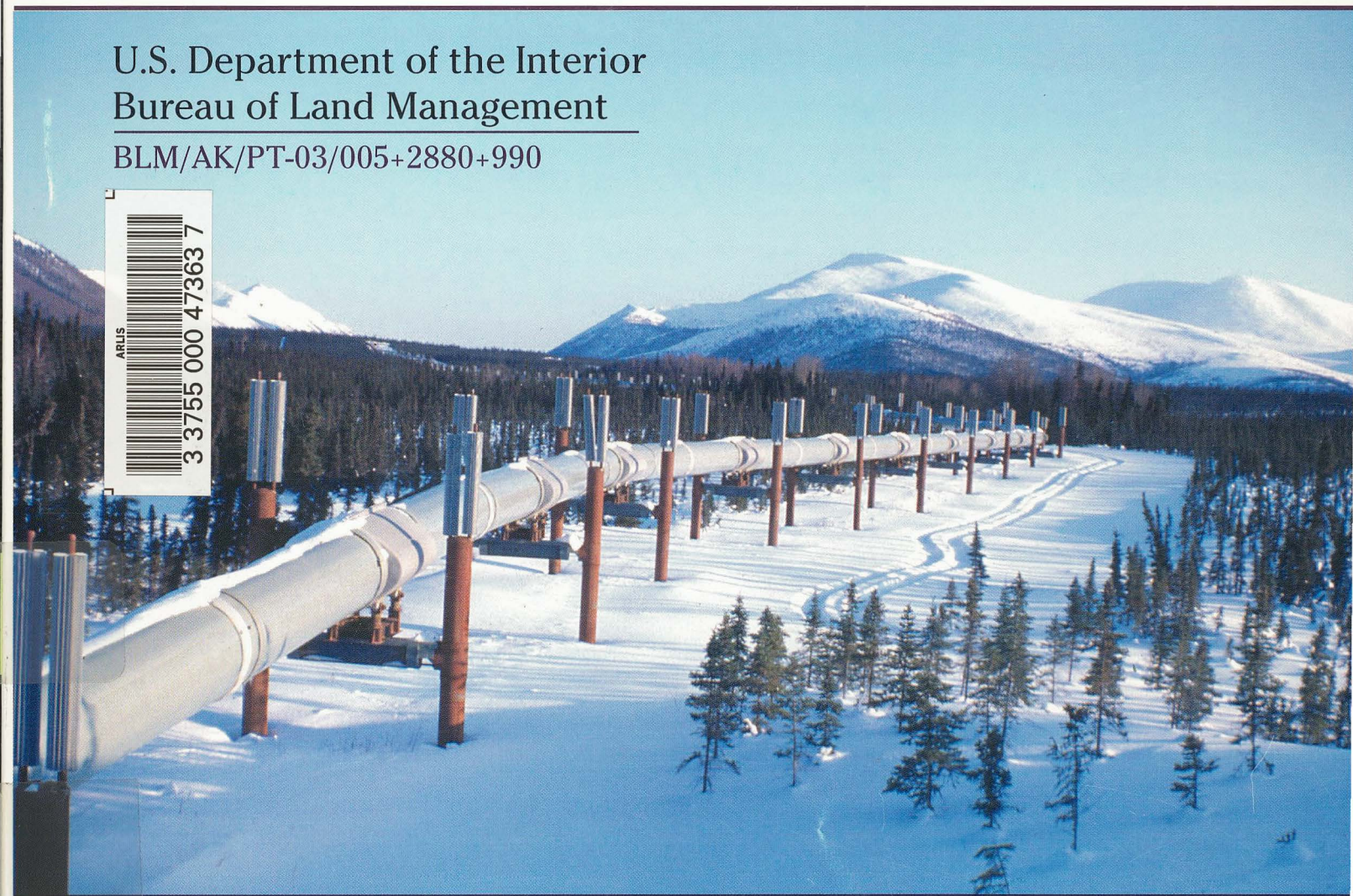


Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way

November 2002

U.S. Department of the Interior
Bureau of Land Management

BLM/AK/PT-03/005+2880+990



Volume 5: Appendixes A through H

BLM/AK/PT-03/005+2880+990

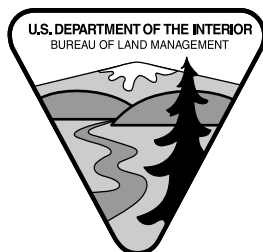
Final Environmental Impact Statement

Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way

Volume 5: Appendixes A through H

U.S. Department of the Interior
Bureau of Land Management

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Notation

The following is a list of acronyms and abbreviations (including units of measure) used in this document. Certain abbreviations used only in tables, equations, and as reference callouts are not included here but are defined in the respective tables, equations, and reference lists.

Acronyms and Abbreviations

AAQAS	Alaska Ambient Air Quality Standards
AAC	Alaska Administrative Code
AADT	annual average daily traffic
ACEC	area of critical environmental concern
ACM	asbestos-containing material
ACMA	Alaska Coastal Management Act
ACMP	Alaska Coastal Management Program
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADGC	Alaska Department of Government Coordination
ADNR	Alaska Department of Natural Resources
ADPS	Alaska Department of Public Safety
ADT	average daily traffic
AFB	Air Force Base
AFFF	aqueous film-forming foam
AFN	Alaska Federation of Natives
AK	Alaska
AKOSH	Alaska Occupational Safety and Health
ALOHA	Areal Locations of Hazardous Atmospheres
AMHS	Alaska Marine Highway System
AMM	asset maintenance management
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ANSI	American National Standards Institute
ANUA	Alaska Native Utilization Agreement
ANWR	Arctic National Wildlife Refuge
AO	Authorized Officer (Joint Pipeline Office)
AOGCC	Alaska Oil and Gas Conservation Commission
APHIS	Animal and Plant Health Inspection Service
API	American Petroleum Institute
APSC	Alyeska Pipeline Service Company
AQCR	Air Quality Control Region
AQRV	air-quality-related value
ARCO	Atlantic Richfield Company
ARRC	Alaska Railroad Corporation
ARRT	Alaska Regional Response Team
AS	Alaska Statute
ASME	American Society of Mechanical Engineers
ATV	all-terrain vehicle
BE	biological evaluation
BLM	Bureau of Land Management (U.S. Department of the Interior)

