boat
General Deck Arrangement



***Kvichak* 47-foot oil spill response Work Boat**
(with Brush Skimmer)

Vessel use:

- Respond quickly to spill site. Recover oil via LAMOR system.
- Operate in shallow water with adequate protection to propellers and rudders.
- Capable of operating in 6- to 8-foot seas.
- Has an approximate 20,000 pounds of bollard pull.
- Able to tow vessels and barges with a maximum weight of 75 gross tons along side, astern, and pushing ahead.
- Capable of slow speed operation for skimming oil via the engine's MGX transmissions.

GENERAL SPECIFICATIONS

LOCATION	SIZE	ALLOY
Bottom	14", 3/8, 1/2"	5086-H116
Sides	3/8"	5086-H116
Transom	3/8"	5086-H116
Decks	3/16"	5052-H32
BHDs	3/16	5086-H116
CVK (Keel)	1/2"	5086-H116
Chine	1/2"	5086-H116
Engine Girders	1/2"	5086-H116
Fuel Tank	1/4", 3/8"	5086-H116
House	3/16"	5052-H32
Bottom Longs	2x2x1/4" Tee Bar	6061-T6
Side Longs	1.5x1.5x3/16" Tee Bar	6061-T6

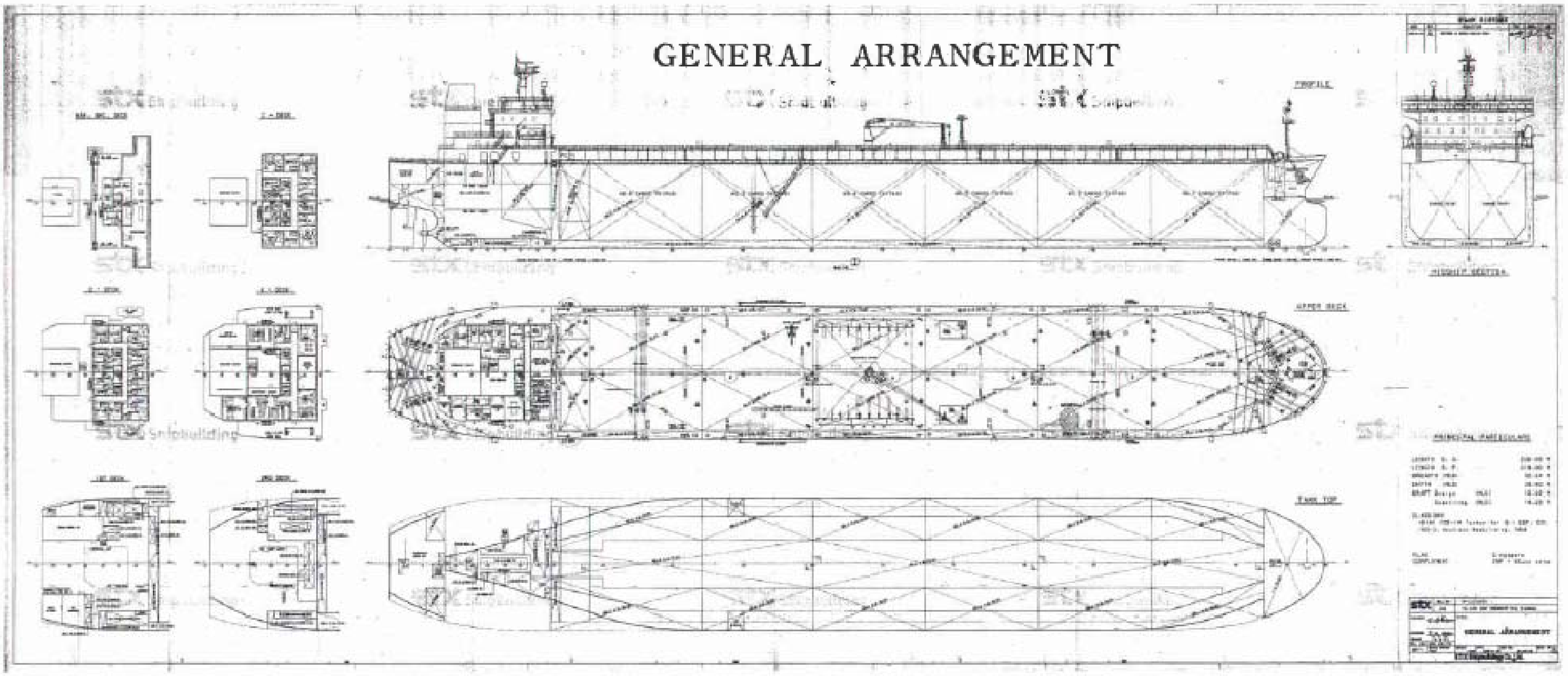
Arctic Tanker: ***Affinity/Perseverance***

This section provides information on an arctic tanker which Shell has chartered for the purposes of the C-Plan. Currently Shell has signed a charter contract with ST Shipping and Transport Pte Ltd for the provision of the *Affinity*, or its identical sister ship, the *Perseverance*.

A general arrangement drawing of the vessel is found on the following page, and a summary of its principal dimensions and capabilities is as follows:

Name:	***Affinity***	***Perseverance***
IMO number:	9289776	9289752
Where Built:	ST Shipbuilding Co. Ltd, Korea	
Date Delivered:	05 Jul 2005	08 Jun 2005
Type of Vessel:	Oil Tanker	
Type of Hull:	Double hull	
Port of Registry:	Singapore	
Flag:	Singapore	
Classification:	Det Norske Veritas	
Class Notation:	+1A1 Tanker for Oil ESP, ICE-1A, E0, VCS-2, T-MON	
Dimensions (meters):		
Length:	228	
Breadth:	32.292	
Draft (summer):	14.3	
Tonnages (metric):		
Gross Tonnage :	42,661	
Deadweight tonnes	73,741	73,789
Crude Capacity(bbls):	553,494	
Performance:		
Engine Output (kW):	13,736	
Engine Type/Builder:	Marine Diesel/STX	
Engine Designation:	6S60MC-C	7S60MC-C
Speed (knots):	16	

ARCTIC TANKER
***AFFINITY/PERSEVERANCE* DIAGRAM**



~~OSRV - *NANUQ*~~
~~GENERAL SPECIFICATIONS~~

~~Vessel Name~~	~~Nanuq (formerly Hull 240, now Hull 235)~~
~~Principal Dimensions~~	~~301'6" x 60" x 24'~~
~~Horsepower~~	~~7,200 BHP~~
~~Deck Space~~	~~169' x 50.5'~~
~~Main Engines~~	~~(2) 3608 Caterpillar~~
~~Bow Thruster~~	~~2 X 1,700 HP / CP tunnel~~
~~Stern Thruster~~	~~1,700 HP / CP tunnel~~
~~Electronics~~	~~As per GMDSS requirements~~
~~Liquid Storage~~	~~12,690 bbls~~
~~Certification~~	~~USCG Subchapter L (OSV) and I (cargo); ABS=A1; ABS=AMS; ABS Load Line; ABS DP-2; Ice Class A1, SOLAS 2000; MARPOL 99~~

POINT BARROW AND ARCTIC ENDEAVOR GENERAL SPECIFICATIONS

Vessel Name	*Point Barrow*	Vessel Name	*Arctic Endeavor*
Principal Dimensions	90' x 32' x 11.5'	Principal Dimensions	205' x 90' x 15'
Horsepower	2110	Horsepower	Non-powered
Deck Space	30' x 30'	Deck Space	Approx 200' x 80'
Main Engines	(2) Caterpillar 3512	Liquid Storage	18,636 bbls
Certification	USCG - Uninspected Towing Vessel ABS - A1, Towing Service, AMS	Certification	USCG - Freight Barge ABS - +A1, Oil Tank Barge, Ice Class C

2. AERIAL SUPPORT OF BEAUFORT EXPLORATORY DRILLING PROGRAM

GENERAL SPECIFICATIONS
BELL 412 (IFR) TWIN TURBINE HELICOPTER

DIMENSIONS

Length	56' 2"
Width	9' 4"
Height	15' 1"
Main Rotor Diameter	46' 0"

CARGO/BAGGAGE

Tailboom cargo space - 28 cu. ft (400 lbs)
Internal cargo space - 220 cu. ft. with 49" x 92" Sliding doors

SPECIFICATIONS

Maximum gross weight	11,900 lbs.
Average basic weight	7,700 lbs.
External sling load	4,000 lbs.
Fuel capacity	214 gal / 1455 lbs (293 gal. (one aux tank))
Fuel consumption	110 gph/800 pph
Average cruise speed	117 kts/135 mph
Maximum range - 252 nm/290 sm with 30 minute fuel reserve	
Passenger seats	11 to 13 passengers depending on configuration
Crew	2 pilots

POWER PLANT

Two (2) Pratt & Whitney PT6T-3B engines developing 1,800 SHP derated to a total of 1,350 SHP.

LANDING GEAR

Fixed skid type landing gear with automatic and pilot activated emergency pop-out float system.

LOADING INFORMATION

Basic weight	7,700 lbs
Full fuel (one auxiliary tank)	1,992 lbs
Pilots (2)	400 lbs
Operating weight	10,092 lbs
Maximum gross weight	11,900 lbs
Minus operating weight	10,092 lbs
Total Payload 1,808 lbs	(full fuel)

PAYLOAD - **Includes 30 minute reserve.*

DISTANCE (roundtrip)	FUEL REQUIRED*	PAYLOAD OUTBOUND	FLIGHT TIME
252 nm/269 sm	1,992 lbs.	1,808 lbs.	2.2
200 nm/230 sm	1,657 lbs.	2,143 lbs.	1.7
150 nm/172 sm	1,337 lbs.	2,463 lbs.	1.3
100 nm/115 sm	1,016 lbs.	2,784 lbs.	0.9
50 nm/57 sm	696 lbs.	3,104 lbs.	0.4

APPENDIX B:
CONTRACTUAL TERMS WITH PRIMARY RESPONDERS AND GRIND & INJECT BALLOT AGREEMENT

SHELL EXPLORATION AND PRODUCTION COMPANY

Oil Spill Response
ASRC Energy Services
AES-Response Operations, LLC
Outline Agreement No. 4610013302

SECTION II – SCOPE OF WORK

GENERAL
AES shall furnish all AES Response Equipment and AES Response Personnel (except Shell-furnished material), supervision, and services in the Arctic Ocean, Alaska, USA.

It shall be AES's responsibility to perform such activities in accordance with Shell's Oil Spill Response objectives.

1) AES OBLIGATIONS
   a) AES shall provide, or cause to be provided, the services as follows:
      i) AES Response Resources to enable Shell to meet the requirements of the C-Plan that pertain to AES;
      ii) the training of AES Response Personnel in compliance with applicable Federal and State Law requirements of the C-Plan that pertain to AES and maintenance of records of such training;
      iii) compliance by AES Response Personnel with all applicable Federal Occupational Safety and Health Administration (OSHA) standards and similar State Laws and standards;
      iv) all information regarding AES Response Resources which must be included in the C-Plan of the Facilities to be filed with the appropriate Federal and State authorities;
      v) list of equipment deployed under the PREP guidelines to assist Shell in fulfilling its obligations under Federal Law;
      vi) supervision and coordination of deployment and use of Response Resources as requested by Shell;
      vii) records and documentation concerning Response Resources, Response Activities and Removal Costs to assist Shell in connection with legal proceedings or for such other purposes as required by Shell; and,
      viii) AES will obtain an OSRO Classification and Certification available to the Oil Spill Response Resources as defined in Shell's C-Plan. Once an OSRO Certification has been obtained, AES will maintain the certification throughout the term of this Agreement.

2) SHELL OBLIGATIONS
   a) Shell shall:
      i) designate a Qualified Individual and provide AES with the name, address, twenty four (24) hours-a-day telephone number and telefacsimile number of the Qualified Individual, and shall amend or update this information as necessary;
      ii) deliver, or cause to be delivered, to AES a copy of each C-Plan, including applicable waivers, and such other information concerning the Facilities as AES may reasonably request;
      iii) be responsible for deciding which Response Resources shall be requested from AES to conduct Response Activities;
      iv) be responsible for coordinating and the overall and general direction of Response Activities, but not specific activities or tasks;
      v) be responsible for disposal of all Oil and Hazardous Substances collected by AES;
      vi) maintain in force at all times Marine Oil Pollution Insurance in compliance with OPA and furnish, whenever requested by AES, confirmation of such insurance; and,
      vii) comply with the mutually agreed event notification procedures.

ACCEPTANCE

By signing below, each party signifies that it has carefully examined and agrees to be bound by all terms and conditions that are contained in this Agreement.

Authorized Shell Representative

Signature: Mary Kelly

Name: Mary Kelly

Title: SCM Category Manager

Date: 12/14/2006

Signature: Chandler Anderson

Name: Chandler Anderson

Title: Manager SCM Production

Date: 12/14/2006

Authorized AES Representative

Signature: Bernard Nidowicz

Name: BERNARD NIDOWICZ

Title: President

Date: 1/15/07

MEMBER

RESPONSE ACTION CONTRACT

By and between

ALASKA CLEAN SEAS

AND

SHELL OFFSHORE INCORPORATED

This Response Action Contract is entered into this 30th day of November, by and between Alaska Clean Seas ("ACS"), a non-profit corporation organized and existing under the laws of the State of Alaska, and Shell Offshore Inc. ("MEMBER").

WHEREAS, MEMBER may request from time to time the use of the response services and equipment provided by ACS as a response action contractor in the event of a release or threatened release ("release") of crude oil, hazardous material or refined petroleum products ("liquid hydrocarbons"), or for a drill conducted by any authorized governmental agency ("drill");

NOW, THEREFORE, in consideration of the premises, and in further consideration of the promises below, the parties agree as follows:

1. **Term of Contract.** This Contract is effective the date first written above.

2. **Payment Due Dates.** All invoices submitted by ACS to MEMBER shall be due and payable not more than thirty (30) days after the date the invoice is transmitted to MEMBER, and amounts due shall bear interest at the rate of one percent (1%) per month or portion thereof from the due date until paid. At any time payments are past due, ACS may request and receive from MEMBER adequate security for payments, such as a cash deposit or an irrevocable letter of credit in amount equal to the anticipated costs for one or more months of services to be rendered, or other security satisfactory to ACS. In the event such security is not forthcoming within three (3) days upon request, ACS may decline to provide services for MEMBER under this Contract, and may cease services immediately upon notice to MEMBER.

   In the event ACS and MEMBER cannot agree on any charge or charges made by ACS to MEMBER under this Response Action Contract, MEMBER may withhold up to ten percent (10%) of the disputed charges, only, pending resolution of the dispute. In the event MEMBER withholds more than ten percent (10%) of any billing on account of disputed charges,

F. Amendment: This Response Action Contract may be amended only in writing signed by both parties to the Contract.

G. Entire Understanding. The terms set forth in this Response Action Contract supersede all previous discussions, understandings and agreements between the parties hereto with respect to the subject matter hereof, and are intended by the parties as a final, complete and exclusive expression of the terms of their agreement and may not be contradicted, explained or supplemented by evidence of any prior agreement, any contemporaneous oral agreement or any additional terms.

H. Conflicts. This Response Action Contract is to be interpreted in harmony with the ACS Bylaws. In the event of a conflict between the provisions of this Contract and the ACS Bylaws, the terms of the ACS Bylaws shall control.

IN WITNESS WHEREOF, the parties have signed this Response Action Contract, effective the date first written above.

ACS		MEMBER	
ALASKA CLEAN SEAS		Shell Offshore Inc.	
Signature:	L.D. [signature]	Signature	Mary Kelly
Name:	L.D. (Lindy) Theis	Name:	Mary Kelly
Title:	Secretary/Treas	Title:	SCM Category Manager
Date:	Dec 1, 2006	Date:	11/10/06

Phone: 504.728.6101
Fax: 504.728.0608
Email: mary.kelly@shell.com

Susan M Moore
Susan M Moore
Alaska Operations Manager
11/30/06
mobile: 907-382-5472
Office: 907-770-3700
Email: Susan.S.m.moore @shell.com

STATEMENT OF CONTRACTUAL TERMS
OSRV

VESSEL REQUEST ORDER

This VESSEL REQUEST ORDER is entered into the 9th day of May, 2006, between Shell Offshore, Inc. ("SHELL") and EDISON CHOUEST OFFSHORE, LLC ("CONTRACTOR"), owner of the vessel described below ("VESSEL").

Pursuant to the terms of that Master Marine Transportation Services Agreement entered into as of the 6th day of December, 1995 between Shell Offshore, Inc. and Edison Chouest Offshore, Inc. <u>to be modified to include special provisions for Arctic and oil spill recovery operations</u>, the premises and covenants of which the parties hereto are familiar with and incorporate herein by reference, CONTRACTOR agrees to and does hereby time charter and SHELL agrees to and does hereby hire the VESSEL subject to the following.

CONTINGENT LIABILITY PERIOD

Contingent Liability Period	May 8, 2006 to June 1, 2006

CONTINGENT LIABILITIES

- The additional costs to be incurred by CONTRA[redacted] Monday, May 8, 2006, and Thursday, June 1, 2006 is $1[redacted]nt is represented below as follows:
  - Gearb[redacted]
  - Whee[redacted]
  - Low [redacted]
  - Engi[redacted]
- If Shell do[redacted]ot commit to time charter the below described vessel for a primary term of three (3) years prior to Thursday, June 1, 2006, the above noted $1,110,000.00 will be for the account of Shell.
- ECO will use its best efforts to reduce contingent liabilities to a minimum.

VESSEL DESCRIPTION

Vessel Name	**Artic Oil Spill Recovery/PSV TBN** (Hull 240)
Official Number	TBA
Principal Dimensions	301'6" x 60' x 24'
Horsepower	7,200 BHP
Deck Space	203' x 50.5'
Main Engines	(2) 3608 Caterpillar

STATEMENT OF CONTRACTUAL TERMS
OSRV

Shell Offshore, Inc.

By: Alan T. Power

Its: Alan T. Power

Date: 5-16-06

Edison Chouest Offshore, L.L.C.

By: Roger White

Roger White

Its: Senior Vice-President, as agent

Date: 5-17-06

Removed

STATEMENT OF CONTRACTUAL TERMS
ARCTIC ENDEAVOR

STATEMENT OF CONTRACTUAL TERMS
OSRB

CONFIDENTIAL

Vessel Request Order

(Ref. SOI/SDDI/SDPI Service Agreements)

VRO Number: 406 Alt: 3
Date of Issue: 11/17/2006
Region: Alaska
Generated By: michael.alvarez

Pursuant to the terms and conditions that certain Master Agreement 4610012929 as amended, entered into by and between Shell Offshore, Inc. (SOI), and other appropriate Shell entities and Crowley Marine Services, This VRO sets forth our understanding and agreement that the captioned vessel has been chartered by Crowley Marine Services to SOI

Charter Details

Vessel Name:	Arctic Endeavor	Starting Fuel (Gals):	0	☑ Term Vessel	
Type:	Barge	Est. Hourly Fuel:	0	Year 1 Rate:	[redacted]
Day Rate:	[redacted]	Date Time On Charter:	6/1/2007 14:40	Year 2 Rate:	[redacted]
Riggers Included:	☐	Expected Days Of Charter:	3 yrs	Year 3 Rate:	[redacted]
		Cancellation Terms:	Non Cancelable	Bid Ref #:	
Shell Focal Point:	KateMiner	Terminal Hired:	Alaska	Charge Code:	

Reason Hired:
Oil Spill Response

Special Equipment:

Special Conditions:
Port of Delivery and Re-Delivery is Seattle, Washington.

The delivery date noted in this VRO is an estimated delivery date and will be firmed up as the project/upgrade timeline is confirmed.

Any reimbursables, including outside engineering charges, will be at cost plus 10% unless such reimbursables are charged in another mutually agreeable fashion.

Owner and Charterer have agreed that in addition to the initial 3-year term, Charterer is granted (3) 3-year contract extensions at Charterers option. The pricing for each option will be based on the cumulative increase in the Consumer Price Index, All Consumers, US – All Products, from year one to year three of the agreement. Each subsequent increase will be priced using the same methodology.

The term of the VRO is 3-years firm and non-cancelable by either party unless by mutual agreement. However, in the event Charterer deems that Owner's safety program is insufficient, Charterer retains the ability to cancel the agreement.

Misc:

Vessel Specifications

DP Type:		Seats:	0	Water Cap (bbls):	0	Fire Monitors:	0
Overall Length (ft):	205	Min Draft (ft):	10	Fuel Cap (gals):	0		
Overall Width (ft):	90	Max Draft (ft):	12	Liquid Mud Cap (bbls):	0		
Clear Deck Length (ft):	0	Max Speed (kts):	0	Dry Bulk Cap (ft3):	0		
Clear Deck Widt (ft):	0	Cruise Speed (kts):	0	Methanol Cap (bbls):	0		

STATEMENT OF CONTRACTUAL TERMS
ARCTIC ENDEAVOR

STATEMENT OF CONTRACTUAL TERMS
OSRB

3	3/19/2009	Mike Alvarez	As per the agreement between Owner and Charterer, the contract shall be amended as follows: - Owner agrees to off-charter the Endeavor Barge as of February 1, 2009 from Charterer's account - Vessel and equipment will remain off-charter until activated for the 2010 drilling season - The number of days the vessel will remain off-charter in 2009/2010 will be added back to the remaining initial term of the charter agreement - Owner shall maintain responsibility for the security and operational control of the vessel while in Prudhoe Bay or any other location while off-charter - Owner shall allow Charterer access to the barge to coordinate any inspections or maintenance, as needed, to the quipment during the off-hire period - The vessel shall be subject to a CPI rate increase/decrease as stipulated in the original charter agreement when reactivated in 2010, if an increase is required it will be capped at 4% maximum. The vessel charter rate shall be less the modification cost which was paid in full in January 2009. - Should the vessel be dispateched to Nome for lay-up, the actual chareter rate for te vessel including fuel will be paid during the transit from Prudhoe Bay to Nome - All expenses for dockage, storage or security of the equipment in nome shall be billed to Charderer at cost plus markup as agreed in the original contract.

Acceptance

	Contractor		Shell
Print Name:	Bruce D. Harland	Print Name:	Michael J. Alvarez
Signature:	[signature]	Signature:	[signature]
Title:	VP - Contract Svcs.	Title:	Atoff SCM Representative
Date:	4/7/2009	Date:	4/7/09

STATEMENT OF CONTRACTUAL TERMS
CROWLEY POINT BARROW TUG

CONFIDENTIAL

Vessel Request Order

(Ref: SOI/SDDI/SDPI Service Agreements)

VRO Number: 407
Date of issue: 11/17/2006

Pursuant to the terms and conditions that certain Master Agreement 4610012929 as amended, entered into by and between Shell Offshore, Inc. (SOI), and other appropriate Shell entities and Crowley Marine Services, This VRO sets forth our understanding and agreement that the captioned vessel has been chartered by Crowley Marine Services to SOI

Charter Details

Vessel Name:	Point Barrow	Starting Fuel (Gals):	0	☑ Term Vessel	
Type:	Tug	Est. Hourly Fuel:	0	Year 1 Rate:	$5,600.00
Day Rate:	$5,600.00	Date Time On Charter:	5/1/2007 0:01	Year 2 Rate:	
Riggers Included:	☐	Expected Days Of Charter:	3 yrs	Year 3 Rate:	
		Cancellation Terms:	Non Cancelable	Bid Ref #:	
Shell Focal Point:	Kate Marstall	Terminal Hired:		Charge Code:	

Reason Hired:
Alaska Oil Spill Response

Special Equipment:

Special Conditions:
Port of Delivery and Re-Delivery is Seattle, Washington.

The delivery date noted in this VRO is an estimated delivery date and will be firmed up as the project timeline is confirmed.

Year 1 rate is fixed at the rate contained in this VRO. The Year 2 and Year 3 rates of the initial term will be adjusted for changes in the Consumer Price Index, US - All Consumers upon each anniversary date. The new rate shall be the product of the existing rate and the percentage change in index values between the month of the anniversary date and the same month of the prior year. Each subsequent increase (including option years) will be priced using the same methodology

During periods when the vessel crew is demobilized the day rate for the vessel shall be $2,500 per day.

If it so chooses, Charterer may return the vessel to Seattle, WA or some other mutually agreeable location during each off-season. In such an event Owner is encouraged to seek alternate employment for the vessel. If alternate employment can be secured, Charterer will not be responsible for any portion of its contracted day rate during the period of alternate employment (unless such employment is at a lower rate than the charter rate).

Owner and Charterer have agreed that in addition to the initial 3-year term, Charterer is granted (3) 3-year contract extensions at Charterers option.

The term of the VRO is 3-years firm and non-cancelable by either party unless by mutual agreement. However, in the event Charterer deems that Owner's safety program is insufficient, Charterer retains the ability to cancel the agreement.

Misc:

Vessel Specifications

DP Type:		Seats:	0	Water Cap (bbls):	4000	Fire Monitors:	0
Overall Length (ft):	90	Min Draft (ft):	6	Fuel Cap (gals):	60000		
Overall Width (ft):	32	Max Draft (ft):	8	Liquid Mud Cap (bbls):	0		
Clear Deck Length (ft):	0	Max Speed (kts):	0	Dry Bulk Cap (ft3):	0		

FAX SIGNED ACCEPTANCE TO ATTENTION OF SHELL SUPPLY CHAIN MANAGEMENT AT 504-728-0637

STATEMENT OF CONTRACTUAL TERMS
CROWLEY POINT BARROW TUG

CONFIDENTIAL | **Vessel Request Order** | VRO Number: 407
(Ref: SOI/SDDI/SDPI Service Agreements) | Date of issue: 11/17/2006

Clear Deck Widt (ft): 0 Cruise Speed (kts): 0 Methanol Cap (bbls): 0

Acceptance

Contractor		Shell	
Print Name:	Michael P. O'Shea	Print Name:	Alan T. Power
Signature:	Michael P. O'Shea	Signature:	Alan T. Power
Title:	Authorized Agent	Title:	SCM Representative
Date:	12/13/06	Date:	12-12-06

FAX SIGNED ACCEPTANCE TO ATTENTION OF SHELL SUPPLY CHAIN MANAGEMENT AT 504-728-0637

Page 2 of 2

STATEMENT OF CONTRACTUAL TERMS
ARCTIC TANKER *(AFFINITY-PERSEVERENCE)*

Code word for this Charter Party
"SHELLTIME 4"

Issued December 1984

ORIGINAL

Time Charter Party

~~LONDON~~ Wilton, CT Jan. 31, 2007

IT IS THIS DAY AGREED between **ST SHIPPING & TRANSPORT PTE LTD**

of **London** (hereinafter referred to as "Owners"), being **Disponent** owners of the

good **motor** vessel called **"AFFINITY" Owners' option "PERSEVERANCE"**

(hereinafter referred to as "the Vessel") described as per Clause 1 hereof **and Special Provisions Clause 7 attached** and **SHELL OFFSHORE INC.**

of **New Orleans, LA** (hereinafter referred to as "Charterers"):

Description and Condition of Vessel

1. At the date of delivery of the vessel under this charter **all details "about"**
(a) she shall be classed; **DNV +1A1 Tanker for Oil ESP, Ice-1A, EO, VCS-2-T-Mon**
(b) she shall be in every way fit to carry crude petroleum and/or its products; **(See ST Shipping Clause 43 attached)**
(c) she shall be tight, staunch, strong, in good order and condition, and in every way fit for the service, with her machinery, boilers, hull and other equipment (including but not limited to hull stress calculator and radar), in a good and efficient state;
(d) her tanks, valves and pipelines shall be oil-tight;
(e) she shall be in every way fitted for burning **(See Bunker Clause 29 below)**

at sea - fueloil with a maximum viscosity of Centistokes at 50 degrees Centigrade/ any commercial grade of fuel oil ("ACGFO") for main propulsion, marine diesel oil/ACGFO for auxiliaries
in port – marine diesel oil/ACGFO for auxiliaries;

(f) she shall comply with the regulations in force so as to enable her to pass through the Suez and Panama Canals by day and night without delay;
(g) she shall have on board all certificates, documents and equipment required from time to time by any applicable lay to enable her to perform the charter service without delay;
(h) she shall comply with the description in Form B appended hereto, provided however that if there is any conflict between the provisions of Form B and any other provision, including this Clause 1, of this charter such other provision shall govern.

Shipboard Personnel and their Duties

2. (a) At the date of delivery of the vessel under this charter
(i) she shall have a full and efficient complement of master, officers and crew for a vessel of her tonnage, who shall in any event be not less than the number required by the laws of the flag state and who shall be trained to operate the vessel and her equipment competently and safely;
(ii) all shipboard personnel shall hold valid certificates of competence in accordance with the requirements of the law of the flag state;
(iii) all shipboard personnel shall be trained in accordance with the relevant provisions of the International Convention on Standards of Training, Certification and Watch keeping for Seafarers, 1978;
(iv) there shall be on board sufficient personnel with a good working knowledge of the English language to enable cargo operations at loading and discharging places to be carried out efficiently and safely and to enable communications between the vessel and those loading the vessel or accepting discharge therefrom to be carried out quickly and efficiently.
(b) Owners guarantee that throughout the charter service the master shall with the vessel's officers and crew, unless otherwise ordered by Charterers,
(i) prosecute all voyages with the utmost dispatch;
(ii) render all customary assistance; and
(iii) load and discharge cargo as rapidly as possible when required by Charterers or their agents to do so, by night or by day, but always in accordance with the laws of the place of loading or discharging (as the case may be) and in each case in accordance with any applicable laws of the flag state.

Duty to Maintain

3. (i) Throughout the charter service Owners shall, whenever the passage of time, wear and tear or any event (whether or not coming within Clause 27 hereof) requires steps to be taken to maintain or restore the conditions stipulated in Clauses 1 and 2(a), exercise due diligence so to maintain or restore the vessel.
(ii) If at any time whilst the vessel is on hire under this charter the vessel fails to comply with the requirements of Clauses 1, 2(a) or 10 then hire shall be reduced to the extent necessary to indemnify Charterers for such failure. If and to the extent that such failure affects the time taken by the vessel to perform any services under this charter, hire shall be reduced by an amount equal to the value, calculated at the rate of hire, of the time so lost.

Any reduction of hire under this sub-Clause (ii) shall be without prejudice to any other remedy available to Charterers, but where such reduction of hire is in respect of time lost, such time shall be excluded from any calculation under Clause 24.

~~(iii) If Owners are in breach of their obligation under Clause 3(i) Charterers may so notify Owners in writing; and if, after the expiry of 30 days following the receipt by Owners of any such notice, Owners have failed to demonstrate to Charterers' reasonable satisfaction the exercise of due diligence as required in Clause 3(i), the vessel shall be off-hire, and no further hire payments shall be due, until Owners have so demonstrated that they are exercising such due diligence.~~

Furthermore, at any time while the vessel is off-hire under this Clause 3 Charterers have the option to terminate this charter by giving notice in writing with effect from the date on which such notice of termination is received by Owners or from any later date stated in such notice. This sub-Clause (iii) is without prejudice to any rights of Charterers or obligations of Owners under this charter or otherwise (including without limitation Charterers' rights under Clause 21 hereof).

Period Trading Limits

4. Owners agree to let and Charterers agree to hire the vessel for a period of **5 months Timecharter plus 30 days/minus 15 days in Charterers' option**
commencing from the time and date of delivery of the vessel, for the purpose of carrying all lawful merchandise (subject always to Clause 28) including in particular **(See ST Shipping Clause 43 attached)**

in any part of the world, **(See ST Shipping Clause 44 attached)** as Charterers shall direct, subject to the limits of the current British Institute Warranties and any subsequent amendments thereof. Notwithstanding the foregoing, but subject to Clause 35, Charterers may order the vessel to ice-bound waters **during the period the vessel is trading in ice, speed and consumption warranties as per Clause 24 are suspended** or to any part of the world outside such limits provided that Owners consent thereto (such consent not to be unreasonably withheld) and that Charterers pay for any insurance premium required by the vessel's underwriters as a consequence of such order.

Charterers shall use due diligence to ensure that the vessel is only employed between and at safe places (which expression when used in this charter shall include ports, berths, wharves, docks, anchorages, submarine lines, alongside vessels or lighters, and other locations including locations at sea) where she can safely lie always afloat. Notwithstanding anything contained in this or any other clause of their charter, Charterers do not warrant the safety of any place to which they order the vessel and shall be under no liability in respect thereof except for loss or damage caused by their failure to exercise due diligence as aforesaid. Subject as above, the vessel shall be loaded and discharged at any places as Charterers may direct, provided that Charterers shall exercise due diligence to ensure that any ship-to-ship transfer operations shall conform to standards not less than those set out in the latest published edition of the ICS/OCIMP Ship-to Ship Transfer Guide.

The vessel shall be delivered by Owners at a port in **dropping outbound pilot U.S. West Coast (Los Angeles-Vancouver, Canada Range) or Charterers' option Singapore-Japan Range. Owners' option to deliver vessel at any port within these ranges. Charterers to declare the delivery range latest 1700 hours Houston time March 31, 2007. Owners' option to deliver the vessel with last cargo Clean Petroleum Products, Dirty Petroleum Products or Crude Oil**
at Owners' option and redelivered to Owners at a port in **dropping outbound pilot U.S. West Coast, Central America, Caribbean, U.S. Gulf, U.S. Atlantic Coast, United Kingdom/Continent or European Mediterranean** at Charterers' option.

Laydays/ Cancelling

5. The vessel shall not be delivered to Charterers before **June 1, 2007** and Charterers shall have the option of cancelling this charter if the vessel is not ready and at their disposal on or before **June 20, 2007.**

Owners to Provide

6. Owners undertake to provide and to pay for all provisions, wages, and shipping and discharging fees and all other expenses of the master, officers and crew; also, except as provided in Clauses 4 and 34 hereof, for all insurance on the vessel, for all deck, cabin and engine-room stores, and for water; for all drydocking, overhaul, maintenance and repairs to the vessel; and for all fumigation expenses and de-rat certificates. Owners' obligations under this Clause 6 extend to all liabilities for customs or import duties arising at any time during the performance of this charter in relation to the personal effects of the master, officers and crew, and in relation to the stores, provisions and other matters aforesaid which Owners are to provide and pay for and Owners shall refund to Charterers any sums Charterers or their agents may have paid or been compelled to pay in respect of any such liability. Any amounts allowable in general average for wages and provisions and stores shall be credited to Charterers insofar as such amounts are in respect of a period when the vessel is on-hire.

Charterers to Provide

7. Charterers shall provide and pay for all fuel (except fuel used for domestic services), towage and pilotage and shall pay agency fees, port charges, commissions, expenses of loading and unloading cargoes, canal dues and all charges other than those payable by Owners in accordance with Clause 6 hereof, provided that all charges for the said items shall be for Owners' account when such items are consumed, employed or incurred for Owners' purposes or while the vessel is off-hire (unless such items reasonably relate to any service given or distance made good and taken into account under Clause 21 or 22); and provided further that any fuel used in connection with a general average sacrifice or expenditure shall be paid for by Owners.

provisions of the Arbitration Act 1950, or any statutory modification or re-enactment thereof for the time being in force.

(i) A party shall lose its right to make such an election only if:

(a) it receives from the other party a written notice of dispute which -

(1) states expressly that a dispute has arisen out of this charter;

(2) specifies the nature of the dispute; and

(3) refers expressly to this clause 41(c)

and

(b) it fails to give notice of election to have the dispute referred to arbitration not later than 30 days from the date of receipt of such notice of dispute.

(ii) The parties hereby agree that wither party may -

(a) appeal to the High Court on any question of law arising out of an award;

(b) apply to the High court for an order that the arbitrator state the reasons for his award;

(c) give notice to the arbitrator that a reasoned award is required; and

(d) apply to the High Court to determine any question of law arising in the course of the reference.

(d) It shall be a condition precedent to the right of any party to a stay of any legal proceedings in which maritime property has been, or may be, arrested in connection with a dispute under this charter, that that party furnishes to the other party security to which that other party would have been entitled in such legal proceedings in the absence of a stay.

Construction

42. The side headings have been included in this charter for convenience of reference and shall in not way affect the construction hereof.

ALSO SPECIAL PROVISIONS CLAUSES NOS. 1 TO 8 AS ATTACHED AND ST SHIPPING CLAUSES NOS. 43 TO 104, AS AMENDED AND ATTACHED ARE DEEMED INCORPORATED IN THIS TIMECHARTER PARTY.

Witness the Signature of:

ST SHIPPING & TRANSPORT PTE LTD, Disponent Owners

Witness the Signature of:

SHELL OFFSHORE INC., Charterers

STATEMENT OF CONTRACTUAL TERMS
KLAMATH

Vessel Request Order

VRO Number 1155

Ref:SOI/SDDI/SDPI Service Agreements

Vessel Supplier	N/A	Region	Alaska
Vessel Name	Klamath	Generated By	Kelly White
		Date Generated	4/25/2011

Pursuant to the terms and conditions Master Agreement 4610012929 as amended, entered into by and between Shell Offshore, Inc. (SOI) and other appropriate Shell entities and , this VRO sets forth our understanding and agreement that the captioned vessel has been chartered by to SOI.

Charter Details

Type	Barge	Cancellation Terms	Cancellation by February 1 of each drilling season
Day Rate	[redacted]	Cancelling Date	2012-02-01
Riggers Included	No	Point of Delivery	
Mobilization Fee		Point of Re-Delivery	
Demobilization Fee		Charter Type	Project Specific
Shell Focal Point	Kelly White	Year 1 Rate	[redacted]
Starting Fuel (USG)		Year 2 Rate	[redacted]
Est. Hourly Fuel (USG)		Year 3 Rate	
Date/Time on charter	2011-06-01 00:00	Bid Ref #	Offer for Tank Barge + Tug
Expected Days on Charter	730	Charge Code	

STATEMENT OF CONTRACTUAL TERMS
KLAMATH

Water Capacity (BBLS)	N/A
Fuel Capacity (USG)	N/A
Liquid Mud Capacity (BBLS)	76923
Dry Bulk Capacity (FT3)	N/A
Menthanol Capacity (BBLS)	N/A
Min Draft (FT)	N/A
Max Draft (FT)	17
Max Speed (KTS)	N/A
Cruise Speed (KTS)	N/A

Alterations

Acceptance

	Contractor		Shell
Print Name	Bruce D. Harland	Print Name	Kelly White
Signature		Signature	
Title	VP. Contract Services	Title	Regional Marine Category Man
Date	4/26/2011	Date	26 April 2011

GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

FOURTEENTH AMENDMENT TO

GRIND AND INJECT TECHNOLOGY

FORWARD ACTION PLAN

AND

OPERATING AGREEMENT FOR THE

GRIND AND INJECT PLANT

BY AND AMONG

THE

WORKING INTEREST OWNERS OF THE

PBU INITIAL PARTICIPATING AREAS, LISBURNE PARTICIPATING AREA, KRU KUPARUK PARTICIPATING AREA AND SHELL OFFSHORE INC.

EFFECTIVE
June 1, 2007

GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

THIS FOURTEENTH AMENDMENT is made and entered into by and among the Prudhoe Bay Unit ("PBU") Initial Participating Areas ("IPA") Working Interest Owners ("IPA Owners"), the PBU Lisburne Participating Area ("LPA") Working Interest Owners ("LPA Owners"), the Kuparuk River Unit ("KRU") Kuparuk Participating Area ("KPA") Working Interest Owners ("KPA Owners"), collectively referred to herein as the "Plant Owners," and Shell Offshore Inc. ("Shell").