BLS	Bureau of Labor Statistics
BMP	best management practice
BOD	biochemical oxygen demand
BOD ₅	biochemical oxygen demand measured over a five-day period
BP	British Petroleum
BPXA	British Petroleum Exploration (Alaska), Inc.
BS&W	basic sediments and water
BTEX	benzene, toluene, ethylbenzene, xylene
BTT	biological treatment tank
BWT	ballast water treatment
BWTF	Ballast Water Treatment Facility
BWTS	ballast water treatment system
CBR	Constitutional Budget Reserve
CBRF	Constitutional Budget Reserve Fund
CCP	Central Processing Plant
CDMS	Corrosion Data Management System
CEO	chief executive officer
CEQ	Council on Environmental Quality
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
Cir.	Circuit Court
CMP	Coastal Management Program
	or
	Comprehensive Monitoring Program
CNG	compressed natural gas
CO	carbon monoxide
CO ₂	carbon dioxide
CP	Contingency Plan
CPF	Central Production Facility
CPlan	Contingency Plan
CS	containment site
CSU	conservation system unit
CY	calendar year
CZ	coastal zone
CZM	coastal zone management
CZMA	Coastal Zone Management Act
DAF	dissolved air flotation
DBGC	designated big-game crossing
DCE	design contingency earthquake
DDT	dichloro-diphenyl-trichloro-ethane
DEIS	draft environmental impact statement
DHCMA	Dalton Highway Corridor Management Area
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOT	U.S. Department of Transportation
DOT/OPS	U.S. Department of Transportation, Office of Pipeline Safety
DRA	drag reducing agent
DRO	diesel-range organics
DS	drill site
DSMA	digital strong-motion accelerograph

EIA	Energy Information Administration
EFH	essential fish habitat
e.g.	exempli gratia (for example)
EGHP	exhaust-gas horsepower
EIA	Energy Information Administration
EIS	environmental impact statement
EMS	environmental monitoring system
	or
	earthquake monitoring system
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ER	environmental report
ERPG	emergency response planning guideline
ESA	Endangered Species Act
et al.	and others
ETT	enhanced tractor tug
FAA	Federal Aviation Administration
FACA	Federal Advisory Committee Act
FDA	U.S. Food and Drug Administration
FDS	Fire Dynamics Simulation (computer model)
Fe	iron
Fe ₂ O ₃	ferric oxide
FEIS	final environmental impact statement
FEOC	Fairbanks Emergency Operations Center
FLIR	forward looking infrared
FOSC	Federal On-Scene Coordinator
FR	Federal Register
FSIH	Fire Safety and Industrial Hygiene
FTE	full-time equivalent
GAO	General Accounting Office
GC	Gathering Center
GHG	greenhouse gas
GIS	geographic information system
GMU	Game Management Unit
GNOME	General NOAA Oil Modeling Environment
GRO	gasoline-range organics
GSP	gross state product
H ₂ O ₂	hydrogen peroxide
H ₂ S	hydrogen sulfide
HAP	hazardous air pollutant
HAZCORE	Hazardous Materials Consolidation and Redistribution
HAZMAT	hazardous material
HAZWOPER	hazardous waste operations
HC	hydrocarbon
HCFC	hydrochlorofluorocarbon
HCl	hydrogen chloride
Hg	mercury
HRR	heat release rate
HVAC	heating, ventilation, and air conditioning

ICS	Incident Command System
i.e.	that is (id est)
IMPROVE	Interagency Monitoring of Protected Visual Environments
IRIS	Integrated Risk Information System
IRT	Initial Response Team
ISC3	Industrial Source Complex Model (Version 3)
ISCST	Industrial Source Complex Short Term
IWSS	industrial wastewater sewer system
JPO	Joint Pipeline Office
L _{dn}	day-night average sound level
L _{eq}	equivalent steady sound level
LEFM	leading-edge flow meter
LNG	liquefied natural gas
LVB	line volume balance
MAP	Man in the Arctic Program
MCCF	mobile contingency camp facility
MCL	maximum contaminant level
MEI	maximally exposed individual
MEK	methyl ethyl ketone
MGV	manual gate valve
MLA	Mineral Leasing Act
MLR	Mainline Refrigeration
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MP	milepost
MSDS	Material Safety Data Sheets
MSFCMA	Magnuson-Stevens Fisheries Conservation and Management Act
MSGP	Multi-Sector General (NPDES) Permit
MSWLF	municipal solid waste landfill
N	nitrogen
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAICS	North American Industry Classification System
NANA	Northwest Alaska Native Association
NEPA	National Environmental Policy Act
NF	National Forest
NFRAP	no further remedial action planned
NGL	natural gas liquid
NH ₃	ammonia
NHPA	National Historic Preservation Act
NMDS	National Missile Defense System
NMFS	National Marine Fisheries Service
no.	number
NO _x	nitrogen oxides
NO ₂	nitrogen dioxide
NO ₃ ⁻	nitrate
NOA	Notice of Availability

NOAA	National Oceanic and Atmospheric Administration
NOD	Notice of Disposal
NOI	Notice of Intent
NORM	naturally occurring radioactive material
NP	national park
NPDES	National Pollutant Discharge Elimination System
NPP	national park and preserve
NPR	National Petroleum Reserve
NPR-A	National Petroleum Reserve-Alaska
NPS	National Park Service
NRA	national recreation area
NRHP	National Register of Historic Places
NS	North Slope
NSB	North Slope Borough
NSC	National Safety Council
NSPTS	North Slope Production and Transportation System
NTP	Notice to Proceed
NWR	national wildlife refuge
NWS	National Weather Service
O ₃	ozone
O&M	operation and maintenance
OCC	Operations Control Center
OCS	Outer Continental Shelf
ODC	ozone-depleting chemical
ODP	ozone-depleting potential
ODS	ozone-depleting substance
OMB	Office of Management and Budget
OMS	operational material site
OPA	Oil Pollution Act
OPS	Office of Pipeline Safety (U.S. Department of Transportation)
ORC	oxygen-releasing compound
ORV	off-road vehicle
OSHA	Occupational Safety and Health Administration
OSHTF	(Alaska) Oil Spill Health Task Force
OSPFR	Oil Spill Prevention, Preparedness, and Response
OSV	oil spill volume
P	phosphorus
PA	Programmatic Agreement
PAH	polycyclic aromatic hydrocarbon
PAI	Phillips Alaska, Inc.
Pb	lead
PBT	persistent, bioaccumulative, and toxic
PCB	polychlorinated biphenyl
PDF	pipeline design flood
PELs	permissible exposure limits
PF	Permanent Fund
PG	Pasquill-Gifford
pH	hydrogen ion concentration
P.L.	Public Law
PM	particulate matter
PM _{2.5}	particulate matter with a diameter less than or equal to 2.5 micrometers
PM ₁₀	particulate matter with a diameter less than or equal to 10 micrometers