Recitals

1. The Plant Owners previously executed IPA Ballot No. 97-201/ LPA Ballot No. 97-047/ KRU Ballot No. 262 ("G&I Ballot Agreement"), IPA Ballot 00-201A / LPA Ballot 00-047A / KRU Ballot No. 262A ("First Amendment"), IPA Ballot No. 02-201B/LPA Ballot 02-047B/KPA Ballot 262B, ("Second Amendment"), IPA Ballot No. 02-201C/LPA Ballot 02-047C/KPA Ballot 262C ("Third Amendment"), IPA Ballot No. 02-201D/LPA Ballot 02-047D/KPA Ballot 262D ("Fourth Amendment"), IPA Ballot No. 03-201E/LPA Ballot 03-047E/KPA Ballot 262E ("Fifth Amendment"), IPA Ballot No. 03-201F/LPA Ballot 03-047F/KPA Ballot 262F ("Sixth Amendment"), IPA Ballot No. 04-201G/LPA Ballot 04-047G/KPA Ballot 262G ("Seventh Amendment") and IPA Ballot No. 05-201H/LPA Ballot 05-047H/KPA Ballot 262H ("Eighth Amendment") and IPA Ballot No. 05-201I/LPA Ballot 05-047I/KPA Ballot 262I ("Ninth Amendment").

2. Section 14.0 of the G&I Ballot Agreement provides that the Plant Owners may authorize an additional Third Party by a 90% Vote of the IPA Owners, an 88% Vote of the KPA Owners, and a 100% vote of the Lisburne Owners.

3. The Plant Owners are willing to authorize Shell to become an additional Third Party.

4. Shell wishes to become a Third Party under the G&I Ballot Agreement.

NOW THEREFORE, in consideration of the mutual covenants and promises contained herein, the parties hereto agree as follows.

1.0 Addition as Third Party

The Plant Owners hereby authorize Shell to become a Third Party to the G&I Ballot Agreement. Shell hereby ratifies the G&I Ballot Agreement as amended and agrees to be bound by the terms and conditions thereof.

2.0 Effective Date and Term

This 14th Amendment shall be effective as of June 1, 2007, upon execution by Shell and approval by a 90% Vote of the IPA Owners, an 88% Vote of the KPA Owners and a 100% vote of the LPA Owners and shall expire December 31, 2010. The expiration date may be extended by the

IPA Ballot 07-201N
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parties if approved by a 90% Vote of the IPA Owners, an 88% Vote of the KPA Owners and a 100% Vote of the LPA Owners.

3.0 Notices

Any notices or communication among the following parties regarding this Agreement shall be addressed as follows:

To BP Exploration (Alaska) Inc. as PBU Operator:

Name: Sherri Gould, GPB Lead Negotiator
Address: P.O. Box 196612
Anchorage, AK 99519-6612
Phone: (907) 564-5942
Fax: (907) 564-4637
Email: sherri.gould@bp.com

To Shell:

Name: Kate Marstall
Address: 3601 C Street, Suite 1334
Anchorage, AK 99503
Phone: (907) 646-7111
Fax: (907) 770-3636
Email: kate.marstall@shell.com

4.0 Counterparts

This 14th Amendment may be executed in counterpart, all of which together shall be deemed to be and shall be treated as a single original instrument.

IN WITNESS WHEREOF, the Parties have executed this 14th Amendment on the date opposite their respective signatures.

PRUDHOE BAY UNIT

Initial Participating Areas Owners

Dated: ______________________

BP EXPLORATION (ALASKA) INC.

By: Michael J Utiler
Unit Owners Committee
Representative/Alternate

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GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

Dated: ______________________ CHEVRON U.S.A. INC.

By: ______________________
Unit Owners Committee
Representative/Alternate

Dated: 6/14/07 CONOCOPHILLIPS ALASKA, INC.

By: Dan Kruse for JT
Unit Owners Committee
Representative/Alternate JKG

Dated: ______________________ EXXONMOBIL ALASKA PRODUCTION INC.

By: ______________________
Unit Owners Committee
Representative/Alternate

Lisburne Participating Area Owners

Dated: ______________________ BP EXPLORATION (ALASKA) INC.

By: ______________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________ CHEVRON U.S.A. INC.

By: ______________________
Unit Owners Committee
Representative/Alternate

Dated: 6/14/07 CONOCOPHILLIPS ALASKA, INC.

By: Dan Kruse for JT
Unit Owners Committee
Representative/Alternate JKG

Dated: ______________________ EXXONMOBIL ALASKA PRODUCTION INC

By: ______________________
Unit Owners Committee
Representative/Alternate

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GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
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KUPARUK RIVER UNIT

Kuparuk Participating Area Owners

Dated: ______________________	BP EXPLORATION (ALASKA) INC. By: ______________________ Unit Owners Committee Representative/Alternate
Dated: ______________________	CONOCOPHILLIPS ALASKA, INC. By: ______________________ Unit Owners Committee Representative/Alternate
Dated: 6/29/07	EXXONMOBIL ALASKA PRODUCTION INC. By: ______________________ Unit Owners Committee Representative/Alternate
Dated: ______________________	UNION OIL COMPANY OF CALIFORNIA By: ______________________ Unit Owners Committee Representative/Alternate

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GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

Dated: ____________________ CHEVRON U.S.A. INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Dated: ____________________ CONOCOPHILLIPS ALASKA, INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Dated: 6/28/07 EXXONMOBIL ALASKA PRODUCTION INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Lisburne Participating Area Owners

Dated: ____________________ BP EXPLORATION (ALASKA) INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Dated: ____________________ CHEVRON U.S.A. INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Dated: ____________________ CONOCOPHILLIPS ALASKA, INC.

By: ____________________
Unit Owners Committee
Representative/Alternate

Dated: 6/28/07 EXXONMOBIL ALASKA PRODUCTION INC

By: ____________________
Unit Owners Committee
Representative/Alternate

3

GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

Dated: ______________________

CHEVRON U.S.A. INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________

CONOCOPHILLIPS ALASKA, INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________

EXXONMOBIL ALASKA PRODUCTION INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Lisburne Participating Area Owners

Dated: ______________________

BP EXPLORATION (ALASKA) INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________

CHEVRON U.S.A. INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________

CONOCOPHILLIPS ALASKA, INC.

By: ______________________________
Unit Owners Committee
Representative/Alternate

Dated: ______________________

EXXONMOBIL ALASKA PRODUCTION INC

By: ______________________________
Unit Owners Committee
Representative/Alternate

3

GRIND & INJECT BALLOT AGREEMENT

IPA Ballot 07-201N
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KPA Ballot 262N

KUPARUK RIVER UNIT

Kuparuk Participating Area Owners

Dated: ______________________	BP EXPLORATION (ALASKA) INC. By: ______________________ Unit Owners Committee Representative/Alternate
Dated: 6/18/07	CONOCOPHILLIPS ALASKA, INC. By: ______________________ Unit Owners Committee Representative/Alternate JKG
Dated: ______________________	EXXONMOBIL ALASKA PRODUCTION INC. By: ______________________ Unit Owners Committee Representative/Alternate
Dated: ______________________	UNION OIL COMPANY OF CALIFORNIA By: ______________________ Unit Owners Committee Representative/Alternate

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Jul. 9. 2007 5:46AM No. 0198 P. 2/3

IPA Ballot 07-201N
LPA Ballot 07-047N
KPA Ballot 262N

THIRD PARTY

NORTH SLOPE OIL FIELD OPERATIONS

Operator: Shell Offshore Inc.

Dated: 7/9/2007

By: Katherine A. Marstall

Title: Head of Logistics- Alaska

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APPENDIX C:
FUEL TRANSFER PROCEDURES

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1. *Kulluk* Fuel Transfer Procedures

DIESEL/HELI-FUEL

TRANSFER MANUAL

FOR THE MODU

KULLUK

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INTRODUCTION

This section of the manual is to be used as a guide for the safe transfer of diesel oil between vessels (supply ships, fuel barges, etc.) and the MODU *Kulluk* and for fuel transfers that are internal to the *Kulluk*.

All practices comply with procedures set by the Canadian Coast Guard Arctic Ship Safety and the United States Coast Guard as interpreted from various publications.

CONTENTS FOR DRILL RIG FUEL TRANSFER SECTION

1.0 FUEL OIL SYSTEM OVERVIEW

The Fuel Oil System consists of:

- Three Hull Storage Tanks	(1603.3 m3 total)
- Two Fuel Oil Transfer Pumps	(6.3 litres/sec.ea.)
- Two Fuel Oil Booster Pumps	(3.15 litres/sec. ea.)
- One Fuel Oil Settling Tank	(14 m3)
- One clean Oil Tank	(14 m3)
- Various Misc. Tanks	(13.1 m3 total)
- Two Fuel Oil Filters	
- Two Fuel Oil Purifiers	
- Associated Strainers, F.O. Meters, Piping	

The three hull storage tanks (5P-10C; 5P-12C2; 5S-11C) have a total capacity of 1603.3 m3. These tanks are located in the 5m level and are each fitted with emergency shut off valves (air operated) on both the high and low suctions, high level alarms, low level alarms, remote level indicators, and armored-type gauge glasses which are fitted to the storage tanks via self closing valves (spring close/air open). In addition each tank is also fitted with manual sounding pipes which are accessed from the 10 m level.

These tanks can be filled, via a duplex strainer located on the 10 m level, from any one of three loading stations located on the main deck (port deck, fwd. deck, starboard deck). Each station is equipped with dry break fittings (5") and a permanent drip tray.

The two fuel oil transfer pumps are used to transfer fuel from the hull storage tanks to the fuel oil setting tank or to discharge fuel oil via the loading stations to one of the support vessels. (ice breaker/supply ship). As these pumps can also be used to off load fuel each loading station is equipped with a start/stop station for remote operation of the pumps. The two transfer pumps can also be operated from a remote stop/start station near the F.O. settling tank and from local stations at the pumps themselves.

In operation the pumps draw fuel from the storage tanks through one of the two suctions and discharge it via a duplex strainer and F.O. meter to either the deck stations or the settling tank.

Fuel in the settling tank is then drawn through the fuel oil purifier where solids and water are removed and the clean fuel discharged to the clean oil tank which is also used as the diesel engine day tank. Both the settling tank and the clean oil tank are fitted with high and low suctions, emergency shut off valves (air operated), low level alarms, flat type gauge glasses, self closing sludge valves and overflow pipes which return excess F.O. to the hull tank 5P - 10C .

The fuel oil booster pumps can be used to transfer fuel from the settling tank to the clean oil tank and from the clean oil tank through two sock type filters to the fuel oil tanks of;

- boiler
- cold start compressor
- emergency generator
- incinerator
- deck cranes
- crude oil tank
- Schlumberger unit
- survival anchor windlass diesel
- and to the mud pits.

The boiler day tank, emergency generator day tank and the incinerator day tank are all fitted with overflow pipes which return excess fuel back to the hull storage tanks.

1.1 PRE TRANSFER REQUIREMENTS

Before any fuel transfer operation can take place that involves either the taking on of fuel or the discharging of fuel the following must be adhered to.

NO VESSEL TO VESSEL TRANSFERS WILL TAKE PLACE ON ANY RED ALERT STATUS

a) The appropriate local authorities must be notified of the intent to transfer fuel as soon as is practical before the transfer operation is begun. Preferably 24 hours prior to commencement.

   I In Canadian Waters

   Contact: Arctic Canada Traffic Systems (Nordreg) via Coast Guard Radio in Inuvik

   II In American Waters

   Contact:

b) If the transfer location is outside port facility areas, a warning announcement must be broadcast to vessels in the area stating the names of the vessels involved in the transfer, their geographic location and expected duration of transfer. A wide berth should be requested. Once the transfer operation has been completed the warning should be cancelled.

c) Pre-transfer checklist must be completed.

d) Emergency procedures must be reviewed.

e) There shall be a person in charge on the transferring vessel or facility and the receiving vessel or facility who will remain at the sites of the oil transfer operation and be immediately available to the oil transfer personnel. Each person must be familiar with vessel oil transfer procedures and conduct the transfer in accordance with them.

f) The person in charge of oil transfer operations on the transferring vessel or facility shall convene a conference to ensure that each person in charge understands the following details of the transfer operations:

   (1) The identity of the product to be transferred;
   (2) the sequence of transfer operations;
   (3) the transfer rate;
   (4) the name or title and location of each person participating in the transfer operations;
   (5) details of the transferring and receiving systems;

(6) critical stages of the transfer operation;

(7) federal, provincial, state, and local rules that apply to the transfer of oil;

(8) emergency procedures;

(9) discharge containment procedures;

(10) discharge reporting procedures;

(11) watch or shift arrangement;

(12) transfer shut-down procedures.

g) The vessel alert status be upgraded to yellow and appropriate announcements made.

h) Both the transferring vessel/rig and the receiving vessel/rig must have a person standing by at the loading/offloading station in a position that enables them to monitor the fueling hose at all times. Both parties must be familiar with the operation of the pump emergency stops and be able to communicate with each other via U.H.F. radio.

i) The area authority will be responsible to verify correct alignment of valves.

j) The area authority will be responsible for the posting of all personnel required for a safe fuel transfer.

k) A person must be assigned to observe the rate of loading for the purpose of avoiding an overflow of tanks. This person must also be able to communicate with the transferring location.

1.2 POST TRANSFER REQUIREMENTS

a) Complete post transfer check list.

b) File all checklists with appropriate signatures.

1.3 EMERGENCY PROCEDURES

1.3.1 Stop Transfer Immediately in the Event Of

- An environmental or well red alert.
- Lost communications.
- Sign of spillage, or damage to hoses and couplings,
- Any detection of accumulated gases.
- Major increase in wind, swell or hazardous ice movement.
- When an electrical storm is present or predicted.
- Severe deterioration in ice or visibility conditions.

1.3.2 Oil Spill Situation

a) Immediately notify Operator's Representative.

b) Initiate spill contingency plan and Emergency Notification.

c) Operator and Drilling unit owner will inform appropriate government Regulatory Agencies, of the situation as follows:

- Location and time of spill.
- Type and approximate quantity of product spilled.
- Precautions being taken at time of notice.
- Current state of tide and local weather.
- Extent of local and shipboard containment and recovery resources.
- Personnel number and skills available on site.
- Request extra resources, and advice, if needed.

EXCEPT AS PERMITTED UNDER PARAGRAPH (b) OF THIS SECTION, NO PERSON MAY RESUME AN OIL TRANSFER OPERATION AFTER IT HAS BEEN STOPPED UNLESS:

- Oil discharge in the oil transfer operation work area is cleaned up, and;
- oil discharged into the water or upon the adjoining shoreline is cleaned up,
- AND ONLY GOVERNMENT AUTHORITY MAY AUTHORIZE RESUMING THE OIL TRANSFER OPERATION IF IT IS DEEMED APPROPRIATE.

1.4 VESSEL TO VESSEL PRE-TRANSFER CHECKLIST

VESSEL TO VESSEL PRE-TRANSFER CHECKLIST		
TASKS	**COMMENTS**	**Area Authority**
A pre-transfer conference. Held		
A pre-transfer announcement made.		
All personnel involved aware of transfer procedures.		
Vessel alert status upgraded to yellow.		
U.H.F. radios will be required, are they fully operational and intrinsically safe?		
Is all firefighting equipment tested, fully operational and in proper location?		
All regulations for transfer are being understood and observed;		
Are flashlights to be used approved?		
Spill containment equipment and materials readily available.		
Ensure transfer emergency shutdown system is tested.		
Hoses to be used have been checked for: a) correct diameter & length to reach other station		
b) chafing, cracks, or other deformation,		
c) damaged fittings,		
d) Lugs on camlock fittings wired.		
e) Pressure rating satisfactory.		
f) Ensure that transfer hoses are adequately supported.		
g) Rubber seal on camlock fittings is in good condition.		
All other craft alongside are authorized and following ignition hazard warnings, etc.		
Has transferring/receiving vessel been electrically bonded to rig?		

1.4 VESSEL TO VESSEL PRE-TRANSFER CHECKLIST

VESSEL TO VESSEL PRE-TRANSFER CHECKLIST		
TASKS	**COMMENTS**	**Area Authority**
Ship's electrical leakage to ground is at a safe level.		
Monitor gas concentration accumulation in still air conditions.		
All doors and ports which are required to be closed are closed.		
All scupper plugs in place.		
Deck area around filling station free of debris		
Manifolds drained before removing blanks.		
Are pressure gauges operational?		
Drip trays all have plugs fitted.		
Ensure that lighting is adequate for all transfer requirements.		
Check all moorings regularly.		
All tank vents open, and flash screens in place.		
Areas authority to verify valve alignment.		
All valves not used shut and blanked on the fueling stations not being used..		
Regularly check the water around vessels for evidence of leakage.		
Keep a continuous check on hose pressure to ensure recommended pressure is not exceeded.		
All tanks sounded manually prior to beginning of transfer.		
Personnel assigned to deck station.		
Personnel assigned to observe rate of loading.		
Officer In Charge (MATE)	Name:	
	Title:	
Officer In Charge (ENGINEER)	Name:	
	Title:	

1.5 VESSEL TO VESSEL POST-TRANSFER CHECKLIST

VESSEL TO VESSEL POST TRANSFER CHECKLIST		
TASKS	**COMMENTS**	**Area Authority**
Have hoses been drained and capped prior to their return to the vessel (Rig)?		
Ensure that all vessel (Rig) valves and tanks are closed.		
Ensure that hoses and other transfer equipment are properly stowed.		
A post-transfer PA announcement.		
Vessel alert returned to appropriate status transfer recorded in oil record book.		
Officer In Charge (MATE)	Name:	
	Title:	
Officer In Charge (ENGINEER)	Name:	
	Title:	

1.6 INTERNAL FUEL TRANSFER

NO INTERNAL FUEL TRANSFERS ARE TO TAKE PLACE DURING ANY RED ALERT STATUS WITHOUT THE PRIOR APPROVAL OF THE MAINTENANCE SUPERINTENDENT.

INTERNAL FUEL TRANSFER PROCEDURE

General

NO INTERNAL FUEL TRANSFERS ARE TO TAKE PLACE DURING ANY RED ALERT CONDITIONS WITHOUT THE PRIOR APPROVAL OF THE MAINTENANCE SUPERINTENDENT.

Internal fuel transfers will be the sole responsibility of the mechanic ll on shift, exceptions to this rule must be approved by the Maintenance Superintendent.

It is the responsibility of the crane operators, watch keepers, and service hands to make their fuel needs known to this man.

He will be the only man to open valves and operate pumps. Fueling of the well test unit, cranes, survival windlass, lifeboats, fast rescue boat, or transfer to the mud pits will be requested by the equipment user but carried out by this man.

This is a priority task and he will not answer telephone pages etc. during this period. While the main transfer pump is running he will NOT leave the control switch.

If a vessel general alarm should occur he will shut down any pumps running and close any valves in use. He will then report to his duty station. Upon reporting to his station he will communicate the internal fuel tank status to the Maintenance Superintendent.

Internal fuel transfer will take place from 10:00 to 12:00 on day shift and 22:00 to 24:00 on night shift.

Fuel will NOT be transferred at any other time, except at the direct direction of the Maintenance Superintendent.

All fuel system discharge points external to the machinery spaces will be kept locked to prevent any accidental tampering with the valves. Keys will be in the possession of the Mechanic ll.

Fuel system valves used during transfer will all be closed once transfer is completed.

Drain plugs will be kept in fuel oil catch basins at all times, except during cleaning.

The INTERNAL FUEL TRANSFER check list will be filled out during and signed after each transfer. This checklist will provide the daily fuel usage figures for the daily log sheets. Each action on the checklist will be initialed by the mechanic ll.

KULLUK INTERNAL F.O. TRANSFER CHECK LIST

VALVE STATUS DATE___________ TIME____________

VALVE		OPEN	CLOSED
5S-11C	4HV-1 upper suction 4HV-2 lower suction		
5P-10C	4HV-3 upper suction 4HV-4 lower suction		
5P-12C	4HV-5 upper suction 4HV-6 lower suction		
PUMP MANIFOLD	4-HV7		
	4HV-9		
	4HV-8		
TRANSFER PUMP	4HV-10 suction #1		
	4HV-22 discharge #1		
	4HV-11 suction #2		
	4HV-24 discharge #2		
FLOW METER	4HV-26 to settling tank		
	4HV-28 to deck fill		
	4HV-27 inlet		
	4HV-30 outlet		
SETTLING TANK	4HV-31 inlet		
	2HV-4 upper suction		
	2HV-2 lower suction		
	4HV-5 upper inlet bypass		
	2HV-32 sump drain		
CLEAN OIL TANK	2HV-13 lower suction		
	2HV-15 upper suction		
	2HV-33 sump drain		
	2HV-7 transfer pump suction		
PUMP #1	2HV-9 suction		
	2HV-62 discharge		
PUMP#2	2HV-10 suction		
	2HV-64 discharge		

VALVE		OPEN	CLOSED
5S-11C	4HV-1 upper suction 4HV-2 lower suction		
HAND PUMP	2HV-11 suction		
	2HV-65 discharge		
Common Bypass	2HV-60		
FILTER #1	2HV-67 inlet		
	2HV-18 outlet		
	2HV-83 sump		
FILTER #2	2HV-67 inlet		
	2HV-70 outlet		
	2HV-88 sump		
Common Discharge	2HV-55		
CENTRIFUGE #1	5HV-2 inlet		
	5HV-11 outlet		
	5HV-5 heater inlet		
	5HV-6 heater outlet		
CENTRIFUGE #2	5HV-1 inlet		
	5HV-13 outlet		
	5HV-7 heater inlet		
	5HV-8 heater outlet		
MAIN ENGINES	2HV-17 supply #1		
	2HV-18 supply #2		
	2HV-19 supply #3		
	2HV-21 return #1		
	2HV-23 return #2		
	2HV-25 return #3		
BOILER TANK	2HV-74 fill		
	2HV-44 high suction		
	2HV-42 low suction		
	2HV-34 sump		
DIESEL COMP	2HV-75 supply		
WATER HEATERS	2HV-47 inlet #1		
	2HV-48 inlet #2		

VALVE		OPEN	CLOSED
5S-11C	4HV-1 upper suction 4HV-2 lower suction		
BOILERS	2HV-132 supply #1		
	2HV-131 supply #2		
STEAM GENERATOR	2HV-130 supply		
	2HV-101 return		
INCINERATOR	2H-127 inlet		
	2HV-29 suction		
EMERGENCY GEN.	2H-119 inlet		
	2HV-26 suction		
	2HV-28 return		
DECK SIDE EQUIP.	2HV-77 crane #1		
	2HV-76 crane #2		
	2HV-129 crane #3		
	2HV-122 testing unit		
	2H-132 mud pits		
	2HV-80 well logging unit		
	2HV-82 windlass		
LOADING STAT.	4HV-32 fwd.		
	4HV-33 stb.		
	4HV-35 p.		

TANK LEVEL	START	FINISH
5S-11C		
5P-10C		
5P-12C		
FLOW METER READING		
4HV-26 to settling tank		
4HV-28 to deck fill main		
FUEL TRANSFER SYSTEM STATUS:		
TOTAL FUEL TRANSFERRED:	**TRANSFER CARRIED OUT BY:**	
	(signature)	

NOTE:

INITIAL STATUS OF EACH VALVE.

REFER TO AS BUILD DRAWING MB#3 FOR SYSTEM SCHEMATIC.

SCHEMATICS ARE POSTED BY PUMP CONTROLS.

FUEL TRANSFER PROCEDURE

Contact control room to check that the vessel is not on RED alert status.

Confirm that all fuel supply valves external to the machinery spaces are closed and LOCKED closed.

COMPLETE THE INTERNAL FUEL TRANSFER CHECK LIST AS THIS PROCEDURE IS CARRIED OUT.

NOTE: IF THERE IS A LEAKING OR OPEN DISCHARGE VALVE, IT WILL SPILL FUEL AT ANY TIME THAT THE PUMP IS RUNNING. ALL SERVICES DOWNSTREAM OF THE CLEAN OIL TANK ARE FED FROM A COMMON HEADER.

To supply fuel to operating equipment day tanks:

Open appropriate valves for the desired fuel pump and filter, and pump fuel from clean oil tank through fuel filters to required day tanks. Do not carry out any other operation while this pump is operating.

If the cranes, etc. require fuel, the mechanic ll will fuel them and lock the valve closed when complete.

NOTE: all valves should be closed, except those required for the normal operation of machinery.

To supply fuel to the settling tank from the main fuel tanks on +5 level.

Note tank Levels and flowmeter reading before start.

Open the appropriate valves to draw fuel from the tank desired, line up the desired pump, and flow meter. All other valves should be closed.

Return to the engine room and operate the pump from the remote switch by the day tanks. Do not leave until this operation is complete

Once complete and the pump is stopped, return to the +5 pump room and record the fuel tank levels and the flow meter reading.

NOTE: close all valves.

While out this procedure, inspect fuel system for any sign of leaks. Fill out status blank on checklist.

Sign completed form and note fuel consumption on daily mechanical log. Return completed checklist to Maintenance Superintendent at end of shift.

1.7 DIESEL OIL SYSTEM

1.7.1 Product Specifications and Material Safety Data Sheets

DIESEL O

PRODUCT CHARACTERISTIC	*SPECIFICATION*		*TEST METHOD*
	MIN	*MAX*	*ASTM*
Pour Point, °C (°F)		-15 (5)	D 97
Cloud Point, °C (°F)		-10 (14)	D2500
Density, kg/L @ 15°C		0.900	D1298
(API Gravity at 60° F)		(25.6)	
Distillation, °C (° F)			D 86
10% Recovered		238 (460)	
90% Recovered		360 (680)	
End Point		371 (699)	
Flash Point, °C (°F)	52 (126)	80 (196)	D 93
Kinematic Viscosity, cSt @ 40°C (SSV at 100 ° F)	1.4 (30)	4.1 (39.5)	D 445
Sulfur, % mass		0.5	D2622
Mercaptan Sulfur, % mass		.005	D3227
Corrosion Copper Strip at 3 h @ 100° C (3h at 210° F)		No. 1	D 130
Water and Sediment, % vol		0.05	D1796
Ash, % mass		0.01	D 482
Carbon Residue (RCR), on 10% bottoms, % mass		0.20	D 524
Total Acid Number, mg KOH/g (% mass KOH)		0.10 (0.01)	D 974
Strong Acid Number, mg KOH/g (% mass KOH)		<0.05 (<0.005)	D 974
Strong Base Number, mg KOH/g (% mass KOH)		<0.05 (<0.005)	D 974
Cetane Number	40		D 613
Electrical Conductivity, pS/m @ 25°C			D2624
Feb. 1 - Jul. 31	135		
Aug. 1 - Jan. 31	200		
Appearance	Bright & Clear		D4176
Colour		3.0	D1500
Stability, Insoluble, mg/100 mL (oz/gal)		2.0 (2.67 x 10-5)	D2274

TRADE NAMES:	Type & Diesel Fuel	SUPERSEDES:
CGSB REFERENCES:	CAN2-3.6-M83 Type B	PLC: M-061

MATERIAL SAFETY DATA SHEET

WHMIS CLASSIFICATION

Combustible Liquid (Class B3)
Poisonous Material (Class D2)

PRODUCT CODE

DATE: April 11, 1990

SECTION I MATERIAL IDENTIFICATION

Trade Name:	DIESEL FUEL
Other Names:	Diesel 20X, 0, 15, 20, 25, 30, 40, 40S, 50, 60 Diesel AA, Diesel GM 35, 45 Domestic Marine Diesel, Power Plus Diesel
Chemical Synonyms and Family:	Petroleum Hydrocarbon
Names of Manufacturer/Supplier Address & Emergency Phone Number:	Petro-Canada Inc. (403) 296-3000 P.O. Box 2844, Petro-Canada Centre Calgary, Alberta T2P 3E3
Poison Control Centre Numbers:	Consult local telephone directory for emergency numbers.
Application:	Diesel Fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type.

SECTION II TRANSPORTATION

UN Number: 1202 Primary Classification: 3.3 Subsidiary Classification: 9.2

Compatibility Groups: N/A CANUTEC Transport Emergency No. (613) 996-6666

SECTION III COMPOSITION

COMPONENTS	ALLOWABLE LIMITS (8 HR)	% (VOL)	CAS #
Complex mixture of petroleum hydrocarbons (C9-C13)	5 mg/m3 (oil mist) ** (3.12 x 10-4 lb/1000 ft3)	>99.9	68334-30-5
Anti-static additive, cetane improver, pour point depressant.	N/A	<0.1	N/A

° Aromatic content is 38% maximum (Benzene nil)
°° Petro-Canada recommendation.

NR-Not Regulated N/A- Not Applicable U-Unknown Cette fiche est aussi disponible en francais.

Trade Name: DIESEL FUEL

SECTION IV	**PHYSICAL DATA**		
DENSITY: (0 15°C)(60° F)	0.78-0.90 kg/L 56 - 25 API	Boiling Point/Range: (@ 1 atm)(14.7 psi)	145-371°C (approx) (293 - 700 °F)
Vapor Pressure: (approx) (O 25°C)(77 °F)	1 kPa (approx) (0.145 psi)	Percent Volatile: (@ 20°C)(68°F)	25% in 10 Hr.
Vapor Density: (O 20°C)(68°F)	4.5 (approx)	Evaporation Rate:	N/A
Solubility in Water:	Insoluble		
Viscosity (Kinematic): (O 40°C)(100 °F)	1.2-4.1 cSt (29 - 40 SSO)		
Pour Point:	-45 to 6°C (-50 to 20° F)	Appearance & Odor	Clear to yellow, bright oily liquid with hydrocarbon odor.°°

°° May be dyed purple or red for taxation purposes.

SECTION V	**FIRE & EXPLOSION DATA**
Flash Point (method used - COC):	40°C (minimum)
Flammable limits in air (% by volume):	Lower 0.7% Upper 6.0%
Auto-Ignition Temperature:	>225°C (437°F)
Fire and Explosion Hazards:	Treat as combustible liquid.
MODERATE FIRE HAZARD	
Extinguishing Media:	Foam, dry chemical, carbon dioxide for small fires, water spray. Do not cut, drill or weld empty containers.
Fire Fighting Procedures:	Use full protective equipment and self-contained breathing apparatus. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning product to avoid spread fire.

Trade Name: DIESEL FUEL

SECTION VI	**HEALTH HAZARD INFORMATION**
Toxicity Data	° Estimated acute LD50 - 7650 mg/kg (rat, oral); practically non-toxic. Rabbit primary dermal irritation index (Draize) - 6.8 extremely irritating. Rabbit eye irritation index (Draize) - O: non irritating
Effects of Overexposure	
Inhalation:	Inhalation of vapors or mist will cause headaches, nausea, dizziness, and intoxication: severe central nervous system depressant.
Skin and Eyes:	Irritation, defatting and drying of skin. Prolonged exposure to skin may cause chapping, cracking or possibly dermatitis. Eye contact may cause irritation, but not permanent damage.
Ingestion:	
Emergency and First Aid Procedures Information	
Skin:	Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.
Eyes:	Copious warm water flush - 15 minutes. Physician assessment mandatory.
Inhalation:	Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment is mandatory.
Ingestion:	DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 ml (1/2 pint) of milk to drink. Mandatory physician assessment.
Notes to Physician:	Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

° Based on API Study #79-6 on Diesel Fuel where LD50 = 9.0 ml/kg.

Trade Name: DIESEL FUEL

SECTION VII	**REACTIVITY DATA**
Stability:	Stable under normal storage and use.
Conditions to avoid:	Excessive heat, sources of ignition, formation of oil mist.
Materials to avoid:	Strong oxidizing agents (strong acids, peroxides, chlorine, etc).
Hazardous Decomposition products:	COx, SOx, smoke on combustion.
Can hazardous polymerization occur?:	No.

SECTION VIII	**SPILL OR LEAK PROCEDURES**
Steps to be taken if material is released or spilled:	Avoid contact. Use full protective equipment and breathing apparatus if required. ELIMINATE IGNITION SOURCES. Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. DO NOT FLUSH TO SEWER.
Waste Disposal Method:	Incinerate at licensed waste reclaimer facility.

SECTION IX	**SPECIAL PROTECTION INFORMATION**
Ventilation:	General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres.
Respiratory Protection:	Up to 5 mg/m3 (3.12 x 10-4 lb/1000 ft3)(oil mist - none required). From 5 to 50 mg/m3(3.12 x 10-4 to 3.12 x 10-3 lb/1000 ft3) use an approved organic vapor respirator suitable for oil mist in areas with sufficient oxygen. Above 50 mg/m3, use full-face air-supplied or self-contained breathing apparatus.
Protective Gloves:	For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended. Otherwise, PVC gloves may be worn.
Eye Protection:	Chemical goggles if splashing likely.
Other Protective Clothing:	Long sleeved clothing to minimize skin contact.

N/A - Not Applicable U-Unknown

Trade Name: DIESEL FUEL

SECTION X SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. AVOID SKIN CONTACT AND INHALATION. Practice good personal hygiene. DO NOT SIPHON BY MOUTH OR USE AS A CLEANING SOLVENT. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 5 mg/m3 (oil mist) when handling DIESEL FUELS.

SECTION XI REFERENCES

ACGIH, Threshold Limit Values and Biological Exposure Indices for 1989-90.

CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.

API, Petroleum Process Stream Terms included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA). 1983

Environment Canada Manual for Spills of Hazardous Materials, March 1984.

Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.

NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.

API, Acute Toxicity Tests on Diesel Fuel, API # 79-6, 1980.

API, The Toxicology of Petroleum Hydrocarbons, May, 1982.

Petro-Canada and its affiliates assume no responsibility for injury to anyone caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Petro-Canad Inc. and its affiliates assume no responsibility for injury to anyone caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee and third persons assume the risk in their use of the material.

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II. HELI-FUEL SYSTEM

2.1 HELI-FUEL SYSTEM DESCRIPTION

This system provides storage, filtering and transfer of fuel from the fuel pods located on the starboard side aft of the main deck, through the pumps and filters to the delivery skid on the heli-deck.

The two fuel pods are connected to the transfer piping via quick disconnect couplings, with a dry break valve, expansion loop and emergency shutdown valve. The emergency shutdown valve is operated pneumatically from the control room (central control panel), or manually locally.

The pumps are controlled from a panel in the pump room and activated as required from the fuel metering skid on the heli-deck.

The fuel skid includes a go-no-go filter, a meter, electric rewind hose reel, a nozzle, and a ground cable all encased in a fibre glass box.

See figure 1.

Heli-Fuel Equipment

Centrifugal Pumps

Manufacturer:	Roto-King
Quantity:	2
Model No:	PUM 00196
Serial No:	1907791, 1907792
Type:	AL93
RPM:	1150
Capacity:	0.23 m3/min (60 gal) (230 liters)
Disch Press:	690 kPa (100 psi) 69 m (210 ft) head

Electric Motors

Manufacturer:	Etotech Electric Motor
Quantity:	2
Model No:	6727035 Explosion Proof X yes _no
Horse Power:	7.5 @ 1150 RPM
Volts:	230/460 v
Amps:	20 amps/10 amps
Cycles:	60
Phase:	3
Frame:	254T
Serial No:	SA-006A/B

Filter Separator

Manufacturer:	"3L" Filters Ltd.
Quantity:	2
Model:	WAV-2028
Serial:	7352-1
Dif Change Press:	15 PSIG
Op Press:	150 PSIG (max)
Op Temp:	100° F (max)
Hydro Test Press:	225 PSIG
Capacity:	200 GPM (max)

Filter Coalescer

Manufacturer:	"3L" Filters Ltd.
Quantity:	2
Capacity:	3.8 l/S
Disc. Press:	1034 kPa @ 1.8° C
OP Press:	345 kPa @ 1.8° C
	0.57 m OD x 1.42 S/FLG

Helicopter Fuel Metering Skid

Filter Separator

Manufacturer:	3-L Filters Ltd, Cambridge Ontario
Model:	3L-75-5
Serial:	7358-1
Op Press:	152 psi

Meter

Manufacturer:	Meter Liq Control Corp.
Serial:	112821
Rate:	225 LPM
Model:	M5-44200-2

Hose Reel

Manufacturer:	MSL Vancouver B.C. (McIntosh)
Model:	EAC 1.5-100
Serial:	L2-1
Size:	11" dia. Drum
Drive Motor:	1/2 HP Imperial Electric Motor

Hose

Manufacturer:	Hewitt (Arctic)
Length:	100'
Dia:	1 1/2"

Ground Reel (Static)

Manufacturer:	McIntosh Supply
Type:	Spring Rewind
Model:	SD2A2-100

Fueling Nozzles

Quantity:	1
Manufacturer:	Dover
Model:	235
Type:	Gas pump type 1-½" straight nozzle
Quantity:	1
Manufacturer:	JC Carter Co.
Parts #:	60427
Serial #:	23245
Type:	Dry break type (Buckeye) 2-½" nozzle

Fibre Glass Cabinet

Manufacturer:	McIntosh Supply
Size:	84" X 54" X 39"
Weight:	200 lbs

Heli-Fuel Pods

Manufacturer:	Specific Equipment Company (Houston, Texas)
Capacity:	2.2 m3 each
Weight:	Empty: 2.53 mt (5,566 lbs)
Weight:	Full: 4.70 mt (10,315 lbs)

2.2 HELI-DECK SAFETY EQUIPMENT

Helicopter Firefighting Crash Kit (Outside Reception Room)

1	Jaws of Life
1	Bolt Cutters 24"
3	Seat Belt Cutters
1	Hatchet
2	Burn Blankets

Helicopter Firefighting Equipment (Reception Room)

3	Full Length Fire Coats
3	Pairs of Steel Toed Rubber Boots
3	Firefighting Helmets with Shields
1	Fire Approach Suit (Fyrepel Approach Suit)

Fire Locker #3 (3rd Deck By SCR Entrance)

2	Fire Helmets
2	Full Length Coats
4	Pair Fire Gloves
3	Pairs of Boots (Steel Shank/Toes)
2	Fire Approach Suits
1	Tool Kit
3	Rechargeable Lanterns
3	Safety Lines
2	Fire Axes

2.3 FIXED DRY CHEMICAL SYSTEM (HELI-DECK SERVICE)

- 1 x 907 kg (2000 lb) unit
- Purple K Chemical
- Nitrogen Actuator Locations: Heli-deck port and stbd access ways
- The system can also be activated at the dry chemical tank location by manually operating the nitrogen release valves.
- Hose Locations: Port and Stbd access way locations
  Nozzle Discharge Rate: Flow 3.4 kg/sec (7.5 lb/sec)
  Range 18.2 m - 21.3 m (60/70 ft) nominal

To Operate Hose Reel

- Check that nozzle discharge valve is closed.
- Pull pin on valve of nitrogen cylinder.
- Open valve by rotating lever fully.
- Unwind hose from reel.
- Push nozzle valve handle fully forward to discharge powder.

CAUTION: DO NOT LET GO OF NOZZLE DURING POWDER FLOW.

If Hose Reel Does Not Operate

- After approximately 20 seconds close nozzle discharge valve
- Go to the main unit and operate opening appropriate valves manually.

System Description

The fixed dry powder extinguisher system provides areas of high fire susceptibility with ready access to volumes of dry powder for fighting fires which cannot be handled using the portable extinguishers.

The 907 kg (2,000 lb) unit is located in the Heli-Foam room (3rd deck of the engine house). This skid unit supplies two hose reels which are located on the landings of the port and starboard heli-deck access stairways. Dry powder used with the heli-deck foam system is a very effective method of fighting aircraft fires, especially when jet fuel is involved.

Operating Policies and Procedures

Authority to activate these systems must come from the OIM or his designate.

Activation of the heli-deck system is at the discretion of the HLO during helicopter operations as the OIM designate.

Each unit is activated by opening the manual operating lever located on the skid or by opening the remote charging valve assembly located next to each hose reel. In either case, opening the valve causes the skid mounted nitrogen cylinders to charge the system. Actual discharge of the dry powder is controlled from the hose reel discharge nozzle.

Note: *BEFORE REMOVAL OF ANY OF THE NITROGEN BOTTLES, ALL PRESSURE MUST BE BLED OUT OF ENTIRE SYSTEM. ONCE REMOVED, THEY MUST BE SENT ASHORE AS SOON AS POSSIBLE FOR RECHARGING.*

2.4 FOAM FIRE EXTINGUISHING SYSTEM

System Equipment

- One 757 l (200 gal) capacity foam unit - bladder type (Feecon horizontal SNP tank).
- Two Foam Monitors - 1,893 l/min (500 gal/min) flow capacity maximum (nat. foam PC 50).
- Three Foam Dispensing Hose Reels - 30.5 m (100 ft) x 38 mm (1-1/2") hose (Servall, Goodyear).