PMP	probable maximum precipitation
PO ₄ ³⁻	phosphate
POP	persistent organic pollutant
POTW	publicly owned treatment works
PPE	personal protective equipment
PPV	peak particle velocity
PRT	prevention and response tug
PS	pump station
PSD	Prevention of Significant Deterioration
PWS	Prince William Sound
QA	quality assurance
RAC	Resource Advisory Council
RCAC	Regional Citizens' Advisory Council
RCM	reliability-centered maintenance
RCRA	Resource Conservation and Recovery Act
REAA	Regional Educational Attendance Area
RGV	remote gate valve
RMP	Resource Management Plan
ROD	Record of Decision
ROS	recreation opportunity spectrum
ROW	right-of-way
RRO	residual-range organics
RSC	reduced sulfur compounds
SARA	Superfund Amendments and Reauthorization Act
SCADA	supervisory control and data acquisition
SD	standard deviation
SDWA	Safe Drinking Water Act
SERVS	Ship Escort/Response Vessel System
SHPO	State Historic Preservation Officer
Si	silicon
SIC	Standard Industrial Classification
SIP	state implementation plan
SO ₂	sulfur dioxide
SOSC	State On-Scene Coordinator
SO _x	sulfur oxides
SPC	State Pipeline Coordinator
spp.	species
SRS	state recreation site
Stat.	statute
SWDS	solid waste disposal site
SWPPP	Storm Water Pollution Prevention Plan
SWTP	sanitary waste treatment plant
TAPAA	Trans-Alaska Pipeline Authorization Act
TAPS	Trans-Alaska Pipeline System
TAGS	Trans-Alaska Gas System
TCA	1,1,1-trichloroethane
TCC	Tanana Chiefs Conference
TCP	traditional cultural property
TEEL	temporary emergency exposure limit
TEF	toxic equivalency factor

TFE	tetrafluoroethylene
TLV	threshold limit value
TPQs	Threshold Planning Quantities
TRI	Toxics Release Inventory
TSDF	treatment storage and disposal facility
TSP	total suspended particulates
TSS	total suspended solids
TVB	transient volume balance
TVR	tanker vapor recovery
UAA	University of Alaska-Anchorage
UC	Unified Command
UIC	underground injection control
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	ultraviolet
VAHS	Valdez Air Health Study
VHF	very high frequency
VHS	viral hemorrhagic septicemia
VMT	Valdez Marine Terminal
VOC	volatile organic compound
VRM	visual resource management
VSM	vertical support member
VTs	Vessel Traffic Service
WSR	Wild and Scenic River
ZRAs	Zone of Restricted Activities

Units of Measure

acre-ft	acre-foot (feet)	GW	gigawatt(s)
bbl	barrel(s)	h	hour(s)
Btu	British thermal unit(s)	ha	hectare(s)
°C	degree(s) centigrade	hp	horsepower
cm	centimeter(s)	in.	inch(es)
cm ³	cubic centimeter(s)	in. ²	square inch(es)
cSt	centistoke(s)	j	joule(s)
d	day(s)	K	kelvin degree(s)
dB	decibel(s)	kg	kilogram(s)
dBA	A-weighted decibel(s)	km	kilometer(s)
°F	degree(s) Fahrenheit	km ²	square kilometer(s)
ft	foot (feet)	knot(s)	nautical mile(s) per hour
ft ²	square foot (feet)	kW	kilowatt(s)
ft ³	cubic foot (feet)	L	liter(s)
g	gravitational acceleration	lb	pound(s)
gal	gallon(s)	m	meter(s)

m ²	square meter(s)	psig	pound(s) per square inch gauge
m ³	cubic meter(s)	rpm	revolution(s) per minute
mg	milligram(s)	s	second(s)
mi	mile(s)	scf	standard cubic foot (feet)
mi ²	square mile(s)	scfm	standard cubic foot (feet) per minute
min	minute(s)	wk	week(s)
mL	milliliter(s)	YA	year(s) ago
mm	millimeter(s)	yd	yard(s)
mmole	millimole(s)	yd ³	cubic yard(s)
mph	mile(s) per hour	yr	year(s)
MW	megawatt(s)	μg	microgram(s)
MYA	million year(s) ago	μg-atoms	microgram-atom(s)
ng	nanogram(s)	μm	micrometer(s)
pCi	picocurie(s)	μmoles	micromole(s)
ppb	part(s) per billion	μR	microroentgen(s)
ppm	part(s) per million	\$/bbl	dollar(s) per barrel
psi	pound(s) per square inch		

Appendix A: Methodology Descriptions

Appendix A: Methodology Descriptions

A.1 Introduction

This appendix describes the methodologies used to analyze the environmental consequences of implementing any of the alternatives presented in the environmental impact statement (EIS). The alternatives are to renew the Federal Grant of right-of-way (ROW) for the Trans-Alaska Pipeline System (TAPS) for a period of 30 years (proposed action), to renew the Federal Grant for a period of less than 30 years, or to not renew the Federal Grant (no action).

The methodologies used in the assessment of the proposed action and alternatives are presented by impact area (Sections A.2-A.15) in the order that they are discussed in the main body of this FEIS. The method used for the cumulative analysis is presented separately in Section A.16. Major assumptions specific to individual methodologies are discussed under individual impact areas; however, several assumptions apply for all methodologies and are presented below:

- Current (2001/2002) conditions of the TAPS define the base case for the analyses.
- Monitoring, maintenance, and repair of the TAPS would continue for the proposed action.
- The TAPS would operate in compliance with all applicable regulations for the proposed action.
- Operations at the Valdez Marine Terminal are treated as part of the proposed action.
- The North Slope and Prince William Sound activities are analyzed separately in the FEIS as part of the cumulative impacts (see Section A.16).
- Levels of activities that correspond to crude oil throughput of 2.1 million barrels per day (bbl/d) (design capacity), 1.1 million bbl/d (base case), and 0.3 million bbl/d

(economically feasible minimum) are assumed to provide a range of reasonable operational scenarios for assessing the impact of the proposed action.

- The no-action alternative addresses removal of all aboveground components of the TAPS; belowground components would be cleaned and capped. One exception would be the removal of belowground components at river training structures.
- No new facilities would be constructed for dismantling and removing the TAPS (current pump stations, workpads, and staging areas would be used).
- Under the no-action alternative, gravel pads and disturbed surface soils would be left in place and revegetated according to accepted restoration practices.
- The impacts of such restoration activities are discussed under no action.