  38 mm (1-1/2") nozzle (Rockwood) 373 l/min (100 gpm) flow capacity.
- Associated piping.

System Description

The foam system is provided to quickly suppress helicopter and fuel related fires on the heli-deck and helpful storage area.

The foam system consists of a skid having a 757 l (200 gal) tank for the concentrated foaming solution, two foam proportioners (one each for the monitors and hose reels), and associated piping. The fire water pumps supply salt water to the skid where the water is control mixed with the foaming solution. The system is capable of discharging a maximum of 2,840 l/min (750 gal/min) of foam.

The skid is located in the heat foam room on the 3rd deck of the engine house. It is accessible only from an exterior walk way.

The two foam monitors are located on the forward portion of the heli-deck, one each on the port and starboard sides. A foam dispensing hose reel is located on the landing of each of the rear access stairways from the third deck of the quarters. The third being on the main deck forward of the heli-pad storage area.

The system is manually activated by one of the control boxes located next to each monitor and hose reel. Activation of the system automatically causes alarms on the central fire/gas control panel located in the control room.

Operating Policies and Procedures

At each hose reel and the two monitors there are small red boxes. Inside are two buttons labeled WATER and FOAM. Push WATER first, wait until water is flowing from the nozzle under pressure then activate foam by pushing foam button. System will not work in reverse order. Ensure that the fire line/foam valve is opened at each monitor and nozzle in use (located at each station).

Authority to activate the foam system is the HLOs during helicopter operations.

2.5 RECEIVING JET-B FUEL ON BOARD

From Vessel or Helicopter

From either systems of transportation the fuel will be contained in a heli-fuel pod.

If the fuel is received in a red heli-pod that is identical to the 2 heli-pods that are incorporated in the fueling system changing pods is a simple procedure.

a) Empty Tank

- Pull the pod retaining pins (4) located at the pod base.
- Shut butterfly valve on pod.
- Secure the vent cap shut on the top of the tank.
- Basket a ½" x 20 ft wire rope sling through the framework of the pod at each end. Secure a tag line to pod tank base.
- Have the Crane Operator in crane III plumb his lifting hook over the heli-pod.
- Hook on the 4 eyes of the slings.
- As the Crane Operator takes the weight of the pod, lift up on the quick release sleeve of the fueling line coupling.
- Lift pod clear of the fueling station and place on the stbd main deck.

b) Full Tank

- Basket pod with a ½" x 20 ft wire rope sling through the framework of the pod at each end. Secure a tag line to framework.
- Lift pod and plumb over fueling station pod rack.
- Lower pod into position while one person is guiding in the quick release fitting into position.
- Ensure that the quick release sleeve is spring shut.
- Secure pod into rack with the 4 retaining pins.
- Disconnect slings and remove from pod.

Note: Before handling heli-fuel pods:

- Ensure that there are no helicopters inbound/outbound.
- Stop all hot work on heli-deck, after deck and stbd deck.
- Verify that the foam fire fighting system is operative.
- Have the 150 lb dry chemical wheeled extinguisher in a position adjacent to the heli-pod racks.
- Stop all spark inducing work in the work area.

2.6 PUMP ROOM ALIGNMENT (FUELING)

- Only one pod, motor, pump, and coalescing filter to be aligned at one time.
- Open the appropriate 4 valves in the pump room.
- Open the service 2 valves located at pods racks exterior to the pump room.
- Align the control panel in the pump room set up for automatic.
- Have an experienced personnel stand by with a UHF radio at the fuel metering skid on the heli-deck.
- Have that person depress the pump actuator and confirm with pump room personnel by radio for pump start up in the pump room.
- Conduct a fuel nozzle test on heli-deck. Use the 2 gallon HLOs bucket provided in the fuel metering cabinet.
- If successful, save the fuel in the bucket for a fuel test.
- Reset litre meter by revolving handle clockwise until all digits indicate zero.
- Shut down pump from cabinet.
- Test for shutdown in pump room
- Tag and date the valves indicating the pod in use. Initial it.
- Enter in the barge log the particulars of the alignment.

2.7 FUEL TESTING

There are two types of fuel testing conducted on board the *Kulluk*.

a) Dynamic Millipore Test

Taken when the fuel line is under pressure at the downstream and upstream locations, (pump room and heli locations respectively). A dynamic millipore probe is inserted in the fuel on each of the two pump lines and one is located on the pipeline in the cabinet on the heli-deck.

These tests evaluate the contamination level of the product from the heli-pods to the nozzle.

If these tests reveal any failure of the pods, filters and pipeline efficiency, helicopters shall be suspended until the cause is rectified.

The dynamic millipore test is conducted bi-monthly and upon the reception of a new shipment of fuel.

Enter the dynamic millipore test results in the fuel log located in the reception room.

b) ASTM Color Standards Test

This test is conducted to determine contamination of the fuel by water.

To conduct this test discharge 4 liters of jet-B fuel into the white enamel pail located on the heli-deck in the cabinet.

Withdraw enough of a sample for a vial sample.

Insert the vial puncture implement into fuel, next, plunge the vial onto the puncture implement, this will induce fuel under pressure into the vile. When full, extract the vial and shake vigorously. This will mix the water seeking chemical with the Jet-B fuel. A white color indicates the fuel is free of water, a pink to reddish color indicates the fuel is contaminated. If contaminated suspend any helicopter fueling until problem is rectified.

This test shall be conducted prior to fueling a helicopter and immediately after fueling. This test shall be conducted by the HLO (Helicopter Landing Officer) and witnessed by the Helicopter Pilot.

These samples shall be dated and marked with call sign of Helicopter and retained by the HLO for at least 1 week's duration.

Enter these test results in the Helicopter fueling procedure checklist, and fueling log book (located in the reception room) and the amount of fuel the helicopter received. These entries must be dated and initialed by the observing Helicopter Pilot.

2.8 HELI-FUEL SYSTEM PREVENTATIVE MAINTENANCE

Besides the fuel tests the fueling system shall be inspected from the heli-pods to the nozzle.

Heli-Fuel Racks

- Quick release coupling valve, leakage and visual condition.
- Inspect for placement/condition of sounding pipe cap, and ventilation cap.
- All valves, operable and lubricated.
- Pneumatic shutdown valve (automated from the control room) activate from control room and have person witness the closure of said valve. Reset upon successful closure.
- Inspect drip tray under heli-pods for cleanliness, dryness, and test drip tray valves for operable condition.

Heli-Fuel Pump Room

- All valves, operable and lubricated.
- Pump alignment switch panel, test each pump/motor system for start and shutdown.
- Check illumination of Heli-pump/motor indicator lights.
- Inspect pump room for cleanliness and dryness.

Heli-Deck Fuel Skid

- Inspect Fibreglass HLOs cabinet for damage to shell and insure that cabinet doors are operable.
- Inspect all valves, operable and lubricated.
- Inspect fuel meter, glass face condition, reset handle.
- Inspect system for leakage.
- Ground static reel/wire for operable condition.
- Inspect nozzles for visual condition, ensure that a brass cap is connected to the straight nozzle. Test dry break nozzle for handle activated opening and closure.
- Run out hose inspect for wear and damage.
- Inspect hose reel for revolution and lubrication.
- Inspect drip tray for cleanliness and dryness.
- Ensure that drip tray plugs are conveniently secured beside each scupper.
- Ensure that a white enamel bucket (only) is in place in the cabinet.

2.9 FUELING PROCEDURE
(Crew Requirement; 1 HLO, 3 Heli-Deck Crew)

Fueling Crew Positions

HLO (Helicopter Landing Officer) is in charge of fueling.

1 Crewman dressed in full fire approach suit stationed at the up wind with foam/dry chemical hoses at either the port or stbd heli-deck stairwell.

1 Crewman stationed at the upwind foam/water fire monitor.

1 Crewman assists the HLO at the fuel meter cabinet. He will have at hand a 150 lb dry chemical extinguisher, the hose is flaked out on deck prior to the commencement of testing and fueling.

The Helicopter Pilot is positioned at the helicopter overseeing the operation.

Procedure

This procedure can only be implemented after the above safety positions are assumed.

- Run out and ground the static wire to the helicopter.
- HLO takes a sample (minimum 4 liters) of Jet-B from the fuel sampling valve in the fueling cabinet. (See fuel testing section).
- On acceptance of fuel sample by HLO and Pilot run out fuel hose to fill location on helicopter.
- Return fuel meter to zero.
- HLO commences fueling helicopter while crewman is standing by the fuel cabinet.
- Fill to Helicopter Pilots request in liters indicated on meter in cabinet.
- On reaching the fill amount, remove nozzle and re-spool the fuel hose by activating hose reel spooling motor.
- Take another fuel sample.
- Shutdown pumps.
- Have the pilot initial the Helicopter Fueling Log and Helicopter procedure checklist. This checklist shall also have date, fuel amount, and helicopter call sign.
- Date, initial, and enter call sign on the two fuel samples, place the samples in the fuel test box for storage.
- Re-spool static ground wire.
- Zero fuel meter.
- Close up cabinet.
    - Put the 150 dry chemical extinguisher in its cabinet.

2.10 HELICOPTER FUELING PROCEDURE CHECKLIST

HELICOPTER FUELING PROCEDURE CHECKLIST		
Type of Fueling Operation (Hot/Normal)		
Name of Vessel/Rig (Donor)		
Helicopter Call Sign (Recipient)		
Date of Fueling Operation		
Time of Fueling Operation		
Location (Rig Site)		
No. of Crewman on Standby Crew		
Inform Control Room		
Expected Type & Quantity of Fuel		
Actual Amount of Fuel (Meter Reading)		
Ground Static Wire To Helicopter		
Take Fuel Sample (First)		
Approval of Sample By Pilot & HLO		
Return Fuel Meter To Zero		
Commence Fueling as Indicated by Pilot		
Stop Fueling as Indicated By Pilot		
Remove Nozzle and Re-spool Hose		
Take Fuel Sample (Second)		
Shut-down Pumps		
Have Pilot Sign Checklist & Fueling Log		
Date, Initial & Call Sign on Two Fuel Samples		
Place Samples in Box For Storage		
Re-spool static ground wire		
Zero Fuel Meter		
Close Up Fueling Cabinet		
Put the 150 lb Dry Chemical Extinguisher in its Cabinet		
Stand-Down From Fueling Operation		
Rig Alert Status		
Donor Officer In Charge (HLO)	Name	
	Title	
Recipient Officer In Charge (Pilot)	Name	
	Title	

2.11 PRODUCT SPECIFICATIONS AND MATERIAL SAFETY DATA SHEETS

JET B

PRODUCT CHARACTERISTIC	*SPECIFICATION MIN*	*MAX*	*TEST METHOD ASTM*
Freezing Point, °C (° F)		-51 (-60)	D2386
Density, kg/L @ 15°C (API at 60 °F)	0.750 (57.0)	0.801 (45.1)	D1298
Distillation, °C			D 86
Initial Boiling Point, °C (°F)	Report	Report	
10% Recovered, °C (°F)	Report	Report	
20% Recovered, °C (°F)		143 (289)	
50% Recovered, °C (°F)		188 (370)	
90% Recovered		243 (469)	
End Point, °C (°F)	Report	Report	
% Recovered, at 204° C (400° F)		1.5	
Residue, % vol		1.5	
RVP, kPa (psi)	1 (203)	21 (3.05)	D 323
Sulfur, % mass		0.4	D1266/D2622
Mercaptan Sulfur, % mass		0.003	D3227
or Doctor Test		Negative	D 484
Corrosion Copper Strip (2 h @ 100° C/212 °F)		No. 1	D 130
Corrosion Silver Strip (Note 1)		No. 1	IP227/PCP300
Copper, mg/L (Note 2)/(oz/gal)		0.15 (2 x 10-5)	3-GP-0 131.1
Aromatics, % vol		25.0	D1319
Olefins, % vol		25.0	D1319
Net Heat of Combustion, MJ/kg (BTU/lb)	42.8 (18,400)	<0.05	D1405/D2382
Combustion Properties: one of the following:			
1. Luminometer No.	45		D1740
2. Smoke Point, mm (inch)	25 (1.00)		D1322
3. Smoke Point, mm (inch)	20 (0.80)		D1322
Plus Naphthalenes, % vol		3	D1840
Electrical Conductivity, pS/m @ point, time and temp. of delivery to purchaser	50	500	D2624
Water Separation Index (Modified)	75		D2550/D3602/
Separation Rating		2	
Interface Rating		lb	D2274
Total Acidity, mg KOH/g (% mass KOH)		0.1 (0.01)	D 974
Particulate Matter, mg/L (oz/gal)			D2276
Purchaser's bulk storage (Note 4)		2.2 (2.94 x 10-4)	
Aircraft and refuelers		0.44 (5.87 x 10-4	
Appearance		bright & clear	

PRODUCT SPECIFICATION

JET B

PRODUCT CHARACTERISTIC	*SPECIFICATION MIN*	*MAX*	*TEST METHOD ASTM*
THERMAL STABILITY:			
JFTOT PROCEDURE			D3241
Press. drop, kPa (psi)		3.4 (0.49)	
Heater deposit rating		<3	
- max. hater tube temp. 260° (500 °F)			
- fuel system pressure 3.45 MPa (500 psi)			
- fuel flow rate 3 mL/min. (7.93 x 10-4 gal/min)			
- test time 150 min.			
COLOUR, Saybolt	Report	Report	D 156

NOTES:
1. Purchaser option.
2. Copper content requirement waived for fuels not subject to copper sweetening process.
3. Smoke Volatility Index (SVI)
   SVI = Smoke Point (mm) + 0.42 (% vol recovered @ 204° C /399.2° F)
4. A minimum of 4L shall be filtered.

TRADE NAMES: Turbine Fuel-Aviation Wide Cut

SUPERSEDES:

CGSB REFERENCES: CAN2-3.22-M80 Jet B

PLC: M-059

MATERIAL SAFETY DATA SHEET

WHMIS CLASSIFICATION

Flammable Liquid (Class B2)

Poisonous Material (Class D2)

CHEMICAL CODE: 3701, 3703, 3706
3444-02

DATE: August 1, 1988

SECTION I MATERIAL IDENTIFICATION

Product Name:	Aviation Turbine Gasoline (ATG)
Trade Names:	Jet B, Jet B D-1
Chemical Synonyms and Family:	International Jet B, International Jet B D-1, Jet Fuel JP-4, Jet Fuel F-40
Name of Manufacturer/Supplier Address & Emergency Phone Number:	Petro-Canada Inc. (403) 296-3000 P.O. Box 2844, Petro-Canada Centre Calgary, Alberta T2P 3E3
Poison Control Centre Numbers:	Consult local telephone directory for emergency numbers.
Application:	Used as aviation turbine fuel. May contain a fuel system icing inhibitor.

SECTION II TRANSPORTATION (NR - Not Regulated by TDG)

UN Number 1863 Primary Classification: 3.1 Subsidiary Classification: N/A

Compatibility Groups: N/A CANUTEC Transport Emergency No.: (613) 996-6666

FLAMMABLE LIQUID

Material Trade Name: **AVIATION TURBINE GASOLINE (ATG)**

SECTION III COMPOSITION

COMPONENTS	ALLOWABLE LIMITS (8 HR)	% (VOL)	CAS #
Complex mixture of aliphatic and aromatic hydrocarbons (C6 - C14)*	300 ppm (vapour)	100	64741-41-9

* Contains trace amounts of conventional gasoline additives such as antioxidant, anti-static additive and king inhibitor (2-Methoxyethanol)

** Petro-Canada recommendation.

SECTION IV PHYSICAL DATA

Density (at 15°C)(60°F):	0.750-0.801 kg/L (57 - 45 API)	Boiling point/ Range (at 1 atm):	50 - 250° C (approx) (122 - 482°F)
Vapour Pressure (at 25°C)(77°F):	21 kPa (3.05 psi) RVP max.	Percent Volatile (at 20° C)(68°F):	100% in 8 hrs (approx)
Vapour Density (at 20°C)(68°F):	3.5 (approx.)	Evaporation Rate:	0.7 - 1.2 (n-butyl acetate = 1)
Solubility in water:	Insoluble	Freezing Point:	-51° C (max)(-59.8°F)
Viscosity: (Kinematic)	(< 7 cSt (@ 38° C) (<48.5 SSV at 100°F)	Appearance & Odor:	Colorless, clear liquid with hydrocarbon odour.

Material Trade Name: AVIATION TURBINE GASOLINE (ATG)

SECTION V FIRE AND EXPLOSION DATA

Flash Point (method used = TCC):	-25°C (minimum)(-13°F)
Flammable limits in air (% by volume):	Lower 1.3% Upper 7.6%
Auto-Ignition Temperature:	240°C (464°F)
Fire and Explosion Hazards:	Easily ignitable by flame or spark. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Do not cut, drill or weld empty containers.
Extinguishing media:	Foam, dry chemical, carbon dioxide for small fires, water spray.
Firefighting Procedures:	Use full protective equipment and self-contained breathing apparatus. Stop flow. Contain spill. cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. isolate all ignition sources in area of spill. Use gas detector in confined spaces. To avoid spreading fire do not point solid water stream directly into burning product.

EXTREME FIRE HAZARD

SECTION VI HEALTH HAZARD INFORMATION

Toxicity Data:	Estimated acute LD50>1400 mg/kg (rat, oral): practically non-toxic.

Effects of Overexposure

Inhalation:	Irritation of nose and throat; headache, nausea, vomiting, dizziness, fatigue, light-headedness, reduced co-ordination and unconsciousness; central nervous system depressant; kidney and liver damage from long-term exposure. May be narcotic in high concentrations.

Material Trade Name: AVIATION TURBINE GASOLINE (ATG)

Skin and Eyes:	Drying, cracking or inflammation of skin. Prolonged exposure to skin may cause dermatitis. Eye contact may cause irritation, but not permanent damage.
Ingestion:	Overexposure due to ingestion is unlikely for adults since taste and smell limit the amount swallowed. Harmful or fatal if swallowed.

NOTE 1: AVOID BREATHING VAPOUR. AVOID CONTACT WITH SKIN AND EYES. AVOID ASPIRATION.

NOTE 2: Aviation Turbine Gasoline contains a small quantity of benzene which is a suspect human carcinogen.

Emergency and First Aid Procedures Information

Skin:	Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.
Eyes:	Copious warm water flush - 15 minutes. Physician assessment mandatory.
Inhalation:	Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation required, physician assessment mandatory.
Ingestion:	DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. give 250 ml. (1/2 pint) of milk to drink. Mandatory physician assessment.
Notes to Physician:	Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

Material Trade Name:	**AVIATION TURBINE GASOLINE (ATG)**

SECTION VII	**REACTIVITY DATA**
Stability:	Stable under normal storage and use.
Conditions to avoid:	Sources of ignition, heating greatly increases fire and explosion hazards.
Materials to avoid:	Strong oxidizing agents (nitric acid, sulfuric acid, chlorine, ozones, peroxides, etc.) which causes detonation on contact.
Hazardous decomposition products:	COx, SOx, partially acidized hydrocarbons, smoke on combustion.
Can hazardous polymerization occur?	No.

SECTION VIII	**SPILL OR LEAK PROCEDURES**
Steps to be taken if material is released or spilled:	Evacuate personnel. Avoid contact. Use full protective equipment and breathing apparatus. Eliminate ignition sources. Shut off source of spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. DO NOT FLUSH TO SEWER. Large spills may be pumped from upwind locations using vacuum trucks and extended hoses. Large pools may be covered with foam to prevent vapour evolution. Immediate shut down and evacuation if wind shifts. Constant monitoring for explosion hazard is required.
Waste Disposal Method:	Incinerate at licensed waste reclaimer facility.

Material Trade Name: AVIATION TURBINE GASOLINE (ATG)

SECTION IX SPECIAL PROTECTION INFORMATION

Ventilation:	General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres. Local exhaust, if necessary, to control vapours to allowable limits.
Respiratory Protection:	Up to 3000 ppm, use an approved full-face organic vapour cartridge respirator. Above this level, use full-face air-supplied or self-contained breathing apparatus.
Protective Gloves:	NITRILE, VITON.
Eye Protection:	Chemical goggles.
Other Protective Clothing:	Nitrile protective clothing to prevent all contact. DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC (polyvinyl chloride).

SECTION X SPECIAL PRECAUTIONS

HANDLE AS EXTREMELY FLAMMABLE LIQUID. DO NOT USE AS CLEANING FLUID OR SIPHON BY MOUTH. Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. PRECAUTIONS SHOULD BE TAKEN TO MINIMIZE SKIN CONTACT AND INHALATION. High standards of personal hygiene are necessary. Wash skin thoroughly with soap and water after contact and before eating. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 300 ppm when handling AVIATION TURBINE GASOLINE.

SECTION XI REFERENCES

ACGIH, Threshold Limit Values and Biological Exposure Indices for 1987-88.

CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.

API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.

Environment Canada Manual for Spills of Hazardous Materials, March, 1984.

NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.

Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.

API, The Toxicology of Petroleum Hydrocarbons, May, 1982.

API, API Project # 1443, September 12, 1980.

API, In Vitro and In Vivo Mutagenicity Studies, Final Report, August 13, 1979.

Petro-Canada and its affiliates assume no responsibility for injury to anyone caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Petro-Canada Inc. and it affiliates assume no responsibility for injury to anyone caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee and third persons assume the risk in their use of the material.

~~1~~2. ~~*Frontier*~~ *Noble* *Discoverer* Fuel Transfer Procedures

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Fuel Transfer Procedures: ~~Frontier~~ *Noble Discoverer*

Prior to taking part in any bunker transfer operations, the Chief Engineer shall ensure that any assistants are fully conversant with the system and understand the implications of the MARPOL regulations.

All persons involved in bunker fuel transfer shall read and understand the posted bunkering procedures.

Prior to working material fuels, crew members are advised to consult the relevant Material Safety Data Sheet (MSDS) in order to familiarize themselves with the potential health risks caused by “inhalation”, “skin contact”, and “ingestion”.

A list of all persons involved in the bunker operation shall be posted in a prominent position.

The Chief Engineer will coordinate with the Chief Officer regarding the possible transfer of ballast to ensure the ship remains in a proper list and trim.

The Chief Engineer will conduct a pre transfer conference with the bunker suppliers, or with the appropriate ship staff for an internal transfer. Ensure sequence of loading/transfer is verified.

The Chief Engineer will check the requirements are carried out, and sign the pre-transfer shore/ship, ship/ship, and bunker checklist forms as appropriate.

Bunker Fuel Transfer Procedure:

1. Suspend all hot work permits.
2. Terminate all internal transfers if in progress.
3. Ensure all fuel storage tank valves are closed.
4. Take a full set of soundings.
5. Clean the inlet strainer and zero the meter count.
6. Liaise with Bridge to confirm which tanks are being filled.
7. Confirm that the bunker connection save all is drained.
8. Ensure deck scuppers are plugged.
9. Check spill kit is on location and complete.
10. Where appropriate, ensure red light and bunker flag are deployed.
11. Bunkering stations to be manned continually during the entire operation.
12. Check hose and bunker line is clear. Make the connection and secure the hose.
13. Establish communication between E.C.R. Bridge and bunker station and fueling vessel.
14. Confirm the pumping rate and quantity to be pumped with fueling vessel.
15. Bridge to make P.A. announcement regarding the start of fueling operations.
16. Ensure any heading or position changes are communicated to the fueling vessel.

17. Open the bunker station valves and tank valves.
18. Start the operation.
19. 10 minutes after starting take a sample. (check the sample with the senior watchkeeper. If ok continue bunkering operations)
20. Take a sample in the middle of the operation. (check sample with senior watchkeeper. If ok continue bunkering operation)
21. Take manual soundings throughout the operation.
22. Always aim to finish on a non full tank.
23. At completion close tank and bunker station valves.
24. Before disconnecting hose, confirm quantity received.
25. Secure bunker hose so that end is over save all.
26. Inform Bridge of terminating operations. Hot work permits may be resumed.
27. Bridge to make P.A. announcement regarding termination of fueling operations.
28. Ensure oil record book is completed with correct information. Also make entries in engine room and deck logs.

~~2~~3. Oil Spill Response Vessel and Barge Fuel Transfer Procedures

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OSRV Fuel Transfer Procedure

Ship's Fuel Oil
Transfer Procedure
Per
33 CFR 155.750

M/V ____________

North American Hull Number 235
Edison Chouest Offshore, LLC
August 17, 2005

__Table of Contents__

1

Introduction

This fuel oil (F.O.) transfer procedure is prepared in accordance with 33 CFR 155.750. It is a requirement for the vessel personnel to use this transfer procedure for each transfer of F.O. to (Loading), from (Off-Loading), and within the vessel (transferring). This procedure is to be kept in a place where it can be easily seen and used by members of the crew when engaged in transfer operations. Any exemptions or alternatives granted must be placed in front of the transfer procedures.

(1) Fuel Oils Transferred - Description and Safety Precautions

Diesel Oil (D.O.) is a light brown, non-viscous liquid that has an odor similar to kerosene. It has a flash point between 110 and 190 deg F and an autoignition temperature of 494 deg F. D.O. is both a skin and eye irritant. Safety precautions should be taken when handling, such as wearing protective gloves and glasses. Keep sparks, flames and other sources of ignition away. In case of a leak or spill, notify personnel on notification list in part (9) of this procedure. When large spills occur evacuate area and remove all sources of ignition. In case of a fire (class B) isolate hazard area and begin extinguishing the fire with the use of carbon dioxide, dry chemical, foam, or water fog. Direct application of water or foam to a pool of D.O. can cause frothing and thereby increase the fire.

(2) Fuel Oil (F.O.) Transfer System

The fuel oil transfer system can be arranged to load from the on deck fuel oil fill/discharge connection, off-load fuel oil from the on deck fuel oil fill/discharge connection or from the rig fuel oil discharge connection or transfer fuel oil between the various tanks within the ship. Diagrams of the fuel oil transfer piping drawing and vents piping drawing are after this procedure.

Tanks and Pumps:

Tanks	Location	Capacity (Gal.)
FO #2-P	21 - 41	22755
FO #2-S	21 - 41	21919
FO #3-C	41 - 57	19484
FO #4-C	57 - 73	22078
FO #5-C	73 - 92	23376
FO #5-P	73 - 92	25043
FO #5-S	73 - 92	25043
FO #6-C	92 - 112	26945
FO #6-P	92 - 112	21535
FO #6-S	92 - 112	21535
FO #7 P	107 - 116	12172
FO #7 S	107 - 112	12172
FO DAY TANK-P	29 - 34	13528
FO DAY TANK-S	27 - 34	18345
FO OVERFLOW-P	36 - 41	2516.2

Pumps

1) Fuel Oil Cargo Pump Located @ Frame 40	Aurora 344A 4"x5"x 9a 75 HP, 3600 RPM Motor 760 GPM @ 290 TDH, 480V
2) Fuel Oil Transfer Pump Located @ Frame 36	Barnes 25CCE 3"x3" 15 HP, 3600 RPM Motor 320 GPM @ 115 TDH, 480V
3) Maximum Transfer Rate For Cargo and Transfer Pumps Combined:	1080 GPM

Note: TDH indicates total head (in feet) developed across pump.

Transferring

The fuel oil cargo pump is used primarily for transferring fuel from the vessel to offshore drilling rig installations. The fuel oil transfer pump is used primarily for transferring fuel oil between the various fuel oil tanks within the vessel. The procedure for transferring fuel oil to and from any combination of two (2) different tanks is as follows:

1. Ensure the F.O. pumps are off.

2. Ensure the following valve line-up is correct and performed in the order given before beginning any transfer (valves can be referenced on the system diagram after this procedure):

   a) Close the following valves:
      1) All F.O. tank fill valves,
      2) All F.O. tank suction valves,
      3) F.O. transfer pump discharge valve(s) for deck connections

   b) Open the following valves:
      1) Appropriate F.O. tank suction valve for tank being transferred from (including appropriate tank valve)
      2) F.O. transfer pump suction valve from suction header
      3) F.O. transfer pump discharge valve to fill header
      3) F.O. meter inlet and outlet valves (if required)
      4) Appropriate F.O. tank fill valve for tank being transferred to (including appropriate tank valve)

3. When communication is established (via sound powered phone, intrinsically safe VHF, or other acceptable means) and the personnel are in their proper positions in accordance with the rest of these procedures - transferring may begin at the order of the person in charge to begin pumping. Inspect entire line-up for leaks after pumping is started.

4. When transferring is complete the system should be secured in accordance with part (8).

Loading

The fuel oil transfer piping system is designed to allow either simultaneous or individual loading (filling) of any combination of the various fuel oil tanks within the vessel from the main deck fuel oil fill/discharge connections. The procedure is as follows:

1. Ensure the F.O. pumps are off.

2. Ensure the following valve line-up is correct and performed in the order given before beginning any transfer (valves can be referenced on the system diagram after this procedure):

   a) Close the following valves:
      1) All F.O. tank fill valves,
      2) All F.O. tank suction valves,
      3) F.O. meter inlet and outlet valves
      4) F.O. transfer pump discharge valve for deck connections

   b) Open the following valves:
      1) Appropriate F.O. tank fill valve(s) for tank(s) being filled (including appropriate tank valves)
      2) F.O. fill valve from deck connection
      3) Main deck F.O. fill/discharge connection and flange - being ready to catch any fuel still in the pipe with a bucket and making immediate hose connection with gasket.

3. When communication is established (via sound powered phone, intrinsically safe VHF, or other acceptable means) and the personnel are in their proper positions in accordance with the rest of these procedures - transferring may begin at the order of the person in charge to begin pumping. Inspect entire line-up for leaks after pumping is started.

4. When loading is complete the system should be secured in accordance with part (8).

Off-Loading

The fuel oil transfer pumps are capable for simultaneous or individual off-loading to an offshore drilling rig installation of any combination of the various fuel oil tanks within the vessel or in the event of dry-docking of the vessel and it is needed. The procedure is as follows:

1. Ensure the F.O. pumps are off.

2. Ensure the following valve line-up is correct and performed in the order given before beginning any transfer (valves can be referenced on the system diagram after this procedure):

   a) Close the following valves:
      1) All F.O. tank fill valves,
      2) All F.O. tank suction valves,
      3) F.O. meter inlet and outlet valves

   b) Open the following valves:
      1) Appropriate F.O. tank suction valve(s) for tank(s) being transferred (including appropriate tank valve)
      2) F.O. transfer pump suction valve from suction header
      3) F.O. transfer pump discharge valve to appropriate deck discharge connection
      4) Main deck F.O. discharge connection - being ready to catch any fuel still in the pipe with a bucket and making immediate hose connection with gasket.

3. When communication is established (via sound powered phone, intrinsically safe VHF, or other acceptable means) and the personnel are in their proper positions in accordance with the rest of these procedures - transferring may begin at the order of the person in charge to begin pumping. Inspect entire line-up for leaks after pumping is started.

4. When off-loading is complete the system should be secured in accordance with part (8).

(3) Personnel Requirement for Fuel Oil Transfer

For loading and off-loading of fuel oil, a minimum of one person in charge and two transfer personnel are required to be on duty for the entire duration of the operation.

For transferring of fuel oil between the tanks within the vessel a minimum of one person in charge and one transfer personnel are required to be on duty for the entire duration of the transfer operation.

(4) Duties of Required Personnel for Fuel Oil Transfer

Duties of Person in Charge

The person in charge is designated by the operator and shall hold a valid license as a master, mate, pilot, engineer, or operator. The person in charge will generally be attending duties in the pilothouse but may be temporarily below deck as required. In the event that the person in charge is not in the pilothouse, a designed person with communications capabilities must be in the vicinity of an emergency shutdown switch. The person in charge is responsible for seeing that the following is accomplished:

1. Assume responsibility for the vessel in filling out the declaration of inspection before commencing transfer operations. All items on this declaration must be fully understood and agreed upon by the deliverer and recipient of cargo and any discrepancies will be noted in writing.

2. Read, understand, and follow this procedure.

3. Expedite transfer of fuel oil without causing any damage to the vessel, its equipment or environment.

4. Constantly watch for any changes in condition that could cause any spill.

5. Notify the proper person(s) in case of a spill. The procedure for spill reporting is found in part (9) of this procedure.

6. Proper tending to the vessel's moorings as specified in part (5).

7. Take charge of all topping operations as specified in part (7).

8. Properly secure vessel and equipment upon termination of transfer as specified in part (10).

9. Remove all spillage from containment boxes as specified in part (8).

10. Instruct and direct the transfer personnel.

Duties of Transfer Personnel

The person in charge designates the transfer personnel. Acceptable transfer personnel shall include; persons designated by the person in charge, qualified deck hands, AB/OS, or qualified crew. Passengers or persons other than crew will not be acceptable for use as transfer personnel. For loading and off-loading one-transfer personnel will be located at the appropriate deck connection and another transfer personnel will be located in the engine room attending the transfer equipment. For transferring operations (within the vessel) it is not necessary to have a transfer personnel located on deck. The transfer personnel are responsible for seeing that the following is accomplished:

1. Follow instructions of the person in charge.

2. Maintain communication with the person in charge.

3. Initiate an emergency shut-down to stop the transfer operation whenever oil or hazardous material from any source is discharged:
    1. In the transfer operation work area; or
    2. Into the water or upon the adjoining shoreline in the transfer area.

4. Immediately report any spills or leakage or potential hazards to the person in charge.

(5) Mooring Duties for Oil Transfer

Deck Officer on Watch - In charge of tying up and letting go of mooring. Insure proper signals hoisted or lit aloft and scuppers plugged.

Bosun, AB's, & OS's - Assist as directed in mooring. Rig ladder during ship to barge operations.

(6) Emergency Shut-Down

For loading, immediate means of communication with the fueling facility must be made available in order to request that the pumping be stopped if an emergency shutdown were to become necessary. If loading from a barge, an emergency stop switch should be given to the vessel by the barge unit.

For off-loading fuel from the ship or transferring fuel within the ship, immediate communication with the transfer personnel attending the transfer equipment is necessary in order to request that the pumping be stopped and appropriate valves be closed. In the event that an emergency shut-down is necessary, appropriate personnel must activate the shut-down. An emergency stop button for the pumps is located on the control panels. These control panels are located in the pilothouse, near the liquid mud and fuel oil fill connection on main deck, and on the local pump control panel.

The person in charge must be able to maintain communication with the barge or shore side fueling facility and transfer personnel via voice, sound powered phone, or portable radio. If portable radios are used they must be intrinsically safe as defined in 46 CFR 110.15-100 and 46 CFR 11.80.

(7) Topping Off

During topping off operations, the flow shall be continually reduced to a level that will allow controlled closure of the discharge valve to that tank and precludes overfilling or spillage. The tanks shall be continuously sounded to ensure tank levels during the topping off phase and continuous communication between the transferring and sounding personnel must be maintained. This phase of the transfer procedure is the most critical and requires the full attention of the person in charge.

(8) Transfer Completion

Once the transfer is complete: all pumping is stopped, all fill valves are closed, all connections drained and removed, and blank flanges replaced and secured with gaskets. The person in charge visually checks all valves and flanges to be sure they are closed after the oil transfer is complete.

Emptying of the Discharge Containment Areas

Containment areas are to be drained and cleaned so as to prevent any oil from spilling overboard. This is to be done by using a hand pump, rags, and/or absorbents. Collected spillage shall be properly disposed of to prevent any re-release because of torn bags or faulty containers. In addition to the required fixed containment area, at each oil tank vent, overflow, and fill pipe a 5 gallon portable container and rags should be placed to clean and collect any oil that might have spilled.

(9) Accidental Oil Discharges

AS SOON AS A SPILL IS SIGHTED, IMMEDIATE ACTION SHALL BE TAKEN TO STOP OR REDUCE THE SOURCE. REFER TO THE SHIPBOARD OIL POLLUTION EMERGENCY PLAN. REPORT ALL SPILLS TO EDISON CHOUEST OFFSHORE DISPATCHER OR PERSON IN CHARGE AT (985) 632-7144, THEN TO THE U.S. COAST GUARD AT 1-800-424-8802.

(10) Closing and Opening the Vessels Openings

The person in charge is to ensure that the vessel is properly secured and equipment stowed upon transfer completion. This includes, but is not limited to:

1. Dogging of all hatches, ullages, doors vents, sounding ports, and any other vessel openings that maintain the seaworthy condition of the vessel and prevent the inadvertent release of oil or hazardous material in the event of an accident.
2. Securing booms, cargo hoses and any other gear that is not permanently fastened to the hull that might move while the vessel is underway.
3. Closing of all fuel valves necessary to prevent shifting of fuel.
4. Remove all spillage from containment boxes using rags or "sugie" cloth to soak up excess oil.

(11) Transfer Hose Markings

Hoses used for the transfer of hazardous materials are to be marked or stenciled as follows, with:

1. The name of the product for hose intended service.
2. Maximum working pressure.
3. Minimum service temperature for service at other than ambient temperature.
4. Manufacture date.
5. Date of latest possible pressure testing in accordance w/ USCG 33 CFR 156.170.

OIL TRANSFER PROCEDURES
POINT THOMPSON CLASS

This statement of oil transfer procedures is to meet USCG 33 CFR 155.720. It addresses: (a) transfers of oil to or from the vessel, and (b) transfer of oil from tank to tank within the vessel. It must be posted or available at the on-deck fueling station during all oil transfer proceedings.

This procedure applies only to the following vessels:

POINT BARROW
POINT MILNE
POINT OLIKTOK
POINT THOMPSON

1. List each of the products transferred to or from the vessel, including the following information:

   (i) Generic or chemical name,

   (ii) Cargo information as described in 154.310 (a), (5), (ii) of this chapter, and

   (iii) Applicability of oil transfer procedures.

   (i) The vessel carries two separate petroleum products: (a) #2 Diesel Fuel and (b) lubricating oil. The #2 Diesel Fuel is a Grade D petroleum product. The lubricating oil is a Grade E petroleum product. Attached are the Material Safety Data Sheets for each product.

   (ii) The following cargo information applies to #2 Diesel Fuel

Section (a):	Oil: Fuel Oils: Number 2 – D
Sections (b) through (g):	See attached Material Safety Data Sheets

   The following cargo information applies to the lubricating:

Section (a):	Oil: Lubricating
Sections (b) through (g):	See attached Material Safety Data Sheets

   (iii) Each product applies to and will be addressed in the following procedures of oil transfer.

2. Describe each of the transfer systems on the vessel, including:

   (i) A line diagram of the vessels oil transfer piping, including the location of each

1

valve, pump, control device, vent, and overflow;

(ii) The location of the shutoff valve or other isolation device that separates any bilge or ballast system from the oil transfer system; and

(iii) A description of any procedure for emptying the discharge containment system as required by 155.310 and 155.320.

(i) Attached are drawings that show all piping, valves, and vents for the oil transfer system on the vessel. The vessel is fitted with 7 diesel oil tanks and 2 lubricating oil tanks, for a total capacity of 72,310 gallons of petroleum products. Each tank is filled only through a main deck stand pipe. There are no valves in the system between the fuel line on the main deck and the tank. Each fuel tank is interconnected by fuel suctions. All engines return their fuel to the 2 centerline fuel tank. This is the only fuel transferring capability on the vessel.

The vessel's fuel tank fill lines have no shutoff valves. The dock facility hose must have either an automatic back pressure nozzle or a quick closing shutoff valve.

NOTE: The tug Pt. Thompson and Pt. Oliktok are fitted with a fuel pump, hose, nozzle and hose reel so it can discharge fuel off the vessel. This pump cannot be used for internal fuel transfers.

(ii) All vessels in this class do not have any connections between the bilge or ballast system and the oil transfer system.

(iii) As listed for vessels (100 gross tons but less than 300 gross tons):

Equip each fuel oil or bulk lubricating oil tank vent, overflow, and fill connection with a portable container of at least 5 U.S. gallon capacity during oil transfer operations.

Disposal of these containers pursuant to 155.320, the portable containers will be carried to the engine room and pumped into the waste oil or contaminated oil tank using the appropriate pump.

The vessel's lubricating oil tank fills make containment impractical. The products for these tanks will be transferred using a back pressure shut-off nozzle.