A.2 Physical Environment: Geology, Seismicity, Soils, Permafrost, and Hydrological Resources

From an environmental perspective, renewal of the TAPS ROW Federal Grant could produce direct, indirect, and cumulative impacts on the physical environment. Similarly, the environment could impact the TAPS.

Normal operations, routine maintenance, system upgrades, and accidents over the next 30 years are impacting factors for the physical environment under the proposed action. Under the no-action alternative, impacting factors of the TAPS on the environment include dismantling the pipeline system, removing the dismantled

system, accidents, and restoration activities. The impacting factors under the proposed action, less-than-30-year renewal alternative, and no-action alternative could:

- Modify rivers and streams by erosion, deposition, migration, and flow restriction;
- Create ponding and flooding along the ROW;
- Drain and create thaw lakes;
- Degrade surface water and groundwater quality;
- Deplete surface water and groundwater resources;
- Spread contamination on land, surface water, and groundwater;
- Disturb permafrost;
- Change the number, size, and connectivity of thermokarsts along the ROW; and
- Remove geologic resources.

Conversely, the physical environment could impact the TAPS under the proposed action, less-than-30-year renewal alternative, and no-action alternative. Impacting factors on the TAPS could include:

- Earthquakes;
- Glacial movements (surges and retreats);
- Solifluction (i.e., a slow-motion debris flow created when a permafrost layer that has reduced cohesive strength because of supersaturation moves slowly downhill);
- Mud flows;
- Climate change; and
- Geologic hazards, such as debris flows, landslides, rock falls, slumps, and floods.

These impacting factors could affect the TAPS by causing physical changes and accidental releases of oil or other materials, which, in turn, could then affect the environment in the ways discussed above.

Effects of the impacting factors on the environment under the proposed action and the less-than-30-year renewal alternative were evaluated by interpolating impacts from existing conditions as a base case, historical ranges of impacts observed from more than 25 years of operation, and mitigation activities that have been implemented. If a potential impact of the proposed action would lie outside the historical range observed, the impact was evaluated by extrapolating historical impacts and their mitigation and using engineering judgment. The potential impacts of the environment on the TAPS were assessed on the basis of existing and historical information and engineering judgment. Impacts were quantified, to the extent possible, by making simplifying assumptions and using analytical expressions, energy balances, and conservation laws (e.g., the total mass in a system is constant).

Under the no-action alternative, the impact of dismantling and removing the TAPS and restoring the ROW was evaluated on the basis of historical impacts of TAPS construction, considering historical mitigation strategies. If necessary, impacts were extrapolated from historical information and engineering judgment to account for impacts outside the range of previous activities.

Data used to evaluate the impacts of geology and seismology on the TAPS were obtained from surface and bedrock maps of the underlying strata along the ROW; historical seismic monitoring information; literature on fault systems crossed by the ROW; and, where possible, aerial photographs of sensitive regions along the ROW.

Information on soil and permafrost was obtained from permafrost surveys, the scientific literature, soil classification guides, proceedings

of polar conferences, maintenance databases, documented historical mitigation activities, site-characterization data for known spill sites, and throughput and accident source terms¹ developed for this analysis by Argonne National Laboratory (Argonne) staff.

Data used to evaluate the hydrological impacts included documentation on river systems crossed by the ROW, U.S. Geological Survey (USGS) databases on river flow, historical information on groundwater well completions, historical data on water uses, National Pollutant Discharge Elimination System (NPDES) permits, and the open literature. Accident source terms (such as spill volumes and release durations) and cumulative source terms (i.e., releases from activities not related to the TAPS that can impact the same resources) were developed by Argonne staff.

Source terms used in the impact analyses for geology, seismology, soils, permafrost, and hydrology were obtained from the Argonne Operations/Risk Analysis Group. Impacts evaluated by the Geology, Seismology, Soils, Permafrost, and Hydrology Group were supplied to the following disciplines for their analyses: Ecology, Human Health, Cultural Resources, Atmospheric Sciences, and Coastal Plain Management. In addition, the Geology, Seismology, Soils, Permafrost, and Hydrology Group supplied information to the Operations/Risk Analysis Group for potential accident scenarios associated with environmental impacts on the TAPS (e.g., earthquakes, glacier movement).

A.3 Paleontology

Methods used in the assessment of paleontological resources focused on evaluating the potential disturbance of plant and animal fossils under the proposed action, the less-than-30-year renewal alternative, and the no-action alternative. Paleontological remains are protected under the Antiquities Act of 1906 (and other laws as indicated in Section 3.6), pending more focused legislation currently in preparation;

as a result, guidance on impact assessment is fairly general. The examination of impacts to paleontological resources ultimately relied on evidence of the existence, density, and nature of fossil deposits in areas that might be disturbed under the alternatives considered. However, the evaluation also considered the quality of available data and the likely condition of paleontological resources. The latter factor was based largely on accumulated ground disturbance from the more than three decades spent constructing and maintaining the TAPS. The region of influence for paleontological resources includes the ROW and any areas affected, or likely to be affected, by TAPS construction or maintenance.

The evaluation of impacts to paleontological resources required specific information on those resources. Critical data included deposit location, assorted information in publications on paleontological resources in the vicinity of the TAPS, data from researchers focusing on the paleontology of Alaska, and information in files maintained by the State Historic Preservation Office, the Bureau of Land Management (BLM), other federal agencies, and the Alyeska Pipeline Service Company (APSC). The analysis used this assortment of information to define where paleontological deposits occur; the age, depth, and spatial extent of each deposit; and the level of disturbance of each locality. It also used available data to understand the likelihood that other paleontological resources occur in particular locations, recognizing the special potential of sedimentary strata for such deposits. Finally, the analysis considered those portions of APSC procedures manuals dealing with paleontological resource protection and monitoring.

The assessment of potential impacts to paleontological resources involved identifying those activities that would result in surface or subsurface disturbance within the region of influence. Activities evaluated included TAPS maintenance efforts that likely would disturb areas containing known paleontological resources or areas likely to contain such resources. Impacts, in turn, were defined as the

¹ The phrase “source terms” refers to the quantities and characteristics of contaminants released to the environment from specific sources or groups of sources.

effect of anticipated activities on intact known paleontological resources. Other potential sources of impacts included the effect of increased accessibility to intact paleontological remains and any effects resulting from spills and spill response-related activities. Of particular concern were any impacts potentially affecting deposits of vertebrate fossils.