3. List the number of persons required to be on duty during the oil transfer operations.

The Chief Engineer and one assigned person from the Deck Department is required to be on duty during the oil transfer procedure.

4. List the duties by title of each officer, person in charge, tankerman, deckhand, and any other person required for each oil transfer operation.

The vessel's Chief Engineer is the designated Person In Charge (P.I.C.) of the oil transfer. The assigned Deck Department assistant is responsible to the P.I.C. and will assist him as directed.

5. List the procedures and duty assignments for tending the vessel's moorings during the transfer operations.

The deckhand or Deck Department officer on watch will be responsible for tending the mooring lines, or seeing that they are properly tended. The P.I.C. and his assistant shall not tend to mooring lines if it takes them away from their oil transfer duties.

6. List the procedures for operating the emergency shutdown and communication means required by 155.780 and 155.785 respectively.

The emergency shutdown procedure on board the vessel is the main deck valve at the deck fill station. This valve is the usual operating station of the P.I.C. of the oil transfer operation.

The communication means required in 155.785 applies during vessel to vessel oil transfer transfers. A portable radio device may be used to comply with this paragraph. When deemed proper, voice communication is also sufficient. Conditions such as vessel proximity, weather, and time of day dictate which form of communication is necessary.

7. List the procedures for topping off tanks.

Tanks will be topped off at reduced flow rates. This shall be accomplished by having the Marine Terminal Operator (M.T.O.) reduce the loading rate. The system for topping off shall be discussed during the pre-transfer conference, as detailed in the Declaration of Inspection. Topping off procedures will commence when the tank is at the 80% capacity amount. Tanks will be filled no more than a maximum of 12 inches from the tank top.

8. List the procedures for ensuring that all valves used during the oil transfer operation are closed upon completion of transfer.

Upon completion of any transfer, the specific manifold, tank, or header valves will be closed. Upon completion of fuel transfer, the deck fill standpipe or tank fill cap will be closed and the camlock cover installed as a safety precaution.

9. List the procedures for reporting oil discharges into the water.

If a spill occurs, take the following steps:

(a) Stop all transfers,
(b) Stop flow of oil into the water if possible,

(c) Immediately report the spill to the United States Coast Guard, the nearest Crowley office, and to your supervisor. The toll free number for reporting spills to the USCG is:

1-800-592-9911 Group Seattle
or
1-800-424-8802 National Response Center

10. List the procedures for closing and opening the vessel openings as described in 155.815.

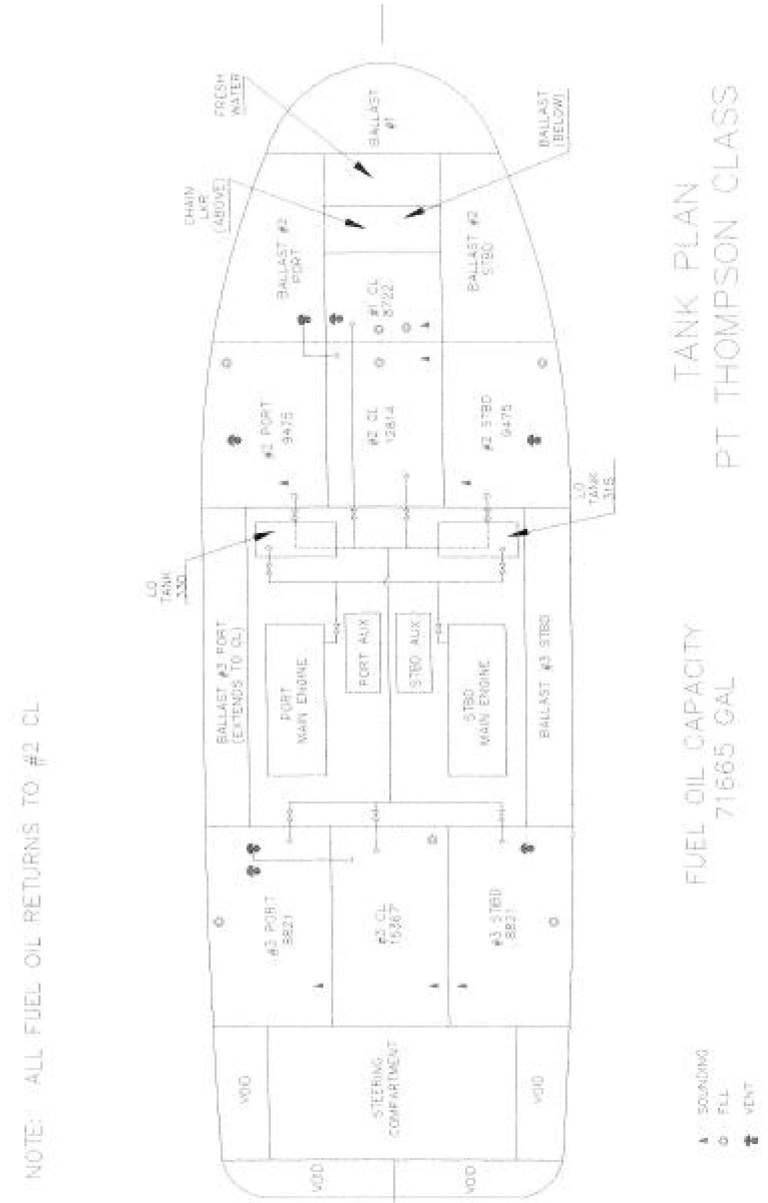
Prior to commencing oil transfer operations, all manhole covers, ullage openings, freeing ports, and scuppers will be properly closed. Only those sounding tubes of tanks being filled will be open. Bulwark openings will be blocked off plugs. Vessels built prior to 1986 can utilize wooden damage control plugs to seal bulwark openings. Vessels built after 1986 must use threaded pipe plugs or caps to seal off bulwark openings. All freeing ports will be blocked with absorbent bags.

Vents will be fitted with 5 U.S. gallon containers if they are not within fixed on-deck containment. Any other opening that maintains the sea worthy condition of the vessel and prevents the inadvertent release of oil in the event of a tank vessel accident must be kept closed.

11. List any statements explaining that each hazardous material transfer hose is marked with either the name of each product which may be transferred through the hose or with letters, numbers or other symbols representing all such products and the locations in the transfer procedures where a chart or list of the symbols used and a list of the compatible products which may be transferred through the hose can be found for consultation before each transfer.

The vessel carries three sections of 3 inch petroleum product transfer hoses, intended for use solely for #2 diesel fuel. Each hose is tested annually and stenciled with the date of the test and the Maximum Working Pressure.

No additional amendments are incorporated in the oil transfer procedures as required under 33 CFR 155.760


TANK PLAN
PT THOMPSON CLASS
FUEL OIL CAPACITY
71665 GAL
NOTE: ALL FUEL OIL RETURNS TO #2 CL
SOUNDING
FILL
VENT

APPENDIX D:
OIL AND DEBRIS DISPOSAL PROCEDURES

INTRODUCTION

The collection, storage, transportation, treatment and disposal of waste will be conducted in a manner that is both safe and environmentally sound. Procedures are in place to insure that all laws and regulations are followed and that necessary permits are obtained in conjunction with waste management.

Wastes generated from an oil spill response will be handled in accordance with federal and state hazardous waste regulations and company policy. Most of the waste collected during response operations will be classified as exploration and production exempt waste .

However, crude oil contains benzene, which can be considered hazardous waste under the Resource Conservation and Recovery Act's (RCRA) toxicity characteristic rule. The hazardous waste characteristics include ignitability, reactivity, corrosivity and toxicity. Oily waste will be tested before a disposal option is selected. Benzene will normally volatilize rapidly from a spill. If oily waste is determined to be hazardous under RCRA, it will be labeled accordingly and sent to a permitted facility for disposal.

In the event of a spill, a site-specific waste management plan will be developed to address the equipment, staffing, and other support necessary to address waste management issues under the known conditions of the spill. The template for the Shell Waste Management Plan (which will be attached to the Incident Action Plan) is provided in Figure D-1. If an oil spill occurs during Shell's Beaufort Sea exploration operations, wastes may be generated offshore, near shore, and onshore.

WASTE CATEGORIES

Oil spills can result in several different types of generated wastes including those listed below. This waste may include oiled personal protective equipment (PPE), possible shoreline debris, and oily sorbents.

- **Oily Liquid Wastes**
  - Recovered or skimmed mixtures
  - Used engine oils, hydraulic fluids
  - Fuels contaminated with water and solids
  - Engine room bilge/ballast waters from vessels
  - Wash waters from cleaning boats, equipment, and gear
  - Other oily waters

- **Non-Oily Liquid Wastes**
  - Sewage, liquid human waste (gray and black waters)

- **Oily Solid Wastes**
  - Sand, gravel, tar balls
  - Asphalt patches
  - Sludge
  - Sorbent pads/boom/wood
  - Shoreline vegetation
  - Oily personnel gear and clothing
  - Damaged response equipment and gear
  - Empty drums and containers

- **Non-Oily Solid Wastes**
  - Domestic trash and garbage
  - Bagged human waste
  - Discarded equipment and construction materials

Wildlife carcasses and contaminated fish may be retained by trustee agencies. Once they are released or determined to be solid wastes, tier disposal will comply with applicable regulations.

COLLECTION AND SEGREGATION OF RECOVERED OIL

- Oil and emulsion from offshore oil recovery will be transferred from skimmer vessels with storage tanks or barges to the Arctic tanker for storage and ultimate disposal.

- Oil and emulsion from near shore oil recovery will be collected with shallow draft vessels and/or mini-barges. Mini-barge would be used for temporary storage of oily liquid wastes.

- Oil and emulsion from shoreline oil recovery will be collected with skimmer systems and pumped off into holding tanks. Each tank's oil and free-water volumes will be gauged and logged, and then pumped to mini-barges or other storage containers. Solid waste and debris will be removed and brought to a segregated interim storage area.

OIL AND DEBRIS SEPARATION AND DISPOSAL

Oil spill cleanup offshore using mechanical recovery will involve the further handling of recovered oil and oiled materials. These should be transported from offshore to the staging area for proper handling or from onshore directly to the appropriate reclamation/ disposal site.

Figure D-2 depicts separation methods for recovered oil/water/debris. The figure also depicts methods that may be employed to separate free and/ or emulsified water from the oily liquid waste.

TEMPORARY STORAGE OF RECOVERED OIL AND WASTE

- Oil recovered at sea via skimmer(s) is transferred to portable tanks onboard recovery vessels or barges.

- The skimmer tanks allow for gravity separation of the oil from the water. The separated water is transferred through a hose and discharged forward of the recovery pump. This method is called "decanting." This process is vital to the efficient mechanical recovery of spilled oil because it allows maximum use of limited storage capacity, thereby increasing recovery operations. Approval must be obtained from the USCG and respective State agencies by the Incident Management Team Liaison Officer prior to decanting.

- Recovered fluids stored onboard the Arctic tanker will be disposed of at a Shell Group refinery or a 3rd part processor.

- Oiled debris collected at sea requires specific handling. Contaminated materials should be placed in leak proof, sealable containers on the recovery vessels and transported to appropriate facilities for processing, recycling, or disposal.

- Oil recovered from onshore areas will typically contain substantial quantities of water and debris. Excess water, sand, and other beach materials greatly increase the quantity of waste and its associated cost for transportation, processing, and disposal. To remedy this, different methods can be employed at the cleanup site to separate oiled debris from excess materials that may be returned to the shoreline. Using screens, filters, conveyor systems and settling tanks, oil/ water mixtures can be drained from debris and collected in temporary containers for further treatment.

- Clean sand and beach materials can be separated from oiled materials.

- Oil spills would occur in remote sites that are some distance from transportation routes and storage facilities. In these situations, temporary on-scene storage arrangements may be required. Oil may be stored in tanks, 55-gallon drums, bladders, or empty fuel storage tanks. Such tanks permit decanting of water from the oil. These pits should be lined with plastic sheeting to prevent oil leakage and soil penetration.

- Contaminated gravel will be temporarily stored on site and later transported by vessel or air off site to a designated waste treatment or disposal facility.

DISPOSAL REGULATIONS

- Oiled Materials – If these materials have not contacted extraneous substances, they will be disposed of at a Shell approved disposal site.

- Oil and oily wastes that are contaminated or excessively weathered will require transport to an approved disposal site. Any transport or disposal of material that is considered hazardous waste must follow the requirements of the RCRA.

- Regulatory Guidelines

    - All wastes scheduled for disposal at a Prudhoe Bay oilfield facility, with prior written approval from the facility owner, will be handled in accordance with the requirements of the U.S. Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), and Alaska Oil and Gas Conservation Commission regulations and policy guidelines. These regulations and guidelines have been synthesized into an operational document titled, "Alaska Waste Disposal and Reuse Guide" (red book) prepared by BP Exploration (Alaska) Inc. and ConocoPhillips Alaska, Inc. (CPAI) to ensure consistency in waste handling practices on the North Slope. This includes directions for using the North Slope manifest, and other requirements for third party contractors using BP or CPAI facilities.

    - Only state licensed hazardous material haulers are used to transport recovered oil. These licensed waste haulers must have an EPA ID number and a state transporter ID number.

    - When completing the manifest, Shell Exploration and Production is listed in the manifest as the generator. The manifest should be signed by the designated Shell representative, and marked with the statement: "This material is being disposed of by Shell as part of a response action in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300)."

    - Recovered waste oil must be properly packaged and labeled prior to transport in accordance with 40 CFR 262.30.

    - All wastes shipped off-site for disposal must be transported in compliance with applicable regulations. These include the RCRA regulations in 40 CFR 262-263, the DOT Hazardous Materials Regulations in 49 CFR 171-178, and applicable ADEC regulations. Ensure shipments of waste collected during spill cleanup activities are transported in appropriate containers to eliminate secondary releases during transport. If the nature of the waste precludes packaging in the required container, the Incident Commander should request emergency exemptions from the regulations following procedures outlined in 49 CFR 107.

    - Waste haulers will use only state-certified disposal sites.

    - Unit personnel must track the Hazardous Waste Manifest and retain the appropriate records per 40 CFR 262.40. Unit personnel should receive a signed copy of the manifest from a designated disposal facility within the specified time limits.

DISPOSAL TRANSPORTATION AND DESIGNATED SITES

- Transportation of oil and oily waste at sea may be accomplished via barge, OSRV, or tanker.
- Transportation of oil or oily waste from shoreline locations will be by shallow draft vessel, , towed bladders, or air (helicopter sling-loads of small containers, if approved).,
- Oil or oily debris recovered from a spill site may only be disposed of at authorized sites (List is maintained by Shell HSE).

FIGURE D-1
WASTE MANAGEMENT PLAN

Always work safely in an environmentally sound manner. Minimize waste. Consider waste management and generation in all actions. Never mix waste; always segregate. Report any accident or incident to your supervisor immediately. Reference the Waste Management Plan for the specific process required for each waste type.

A. INTRODUCTION

Incident Name: ______________________________

Date of Incident: ______________________________

Time of Incident: ______________________________

Individual in Charge of Site: ______________________________

B. SITE DESCRIPTION

Location of Site: ______________________________

Description of Site Including Surrounding Area (e.g., beach, marsh) - attach map: ______________________________

Access/Limitations (e.g., highway/bridge limitations, boat/shallow water) - attach map: ______________________________

Any Additional Information / Considerations: ______________________________

Present Weather Conditions: ______________________________

12-Hour Forecast: ______________________________

24-Hour Forecast: ______________________________

C. SITE-SPECIFIC SAFETY PLAN

This plan must be completed and attached before starting any physical work. One plan must be completed for each waste handling/storage area.

FIGURE D-1
WASTE MANAGEMENT PLAN

D. TYPE OF WASTE GENERATED FROM RESPONSE OPERATIONS

Wastes generated by oil spill cleanup fall into several different types. Use the following to identify your wastes. Remember - never mix wastes!

Waste Stream	Sources
Non-Hazardous	
- Oily Liquid	Offshore and onshore recovery operations; vessels, vehicle, aircraft and equipment operations; personnel and equipment decontamination operations; waste storage and disposal area storm water runoff control operations; wildlife washing operations; equipment demobilization operations.
- Non-Oily Liquid	Sewage collection operations; gray water collection operations; laundry operations; oil/water separation operations; wildlife rehabilitation operations.
- Oil Solids	Offshore and onshore recovery operations; debris removal operations; in-situ burning operations; site restoration operations; personnel and equipment decontamination operations; equipment demobilization operations; wildlife capture, cleaning and rehabilitation operations.
- Non-Oily Solids	Offshore and onshore recovery operations; debris removal operations; garbage collection operations; construction operations; site restoration operations; wildlife capture, cleaning and rehabilitation operations; equipment demobilization operations.
Hazardous	
Vessels, vehicle, aircraft and equipment operations; dispersant use operations; wildlife rehabilitation operations.	

FIGURE D-1
WASTE MANAGEMENT PLAN

E. CONTAINERIZED AND STORED WASTE

Waste accumulated at spill cleanup sites will have to be containerized and stored. Use **F through K** of possible waste streams to identify temporary storage techniques. Note that each waste stream will have to be classified as to its hazardous nature. Additionally, each container will have to be properly identified and marked for hazard communications as well as properly marked and labeled to meet Department of Transportation requirements before shipment. All hazardous waste must be transported immediately to the nearest shore base for continued storage.

F. **TEMPORARY WASTE SITES** will have to be identified and established. These sites will need to be in close proximity to the cleanup site. Security requirements must be considered along with the access to outside transportation. These storage areas should be established with the following considerations: distance to living/working areas (cleanup operations as well as the general public), tidal influx, local wildlife impact, security, cleanup of spilled product and rainwater runoff. The following section should be completed for each temporary storage site. To establish security, contact the Logistics Section Chief.

Site Location	Security	Access

G. **COMPANY-APPROVED TREATMENT, RECYCLING AND DISPOSAL FACILITIES** are listed below. Prior contact must be made with the facility as soon as the waste is identified and an estimated volume is established.

Company Name, Address, Phone Number	Contact (Complete When Called)	Type Waste Approved For

FIGURE D-1
WASTE MANAGEMENT PLAN

H. **COMPANY-APPROVED WASTE TRANSPORTERS** shall be used to haul all waste. The following is a list of transporters presently used to transport wastes. The shipper must ensure that all Department of Transportation requirements are met. Additionally, all waste must be accompanied by a properly completed manifest or shipping paper. All containers must be secure and strong. All dump trucks or roll-off bins should be lined to prevent spillage or contamination of other areas.

Company Name, Address, Phone Number	Contact (Complete When Called)	Type Waste Approved For

I. **WASTE MATERIAL MUST BE CONTROLLED WHEN ENTERING AND LEAVING** the storage area. The following can be used to accomplish this task.

Waste Type	Type / # Containers	Control Number	Date IN	Date OUT	Transporter	Disposer	Type / Manifest #

J. If **ADDITIONAL HELP OR ASSISTANCE** is required, immediately contact your on-scene safety or environmental representative or contact the Operations Section Chief or the Safety Officer.

FIGURE D-1
WASTE MANAGEMENT PLAN

K. **EQUIPMENT, MANPOWER AND EXPENDITURES** must be controlled and documented. The following can be used for this purpose. If additional assistance is required for cost control, contact the Finance Section Chief. If additional assistance is required for purchasing or locating equipment or supplies, contact the Logistics Section Chief.

EQUIPMENT					
Waste Handling Equipment	Vendor	S.O. #	Days Used	Cost Per Day	Total Cost

MANPOWER					
Waste Handling Equipment	Vendor	S.O. #	Days Used	Cost Per Day	Total Cost

OTHER COSTS (Fuel, Tools, Repair, Container Rental/Purchase, Other Equipment)					
Waste Handling Equipment	Vendor	S.O. #	Days Used	Cost Per Day	Total Cost

TOTAL COST =

L. **WASTE MANAGEMENT SITES** are identified in **this Section**.

M. Report all **ACCIDENTS/INCIDENTS** immediately to your supervisor. Always work safely and in an environmentally sound manner.

FIGURE D-2
Oil/ Water/ Debris Separation Strategies

The different types of wastes generated during response operations require different disposal methods. Waste shall be separated by material type for temporary storage prior to transport. The following table lists some of the options available for separating oily wastes into liquid and solid components. The table also depicts methods that may be employed to separate free and/or emulsified water from the oily liquid waste.