Several disciplines provided data relevant to the evaluation of impacts to paleontological resources. Geology and soils analyses provided information on the distribution of geological strata, providing insight both on likely effects of any spill in certain paleontological deposits and on areas with a high potential for undocumented paleontological resources. The hydrological evaluation, in turn, provided information on changing waterways and the potential for erosion that might threaten paleontological deposits. Personnel working on the TAPS maintenance sections of the FEIS described procedures and activities associated with TAPS operation that might disturb known fossil deposits.

A.4 Air Quality and Noise

A.4.1 Air Quality

Assessment of the potential air quality impacts for the proposed action, the less-than-30-year renewal alternative, and the no-action alternative involved a multistep process that included (1) collecting and organizing information on existing air quality and meteorological conditions in the affected environment; (2) identifying and quantifying TAPS-associated air pollutant emissions sources for a range of activities under the proposed action, no action, and the less-than-30-year renewal alternative; (3) identifying and quantifying pollutant emissions from other sources in the affected areas; (4) using computer models to estimate the dispersion of TAPS-related emissions and their contributions to ambient air quality; and (5) comparing results of the modeling to appropriate air quality standards.

Available meteorological data and ambient air quality measurements from instruments along the TAPS ROW were acquired for use in describing the existing environment and as input data in modeling potential air quality impacts resulting from the proposed action and the no-action alternative. Data for meteorological parameters, such as surface data (wind speed and direction, temperature, humidity, precipitation, etc.) and upper-air data were obtained from government agencies (e.g., National Climatic Data Center) and industry sources. Ambient monitored and modeled data for criteria and hazardous air pollutants were obtained from the U.S. Environmental Protection Agency (EPA) and industry sources.

Basic information on emission sources and emission inventory data for the TAPS stationary, mobile, and fugitive pollutant sources that is essential in assessing potential air quality impacts were obtained from such documents as TAPS facility air permit applications submitted to and air permits issued by the Alaska Department of Environmental Conservation (ADEC) and environmental impact studies conducted by industry.

Information on the extent of disturbed land areas and vehicle and heavy equipment usage associated with maintenance and system-upgrade activities was obtained from industry sources. Data on the extent of land area disturbed and vehicle and heavy equipment usage that would be associated with termination activities under the no-action alternative were developed in consultation with industry specialists. Information previously developed for other similar projects was also obtained and used to the extent applicable.

To assess the significance of TAPS emissions relative to overall air quality, information and inventory data for other emissions sources in the areas surrounding TAPS facilities were obtained from regulatory agencies.

In assessing potential air quality impacts, a number of assumptions were necessary because of the limitations of impact assessment models or uncertainties in model input data. In addition to the general assumptions outlined in

Section A.1, the following specific assumptions were made for the air quality impact analysis:

- Assessments of potential impacts were made for (1) areas up to 30 mi from sources for ambient air quality impacts of criteria pollutants, and (2) community boundaries for hazardous air pollutants.
- Assessments of potential impacts on air-quality-related values, such as visibility and acid deposition, were made for sensitive receptors located within about 60 mi of source areas.

The following procedures were used to assess potential air quality impacts resulting from the proposed action and the no-action alternative:

- Confirm or estimate emissions data for criteria and hazardous air pollutants from TAPS facilities and TAPS-related activities by reviewing available data or using available emission factors and activity levels.
- Estimate emission rates of hazardous air pollutants from accidental releases or spills of crude oil, petroleum products, and hazardous materials by using the EPA-recommended procedures for estimating evaporative emissions from mixtures containing toxic liquids and water and solutions of toxic substances (EPA 1999a; IT Alaska 2001).
- Assess the significance of TAPS-related emissions by comparing with emissions from major facilities in adjacent areas.
- Perform air dispersion modeling as needed by using EPA-recommended models, such as the Industrial Source Complex Model (ISC3) (EPA 1995) for short- and long-term continuous emissions and the ISC3 or Areal Locations of Hazardous Atmospheres (ALOHA) Model (EPA et al. 1999) for short-term emissions from accidental releases.
- Compare modeled concentration increments with prevention of significant deterioration (PSD) increments.

- Identify appropriate background concentrations used in air quality impact modeling studies conducted recently for TAPS facility emission sources.
- Add background concentrations to the modeling results and compare resultant concentrations with National or Alaska Ambient Air Quality Standards (NAAQS or AAAQS).
- Assess potential visibility and acid deposition impacts at sensitive receptors by relating recent trends in TAPS emissions to those in available visibility and sensitive lake acidity data at those sensitive receptor locations.

Factors that would determine levels of potential air quality impacts would include the intensity, duration, and frequency of TAPS activities that generate air emissions. These parameters were defined on the basis of available information or were estimated in consultation with industry specialists for normal operations, routine maintenance activities, system upgrade activities, routine security and oil spill surveillance activities, and restoration activities. These data then were used as input for impact modeling and assessments.

Certain basic information and results of impact assessments from other disciplinary areas were needed to conduct air quality impact modeling and assessments. The results from that modeling were in turn needed in conducting impact assessments for certain other disciplinary areas. Information to and from other disciplinary areas for air quality was as follows:

- *Transportation:* Received current and projected traffic volumes (ground, air, and marine);
- *Accidents:* Provided meteorological data;
- *Spills:* Received projected information on potential spills of crude oil, petroleum products, and hazardous materials; and
- *Human health:* Provided air dispersion modeling results for criteria and hazardous air pollutant emissions.

A.4.2 Noise

Intrusive noise can be continuous, intermittent, or impulsive depending on its duration. Continuous or intermittent noise is typically generated by stationary sources, such as boilers and diesel generators, and mobile sources, such as aircraft, vehicles, and construction equipment. Blasting that uses explosives to demolish concrete structures as part of termination activities under the no-action alternative would produce impulsive noise accompanied by ground vibration and airblast overpressure.

The methodology used to assess potential impacts on noise consisted of (1) collecting available information on background and ambient noise measurements and noise studies conducted in the vicinity of TAPS facilities; (2) collecting information on existing noise sources within and around the TAPS facilities as well as on TAPS-related noise sources for the proposed action and the alternatives, (3) determining the locations of potential sensitive receptors, and (4) modeling potential noise impacts for comparison with appropriate noise guidelines.

Procedures used in assessing potential impacts of continuous or intermittent noise were as follows:

- Compilation or estimation of sound-power or sound pressure level of individual noise sources along the TAPS ROW by using the data available in the literature,
- Estimation of the potential noise impacts at TAPS facility site boundaries or nearby sensitive receptors by considering geometric spreading of sound energy through the atmosphere, and
- Assessment of potential noise impacts by comparing resultant noise levels with EPA noise guidelines.

The methodology used to assess potential impacts on ground vibration and airblast overpressure consisted of (1) collecting available information on concrete structures to be demolished at TAPS facilities under the no-action alternative; (2) collecting or estimating information on the charge weight per delay,² charge depth, and frequency and duration of blasting; (3) determining the locations of potential sensitive receptors; and (4) modeling potential impacts on ground vibration and airblast overpressure for comparison with appropriate guidelines.

Procedures used in assessing potential impacts on ground vibration and airblast overpressure were as follows:

- Estimation of the potential impacts on ground vibration at nearby sensitive receptors by using a monograph (Rose 1981) that relates the peak particle velocity (PPV), charge weight per delay, and the distance between the blast and selected receptor. (The PPV or the velocity of ground movement is generally accepted as the best indicator of the potential for structural damage.)
- Assessment of the potential impacts on ground vibration by comparing the resultant PPV with the PPV level of 2.0 in./s, which is generally accepted as safe for poor plaster (DOE 1990).
- Estimation of the potential impacts on airblast overpressure at nearby sensitive receptors by using empirical formulas that allow computation of peak overpressure at a given receptor location for a blast of a given charge weight per delay by correcting the peak overpressure at the reference of 200 ft from 1.0 lb of charge exploded at ground level (Schomer 1973, 1981).

² Blasting is commonly conducted in sequences using delays. Thus, for any given delay, only a portion of the total explosive charge is set off to limit the potential impact to that of the portion rather than the total.

- Assessment of the potential impacts on airblast overpressure by comparing estimated peak overpressure with a conservative upper limit value (0.01 lb/in.²) below which no damage to farm or wild animal was caused (Fletcher and Busnel 1978).

Certain basic information and results of impact assessments from other disciplinary areas were needed to conduct noise impact modeling/estimation and assessments. The results of that modeling/estimation were in turn needed in conducting impact assessments for certain other disciplinary areas. Information to and from other disciplinary areas for noise was as follows:

- *Transportation:* Received current and projected traffic volumes (ground, air, and marine); and
- *Human health:* Provided impact modeling/estimation results for noise, ground vibration, and airblast overpressure.

A.5 Hazardous Materials and Waste Management

Stipulations contained in Part 2 of the Federal Grant require that all operations of the TAPS comply with relevant state and federal laws and regulations. Member agencies of the Joint Pipeline Office (JPO) have the necessary authority to interpret and apply those requirements to TAPS operations, in part through the issuance of operating permits, site licenses, or other enforceable instruments. Operating permits routinely require the collection, maintenance, and, in some cases, submission of data to demonstrate the facility's compliance with permit stipulations. These compliance-related data are valuable indicators of both the nature and dimensions of environmental impacts related to TAPS waste generation and management, and, when relevant, have been used in assessing impacts of the proposed action and the alternatives.

The APSC corporate strategy for compliance with all applicable environmental regulations,

permit requirements, and Federal Grant stipulations is to establish and maintain a comprehensive environmental management system that provides explicit guidance for satisfaction of each applicable requirement. The environmental management system comprises a number of "business models," each of which establishes strategic objectives, assigns roles and responsibilities, and defines performance indicators for a specific area of interest. Models with relevance for hazardous materials and waste include water quality, waste management, environment response and remediation, hazardous materials management, field activities, and records and documentation.

In most instances, the business models direct the development of standard operating procedures to, among other objectives, ensure compliance with applicable standards. Procedures controlling the acquisition, storage, and use of hazardous materials are contained in Chapter 8 of the *TAPS Environmental Protection Manual*, EN-43-1 (APSC 1998a). Procedures relating to the transportation of hazardous materials by APSC and its contractors are contained in APSC Manual HZ-134, *Guide for Packaging and Transporting Hazardous Materials/Dangerous Goods by Highway and by Aircraft* (APSC 2001c).

Procedures that most directly relate to waste management are incorporated into the *TAPS Environmental Protection Manual, Waste Management*, EN-43-2 (APSC 2000). Procedures specific to the Ballast Water Treatment Facility (BWTF) at Valdez Marine Terminal are contained in APSC Manual MP-69-1, *Best Management Practices Plan, Ballast Water Treatment, Alyeska Marine Terminal* (APSC 1998b).

APSC procedures also call for internal reviews of scheduled projects to define their expected environmental consequence and identify applicable external regulatory or internal APSC controls. These project reviews also are valuable sources of information indicative of affected environments from TAPS operations. Such internal reviews can also be used to qualify

and in some cases, quantify, the impacts of TAPS operations on the environment.

The pertinent APSC business models and related procedures manuals, as well as data contained in required compliance submissions and environmental monitoring reports and obtained from implementation of internal standard operating procedures, were used to describe the use of hazardous materials in operation of the TAPS and to define the nature and scope of TAPS-related waste management and the associated impacts. The use of TAPS empirical operating data, especially data that have been independently validated through JPO oversight, will result in the highest possible levels of accuracy and relevance. Success of this strategy relies on the validity of the following assumptions:

- Adequate statutory authority exists for effective oversight by JPO agencies;
- Relevant and enforceable regulations are in place to control wastes resulting from TAPS activities;
- Appropriate considerations of human health and environmental risk are reflected in current grant stipulations, operating permits, and other controls;
- Appropriate commitment and resources exist within the JPO to ensure continuing effective oversight of TAPS activities;
- APSC demonstrates a continuing commitment to protect TAPS assets through appropriate preventative maintenance programs and expeditious response to system failures, including accidental or unplanned releases of contaminants to the environment; and
- No significant changes to operating conditions or reconfigurations of the TAPS are contained in the proposed action to continue the Federal Grant, notwithstanding fluctuations of oil throughput, changes made to equipment necessary to meet minimum performance standards, or changes resulting from the introduction of technology advancements, as approved by the JPO.

Identified environmental impacts associated with the generation and management of wastes are categorized as direct or indirect. Working definitions and examples for each of those categories as they pertain to hazardous materials and waste management are as follows:

- *Direct impacts:* Impacts of wastes and waste management activities resulting directly from operation and maintenance of the pipeline, pump stations, and the Valdez Marine Terminal. Examples include wastes from the corrosion digs/corrosion repairs, recovery and disposal of tank bottoms from pump stations and Valdez Marine Terminal crude oil storage tanks, and contaminated media resulting from accidental or unplanned releases of crude oil.
- *Indirect impacts:* Impacts of wastes and waste management activities related to the operation of essential ancillary systems and facilities. Examples include domestic sanitary wastewater and domestic solid waste from pump station personnel living quarters, maintenance of APSC vehicles, equipment refurbishment and repair activities conducted at maintenance yards, and ash from incineration of solid wastes at pump stations.