TYPE OF MATERIAL	SEPARATION METHODS
(1) LIQUIDS	
Non-emulsified oils	Gravity separation of free water
Emulsified oils	Emulsion broken to release water by: • Heat treatment • Emulsion breaking chemicals • Centrifuge • Filter/belt press
(2) SOLIDS	
Oil mixed with sand	• Collection of liquid oil leaching from sand during temporary storage • Extraction of oil from sand by washing with water or solvent • Mechanical sand cleaner • Removal of solid oils by sieving
Oil mixed with cobbles, pebbles or shingle	• Screening • Collection of liquid oil leaching from beach material during temporary storage • Mechanical sand/gravel cleaner • Extraction of oil from beach material by washing with water or solvent
Oil mixed with wood, plastics, seaweed and sorbents	• Screening • Collection of liquid oil leaching from debris during temporary storage • Flushing of oil from debris with water
Tar balls	Separation from sand by sieving

FIGURE D-3
TEMPORARY STORAGE METHODS

Container	On-shore	Off-shore	Solids	Liquids	Notes
Barrels	✓	✓	✓	✓	May require handling devices.
Barges		✓	✓	✓	Liquids only in tanks. Consider venting of tanks.
Oil Storage Tanks	✓	✓		✓	Consider problems of large volumes of water in oil.
Bladders	✓	✓		✓	May require special hoses or pumps for oil transfer.
Pits	✓		✓	✓	Liner(s) required.
Roll-off Bins	✓		✓		Require impermeable liner and cover.
Mud Tanks	✓	✓	✓	✓	500 gallon - 500 bbls
Frac Tanks	✓	✓	✓	✓	Portable, can be deployed anywhere.

APPENDIX E:
WILDLIFE CAPTURE, TREATMENT AND RELEASE PROGRAMS
BEAUFORT SEA OIL SPILL RESPONSE PLANNING

Wildlife Capture, Treatment and Release Programs Beaufort Sea Oil Spill Response Planning

November 2006

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Attachments

1.0 EXECUTIVE SUMMARY

Wildlife Permits for Secondary and Tertiary Response:

- Develop a wildlife assessment (affected species, concentrations relative to spill)
- Prepare a plan of operations for protection, hazing, capture, or treatment
- Complete State and Federal permit applications
- Mobilize qualified wildlife response contractors

Resources to develop agency acceptable wildlife response plans, listed in order of preference (Specific contractors are identified in Table 1):

- Local resident possessing traditional knowledge
    - Whaling Captains and crews
    - Alaska Eskimo Whaling Commission (AEWC)
    - Village Elders and Leaders
    - Marine Mammal Observers (MMO)
    - Subsistence Advisors
- Trained Biologists with permit experience
    - ASRC Energy Services, Lynx Enterprises, Inc. (AES Lynx) Personnel
    - Other subcontractor support (ABR, LGL)
- Alaska Clean Seas (ACS)
    - ACS Permits for Birds and Terrestrial Mammals (Tactic W-1)
    - Master Service Agreement with International Bird Rescue and Rehabilitation Center (IBRRC)
    - ACS Mobile Wildlife Stabilization Center
- Wildlife Response Contractors
    - International Bird Rescue and Rehabilitation Center (IBRRC)
        - Their network of subcontractors
    - Medical Support Personnel
- Agency Personnel
    - NSB Department of Wildlife Management
    - Alaska Department of Fish and Game
    - U.S. Fish and Wildlife Service
    - U.S. National Marine Fisheries Service

Table 1
Wildlife Response Contractors

	Potential Contractors Wildlife Response Contractors					
Species	**Observe and/or Identify**	**Develop Wildlife Assessment**	**Haze**	**Collect and Hold**	**Treat**	**Carcass Collection[4]**
Migratory Birds	AES Lynx[1] ABR[6] , LGL[6]	AES Lynx[1] ABR[6] , LGL[6]	ACS AES Lynx [1]IBRRC	IBRRC[2,3,4]	IBRRC[2]	AES Lynx ACS
Walrus and Polar Bears	AES Lynx[1]	AES Lynx[1]	ACS[4] AES Lynx[1] IBRRC	IBRRC[2,3,4]	IBRRC[5]	AES Lynx ACS
Whales, Porpoises, Seals and Sea Lions	AES Lynx[1]	AES Lynx[1]	ACS[4] AES Lynx[1] IBRRC	IBRRC[2,3,4]	IBRRC[5]	AES Lynx ACS
Terrestrial Mammals	AES Lynx[1] ABR[6] , LGL[6]	AES Lynx[1] ABR[6] , LGL[6]	ACS[4] AES Lynx[1] IBRRC	IBRRC[2,3,4]	IBRRC[5]	AES Lynx ACS
Endangered Species*	AES Lynx[1] ABR[6] , LGL[6]	AES Lynx[1] ABR[6] , LGL[6]	ACS[4] AES Lynx[1] IBRRC	IBRRC[2,3,4]	IBRRC	AES Lynx ACS

Notes:
1. The capability is available through AES Lynx, however, it requires enhancement to be response-ready. AES Lynx would contract for directly local hire directly or through other North Slope based corporations.
2. IBRRC is available through the ACS Master Services Agreement.
3. IBRRC would likely contract or sub-contract local experts or residents.
4. Village Response Teams are available through ACS Master Service Agreements to fill these roles.
5. This response action is likely restricted to young animals.
6. The capability of this contractor to perform these duties is assumed through other experience, not necessarily oil spill response.

*Endangered and threatened species are listed in Appendices 2 through 4 of the Alaska Regional Response Team (ARRT) Wildlife Protection Guidelines. Check at the time of the spill for current listing.

ACS = Alaska Clean Seas
AES Lynx = ASRC Energy Services, Lynx Enterprises, Inc.
ABR = ABR Inc. Environmental Research & Services
IBRRC = International Bird Rescue and Rehabilitation Center
LGL = LGL Limited

2.0 BACKGROUND INFORMATION

Marine mammal spill response options in the Arctic Ocean remain limited due to federal prohibitions and the practicality of capturing large animals for treatment. The Exxon Valdez incident provided the impetus for the development of a successful bird and sea otter capture and treatment program in the State of Alaska. Regulatory agencies have promoted a strong bird capture and treatment capability for North Slope operators.

Concerns over potential affects of drilling activities in the Beaufort Sea have lead to the seasonal drilling mitigation measures and restrictions in lease stipulations issued by the State of Alaska Division of Oil and Gas and the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)~~Minerals Management Service (MMS)~~. BOEMRE ~~MMS~~ leases require lessees to enter into Conflict Avoidance Agreements with the AEWC before exploring for oil offshore. This includes the use of MMO during the seismic and drilling phases of an operation to address subsistence and whale harvest protection mitigation measures. The expectation of the AEWC is that the state stipulations along with the Conflict Avoidance Agreements required by the BOEMRE~~MMS~~ would impose drilling restrictions during whale migration at varying times anywhere between June 1 and October 31, depending on the drilling location.

In recent years the focus has been to incorporate wildlife protection measures into facility design, implement wildlife monitoring and conflict avoidance programs, and develop response plans to contain and control oil spills at the source, thereby preventing the spread of oil and direct impacts to habitats and wildlife.

Response options such as hazing are available and can be effective for birds and certain terrestrial mammals. However, hazing large marine mammals is difficult and success has been mixed. Depending upon the species, wildlife conditioned to the human activity may not respond to hazing and the risk of oiling may be a lesser concern than the consequences of hazing, such as when seals abandon their pups. Due to these considerations, capture, treatment and rehabilitation need to be credible and sensitive to local concerns and knowledge.

Facilities exist in the State of Alaska to capture and stabilize oiled birds and marine mammals. On the North Slope, ACS maintains a Mobile Wildlife Stabilization Center and maintains a service agreement with the IBRRC.

3.0 PERMITS AND INFORMATION REQUIREMENTS

The permits required to are based on the jurisdiction and resource protection interests of each agency. See the attachment for a brief description of these responsibilities and interests. Each permit can be applied for during the response to the Unified Command, using the checklists and permit applications provided in Annex G of the Unified Plan. A copy of these applications and checklists has been enclosed.

The permit applications were developed by the ARRT for use by responsible parties during a spill event, if needed. The ARRT serves as a regional body for federal and state agencies to coordinate planning and preparedness activities in support of response operations for pollution incidents. For a detailed description of wildlife response planning requirements and options in Alaska, refer to the 176 pages of "Annex G – Wildlife Protection Guidelines" to the "Unified Plan" for the State of Alaska, located at the Alaska Regional Response Team's website: http://www.akrrt.org/UnifiedPlan/index.shtml.

The Unified Command requires the following types of information to process the request: potentially affected species, estimated distribution, habitat types, spill trajectory, and hazing or treatment options. Qualified individuals to generate a "Wildlife Assessment" can be provided by the responsible party (RP) and/or agency personnel, at the discretion of the Federal on Scene Commander (FOSC).

The Wildlife Assessment is best performed by biological specialists and locals with traditional knowledge of the species affected, such as subsistence hunters. Federal agencies actively promote the involvement of local knowledge to come up with alternatives for wildlife rescue and protection. For example, Barrow residents played a major role in the planning for the rescue the grey whales in 1988.

The following table is taken from the ACS Technical Manual, Tactic W-1 and summarizes permits required for hazing, capture, and holding of live animals.

Table 2
State and Federal Permits and/or Authorizations Required for Hazing, Collecting, or Holding Live Animals

Species	Alaska Department of Fish and Game		U.S. Fish and Wildlife Service		National Marine Fisheries Service	
	Collect and Hold	Haze	Collect and Hold	Haze	Collect and Hold	Haze
Migratory Birds	No	Yes	Yes	No	No	No
Sea Otters, Walrus and Polar Bears	No	No	Yes	Yes	No	No
Whales, Porpoises, Seals and Sea Lions	No	No	No	No	Yes	Yes
Terrestrial Mammals	Yes	Yes	No	No	No	No
Endangered Species*	Yes	Yes	Yes	Yes	No	No

Source: App. 16 of the ARRT Wildlife Protection Guidelines, Alaska Unified Plan
*Endangered and threatened species are listed in Appendices 2 through 4 of the ARRT Wildlife Protection Guidelines. Check at the time of the spill for current listing.

4.0 ARCTIC OCEAN CONSIDERATIONS

Species identification is crucial to developing the wildlife assessment and response plans. The following species, separated into birds and mammals, are those likely to be encountered in the Arctic operating area:

4.1 MIGRATORY BIRDS

The major group to which each species belongs is indicated as follows: waterfowl (WF), seabird (SE), and other diving bird (DB), shorebird (SH), raptor (RA), and upland bird (UB). Also indicated are endangered species (ES), threatened species (TS), and those of special management concern (SMC) to the Alaska Department of Fish and Game (ADF&G). Species of SMC are generally defined as species established as a priority for study and management by public agencies to prevent their populations from declining to a level warranting a listing action under the Endangered Species Act.

Table 3
Migratory Birds

Species of Concern	Population Density Code	Species of Concern	Population Density Code
Loons (DB)	P/S	Scoter (WF)	U/S
Grebes (DB)	A	Mallard (WF)	R/S
Tundra Swans (WF)	P/S	Bald Eagles (RA)	A
Greater White-fronted Goose (WF)	P/S	Osprey (RA)(SMC)	A
Snow Goose (WF)	P/S	Arctic Peregrine Falcon (RA)	P
Emperor Goose (WF)	R/S	Snowy Owl (RA)	U/S
Black Brant (WF)	P/S	Sandhill Crane (SH)	U/S
Canada Geese (WF)	P/S	Wandering Tattler (SH)	A
Oldsquaw (WF)	P/S	Bristle-thighed Curlew (SH)(SMC)	R
Greater Scaup (WF)	U/S	American Golden Plover (SH)	P
Red-breasted Merganser (WF)	R/S	Semipalmated Plover (SH)	U
Northern Pintail (WF)	P/S	Aleutian Tern (SE)	A
Bufflehead (WF)	A	Arctic Tern (SE)	U
Goldeneye (WF)	A	Gulls (SE)	P/S
Canvasback (WF)	A	Murres (SE)	P/S
Northern Shoveler (WF)	R	Guillemots (SE)	U
Spectacled Eider (WF)(TS)	U/S	Murrelets (SE)	R
Steller's Eider (WF)(TS)	U/S	Kittlitz's Murrelet (SE)(SMC)	R
King Eider (WF)	P/S	Puffins (SE)	R
Common Eider (WF)	P/S	Northern Fulmar (SE)	R
Harlequin Duck (WF)(SMC)	R	Black-legged Kittiwake (SE)	P

Table 3
Migratory Birds

Species of Concern	Population Density Code	Species of Concern	Population Density Code
American Widgeon (WF)	U/S	Cormorants (SE)	R
Green-winged Teal (WF)	U/S	Ptarmigan (UB)	P/S
Wandering Tattler (SH)	A	Northern Shoveler (WF)	R
Bristle-thighed Curlew (SH)(SMC)	R	Spectacled Eider (WF)(TS)	U/S
American Golden Plover (SH)	P	Steller's Eider (WF)(TS)	U/S
Semipalmated Plover (SH)	U	King Eider (WF)	P/S
Aleutian Tern (SE)	A	Common Eider (WF)	P/S
Arctic Tern (SE)	U	Harlequin Duck (WF)(SMC)	R
Gulls (SE)	P/S	American Widgeon (WF)	U/S
Murres (SE)	P/S	Green-winged Teal (WF)	U/S
Guillemots (SE)	U	Scoter (WF)	U/S
Murrelets (SE)	R	Mallard (WF)	R/S
Kittlitz's Murrelet (SE)(SMC)	R	Bald Eagles (RA)	A
Puffins (SE)	R	Osprey (RA)(SMC)	A
Northern Fulmar (SE)	R	Arctic Peregrine Falcon (RA)	P
Black-legged Kittiwake (SE)	P	Snowy Owl (RA)	U/S
Cormorants (SE)	R	Sandhill Crane (SH)	U/S
Ptarmigan (UB)	P/S		

P = Present U = Uncommon R = Rare A = Casual/Accidental O = Pelagic (well offshore) S = Subsistence Species

4.2 MARINE MAMMALS

Table 4
Marine Mammals

Species of Concern	Population Density Code	Species of Concern	Population Density Code
Polar Bear (FWS)	P/S	Beluga Whale (NMFS)(SMC)	P/S
Ringed Seal (NMFS)	P/S	Brown Bear	P/S/SMC
Spotted Seal (NMFS)	P/S	Black Bear	P/S
Bearded Seal (NMFS)	P/S	Caribou/Reindeer	P/S
Pacific Walrus (FWS)	P/S	Moose	P/S
Ribbon Seal (NMFS)	P(pack ice)/S	Muskoxen	P/S/SMC
Bowhead Whale (NMFS)(ES)	P/S	Dall Sheep	P/S
Gray Whale (NMFS)	P	Wolf	P/S
Minke Whale (NMFS)	U	Arctic Fox	P/S
Aquatic Furbearers	P/S	Red Fox	P/S
Harbor Porpoise (NMFS)	P/S	Killer Whale (NMFS)	P

P = Present U = Uncommon R = Rare O = Pelagic (well offshore) S = Subsistence Species TS = Threatened Species ES = Endangered Species SMC = Special Management Concern

ATTACHMENT 1
AGENCY JURISDICTION/RESPONSIBILITIES

Under federal statutes, the National Marine Fisheries Service (NMFS, as an agency of the U.S. Department of Commerce (DOC)) has responsibility for managing and protecting all cetaceans and pinnipeds, except walruses. The Fish and Wildlife Service (FWS, as an agency of the U.S. Department of the Interior (DOI)) has responsibility for managing and protecting migratory birds, walruses, sea otters, and polar bears.

FWS has joint statutory responsibility with ADF&G for management of wildlife on all federal lands in Alaska (i.e., national park system units, national wildlife refuges, national forest system lands, military reservations, and other DOI- and federally-managed public lands).

DOC, through NMFS, is responsible for the administration of the Endangered Species Act as it applies to certain cetaceans (whales and porpoises) and pinnipeds (seals, sea lions, etc.) in Alaska. These include most species of whales and the northern (Steller) sea lion. DOI, through FWS, is responsible for the administration of the Endangered Species Act as it applies to remaining marine mammals and terrestrial mammal and bird species in Alaska. These species found in Alaska are as follows:

- Beluga Whales
- Bowhead Whales
- Humpback Whales
- Gray Whales
- Killer Whales (Orcas)
- Minke Whales
- Northern Right Whales

The Marine Mammal Protection Act (MMPA) of 1972 gave NMFS responsibility for the management and conservation of all but three species of marine mammals in Alaska. The USFWS, Region 7, Alaska, Marine Mammals Management Office is responsible for management of the three Alaska species: polar bears, sea otters, and Pacific walrus.

The hyperlink connects to the following resources:

- Wildlife Hazing, Capture and Treatment Facilities
- Oil Spill Hazing and Treatment Application Forms

Hyperlink: Facilities and Permit Applications.pdf

APPENDIX F:
PRODUCT SPECIFICATION FOR LOW SULFUR DIESEL FUEL OIL

MARKETING AND SUPPLY SALES SPECIFICATION
LOW SULPHUR DIESEL LIGHT

Effective: June 1, 2006
Location: Western Canada.

PARAMETER	MIN	MAX	TEST METHOD
Appearance	Clear and Bright		Visual
Ash, % mass		.010	ASTM D482
Colour	Report		ASTM D156, D1500
Distillation - 10% Recovered, °C		215.0	ASTM D86
Distillation - 90% Recovered, °C		290.0	ASTM D86
Density, kg/M3		850	ASTM D1298, D4052
Cetane Number	40.0		ASTM D613
Corrosion - Copper - 3 hrs @ 50°C		No. 1	ASTM D130
Electrical Conductivity, pS/m September 01 - April 15 @ 20°C April 16 - August 31@ 20°C	 200 (1) 100 (1)		ASTM D2624
Flash°C	40.0 (2)		ASTM D93, D3828
Lubricity	Meets Requirements		CAN/CGSB 3.517 Para 6.22
Mercaptan Sulphur, ppm		120	ASTM D3227
Micro Carbon Residue - 10 % Btms, % mass		0.10	ASTM D4530
Operability, °C	See Table A		ASTM D2500, D5773, CGSB 140.1
Pour Point, °C	Report		ASTM D97, D5949
Sulphur, mg/kg Up to Aug 31st, 2006 September 1, 2006		 500(3) 15(4)	ASTM D5453, D7039
Total Acid Number, mg/KOH/g		0.10	ASTM D974
Viscosity @ 40°C, cSt	1.30	3.00	ASTM D445
Water and Sediment, % vol		0.05	ASTM D1796(mod), D2709

TABLE A
CLOUD SCHEDULE (°C)

Terminal	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Vancouver	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34
Nanaimo	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34
Victoria	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34	-34
Kamloops	-37	-37	-34	-34	-34	-34	-34	-34	-34	-34	-34	-37
Prince George	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43
Terrace	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43
Calgary	-37	-37	-34	-34	-34	-34	-34	-34	-34	-34	-34	-37
Edmonton	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43
Regina	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43
Saskatoon	-43	-43	-34	-34	-34	-34	-34	-34	-34	-34	-43	-43
Winnipeg.	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43	-43
Hay River- Truck	-45	-44	-43	-43	-43	-43	-43	-43	-43	-43	-43	-45
Hay River-Marine	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48
Whitehorse	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48

Notes: (1) The fuel's minimum electrical conductivity shall apply at the shipping terminal.
(2) The fuel's minimum flash point shall be 43°C at the shipping terminal.
(3) The maximum sulphur will be 8 mg/kg at the refinery flange into pipeline, and 10 mg/kg into refinery connect rail & truck rack. Terminal storage will be converted to 12 mg/kg or less during the transition period of June through August.
(4) The maximum sulphur at the refinery "flange" will be 8 mg/kg into pipeline, and 10 mg/kg maximum into refinery connect rail or truck rack.

Meets: Automotive Low Sulphur Diesel Fuel, CAN/CGSB 3.517-2000 Type A-LS,
Regular Sulphur Diesel, CAN/CGSB-3.6-2000 Type A