The JPO has stipulated that the TAPS itself ends at the product discharge points of the oil loading arms at the Valdez Marine Terminal tanker berths. Consequently, ballast water that is removed from tanker ballast tanks and delivered to the BWTF for treatment is technically outside the TAPS, and ballast water management could be addressed as a cumulative impact. However, while the primary purpose of the BWTF is the treatment of ballast water, it is also used to treat potentially contaminated storm water originating within the industrial areas of the Valdez Marine Terminal as well as condensates removed from the pipeline and from storage tanks and transfer piping within the Valdez Marine Terminal. With respect to those functions, therefore, the BWTF is an integral part of the Valdez Marine Terminal and is considered to be within the TAPS. Nevertheless, all wastewater delivered to the BWTF is commingled before treatment, and differentiating the environmental impacts of the BWTF between its treatment of various identifiable waste streams is not possible.

Consequently, it is appropriate to discuss the impacts of the entirety of BWTF operations at one location within this FEIS. However, the BWTF's operation is integral to the Valdez Marine Terminal operations and is discussed in Section 3.16 and Appendix C, and its impacts are addressed in Sections 4.3.12, 4.5.2.12, and 4.6.2.12. In addition, changes to ballast water impacts because of tanker reconfiguration are addressed in Section 4.7.6.10, Cumulative Impacts Analysis.

The following data used to support environmental impact analyses for direct and indirect activities were collected:

- Data supplied by APSC through its Anchorage administrative headquarters and its Fairbanks and Valdez Business Units, including but not limited to:
 - Copies of past and present operating permits,
 - Compliance-related data submitted to appropriate JPO agencies in satisfaction of regulatory or facility-specific permit requirements,
 - Documentation related to the disposal of APSC wastes by commercial facilities,
 - Monitoring data required to be maintained by regulation or permit,
 - Correspondence between APSC and the JPO relating to waste management issues,
 - Internal APSC monitoring data resulting from the execution of standard operating procedures, and
 - Characterization studies of sites at which accidental or unplanned releases of oil or hazardous substances had occurred,
- Compliance-related documents supplied by the JPO,
- Summary reports of unique APSC projects, and
- Personal communications with representatives of JPO regulatory agencies and APSC.

Many compliance-related documents are of a recurring nature (e.g., annual reports of discharges under a NPDES permit or a Biennial Resource Conservation and Recovery Act [RCRA] report of hazardous waste generation and management activities). For these, a number of submissions in the sequence were reviewed to detect any significant trends. Where no such trends were identified, the most recent submissions were deemed to be the most representative of APSC activities. Where substantial changes had occurred over time with respect to the volume or character of waste or their management, averages of the data contained in an appropriate number of historical submissions were used as the best representation of activity levels. Waste management activities of APSC contractors are also reflected in the APSC compliance submissions, even when those activities take place off the TAPS ROW. Consequently, neither contractor data nor personal communications with contractor personnel were deemed necessary to capture contractor waste generation and management activities.

Compliance-related documents obtained from APSC sources and the JPO were used to support environment impact assessments associated with direct or indirect activities, that is, the continuing operation of the TAPS. However, waste management documentation related to oil exploration and production at the North Slope (including both onshore and offshore activities) were collected directly from companies conducting those activities. Such documentation was used to support assessments of cumulative impacts.

For the no-action alternative, the historical record of waste generation and impact during initial TAPS construction was identified as potentially relevant, although not all wastes generated during construction would necessarily reoccur during removal and restoration, as defined by the JPO. In addition, the historical record of pipeline reroutes and replacements was reviewed for its potential relevance in describing the nature and extent of wastes that

can be anticipated during removal and restoration activities.

Finally, information on volumes and types of TAPS wastes and the manner in which they are managed will be provided for incorporation into impact analyses of natural ecosystems.

A.6 Human Health and Safety

Potential health and safety impacts to workers and the general public were evaluated for normal operations and accidental releases. The following overview of the methodology addresses both the proposed action, the less-than-30-year renewal alternative, and the no-action alternative.

A.6.1 Proposed Action and Less-Than-30-Year Renewal Alternative

Two types of potential impacts are addressed: (1) the industrial (physical hazard) risk and (2) the risk from chemical exposures during both normal operations and accidental releases at the pipeline releases.

A.6.1.1 Normal Operations

A.6.1.1.1 Occupational. The numbers of worker fatalities and injuries associated with continued operation and maintenance of the pipeline were estimated by using occupational hazards statistics available from the Bureau of Labor Statistics and the National Safety Council (NSC 2000, 2001). These projections were then compared with the historical safety performance data reported for normal pipeline operations.

Fatality and injury risks for recordable injuries and those involving lost workdays were calculated as the product of the appropriate incidence rate, the number of years for operations, and the number of full-time equivalent employees for operations. These calculations of risks of fatality and injury from industrial accidents were based on historical

industrywide statistics and, therefore, do not consider a threshold (i.e., any activity would result in some estimated risk of fatality and injury).

The analysis of physical hazards to workers required historical occupational hazard data from APSC and the JPO — specifically annual fatality and injury incidence rates and the number of workers by location over time.

Potential impacts of chemical exposures to workers were not quantified for normal operations and maintenance activities. It was assumed that potential worker exposures to chemicals used in TAPS operations (e.g., chemicals used at pump stations) were addressed by U.S. Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (OSHA 2001). To maintain compliance with OSHA standards, it is likely that chemical exposures would be minimized by various engineering mitigative controls (e.g., fume hoods and glove boxes and heating and ventilation designs for high-hazard areas) and extensive indoor air monitoring.

A.6.1.1.2 Public. The first step of the chemical exposure assessment for members of the public was to screen potential hazards of chemical exposure along the ROW on the basis of estimates of the quantities released to air, water, or soil. If the screening phase revealed that potentially significant chemical exposures could occur to the general public during normal operations, the associated risk was then quantitatively assessed. When available, chemical concentrations in air, water, and/or soil were compared with generic screening values that correspond to a fixed level of risk to human health. Chemical concentrations less than or equal to screening levels or below background concentrations were eliminated from further evaluation. The purpose of this human health screening approach was to identify any significant chemical contaminants and exposure pathways that might warrant quantitative analysis. The methodologies used in quantitatively assessing chemical risk and impacts on human health from normal operations and maintenance of the pipeline are described below.

The evaluation of chronic health hazards focused on hypothetical maximally exposed individuals (MEIs) of the general public. Because the standard methodologies for chemical health risk assessment do not usually involve assessment of collective (population) dose or risk, population risk was not evaluated for chemical exposures (EPA 1989). However, if a health risk was shown to exist for the MEI, additional assessment was conducted to estimate the number of individuals likely to be affected.

Chemical intakes and health risks from relevant exposure routes (e.g., inhalation) were assessed when estimated releases from TAPS operations exceeded screening values. For example, air dispersion modeling was conducted to estimate exposure media concentrations. Possible exposures for the MEI could include inhalation of airborne emissions, incidental ingestion of contaminants deposited on soil, and ingestion of contaminated water. Intake was summed over the appropriate potential exposure pathways. Appropriate exposure factors (e.g., data on human behaviors and characteristics that affect exposure to environmental contaminants) for the various pathways to be evaluated can generally be obtained from EPA guidance documents.

Risks from chemical releases are commonly expressed in terms of the "hazard quotient" for exposures to noncarcinogens (i.e., comparison of estimated receptor doses with reference levels or doses below which adverse effects would be very unlikely to occur). For carcinogenic chemicals, the estimated average daily intake was multiplied by carcinogenic potency factors to estimate increased lifetime cancer risks. The risks were then compared with the risk range of 10^{-4} to 10^{-6} generally used to assess the significance of exposures to carcinogens. Where possible, the reference levels used to generate hazard quotients and carcinogenic risks were obtained from the EPA's Integrated Risk Information System (IRIS) (EPA 2001). If standard reference levels were not available, the existing toxicity literature was reviewed to assess the potential hazard of estimated exposures.

Whenever possible, the assessment of chronic health hazards of chemical exposures to

the general public used quantitative estimates of the chemical concentrations in air, water, or soil that were estimated in the medium-specific analyses of the FEIS. If such information was not available, the assumption was generally made that there was insufficient evidence for elevated media concentrations from normal operation releases and, therefore, the potential for public health impacts was too low to be evaluated. Another important assumption was that physical hazards to the general public are minimized through restricted access to TAPS facilities. It was also assumed that health surveillance (epidemiological) data are not available for documenting current health status of the general public.

A number of types of data from other disciplines were needed for these assessments: (1) maximum air toxics levels (e.g., at pump stations, Valdez Marine Terminal); (2) chemical concentrations in groundwater and surface water; and (3) residual chemical concentrations in soil. Demographic data on nearest residences and subsistence patterns were also needed. Data sources for evaluating chronic health hazards of chemical exposure were mostly those that the other disciplines needed to estimate releases and subsequent media concentrations (e.g., air toxics emissions data from the Valdez Marine Terminal and pump stations, BWTF effluent discharge concentrations, and demographic data).

A.6.1.2 Accidental Releases

A.6.1.2.1 Occupational. Because historical safety hazard data were not compiled and reported for specific spill events, physical hazards to workers during spill responses were included in the overall data analysis of worker fatalities and injuries associated with ongoing operations of the pipeline.

Potential impacts of chemical exposures and/or physical hazards to workers were also addressed by modeling a fire and explosion (for additional information, see the fire analysis of spill events in Section 4.4.3). The probability of fire and explosion at the Valdez Marine Terminal was estimated on the basis of historical data. Although highly speculative, estimation of the

number of fatalities and injuries resulting from this scenario was also explored. However, it is assumed that potential exposures of workers to chemicals from a fire and/or explosion would be addressed both through emergency response contingency plans and by compliance with OSHA standards for minimizing chemical exposures using various engineering mitigative controls for high-hazard areas.

A.6.1.2.2 Public. This analysis primarily addressed the potential risk to the general public of chemical exposures resulting from accidental releases at the pipeline. Because it is assumed that spills onto gravel or soil surfaces would be cleaned up according to regulations, there should be no long-term impacts to soil or exposure to contaminants in soil. Therefore, the first step was to confirm that no complete exposure pathways or elevated concentrations would remain after remediation was completed at the land spill sites. Specifically, the risk-based corrective action approach that was conducted for one of the larger spill sites was reviewed to ensure that the ADEC Site Contamination Program has shown that spills to soil have not resulted in potential human health risks from direct contact or leaching to groundwater.

For spills to water, the potential for uptake of pipeline-related contaminants into the food chain, with subsequent ingestion of subsistence species by Alaskans, was evaluated. Specifically, if elevated concentrations of petroleum hydrocarbon constituents in fish tissue were found by the biological resources impact analysis or in the literature, then a screening analysis of fish ingestion was conducted. This screening analysis of potential hazards of chemical exposures to the general public was based on the comparison of incremental tissue concentrations of contaminants in fish to available screening values (e.g., Alaska and national fish advisories). Petroleum hydrocarbon-related compound concentrations less than screening levels or below background concentrations were eliminated from further evaluation. If further analysis was warranted, then available Alaskan

dietary intake survey data were used to estimate potential risks from fish consumption.

It was assumed that physical hazards to the general public would be minimized through restricted access to TAPS facilities, including fire/explosion scenarios modeled at the Valdez Marine Terminal. It was also assumed that an indoor explosion event (e.g., at pump stations, North Pole metering station) is improbable because of the relatively low probability of occurrence based on historical data, as well as fire protection systems in place.

Some data needed for these evaluations had to come from impact assessments in other disciplines. For example, maximum fish tissue concentrations of chemicals resulting from spills to water bodies were necessary from the biological resources analyses. The fire and explosion modeling results were needed from the air quality accidents analysis. Demographic data on nearby residences and information on subsistence patterns were also needed. Data sources for evaluating chronic health hazards of chemical exposure include those that were needed by biological resources for estimating the incremental uptake and subsequent fish tissue concentrations. An important source was data collected after the Exxon Valdez spill relating to measured tissue levels of contaminants in fish species. Additional data needs included the level and duration of fish and wildlife advisories; Alaskan dietary intake survey data; chemical constituents in crude oil and industrial products used (including use of proprietary chemicals and pesticides along the ROW); risk characterization data for previous spill-contaminated sites; and ambient air concentration measurements collected after the Exxon Valdez spill.

A.6.2 No Action

The analysis of the no-action alternative of not renewing the Federal Grant of the TAPS ROW, including dismantling and removing TAPS assets and restoring the environment, involved some of the same methodologies as described above for the proposed action. In particular, the health and safety analysis of the no-action

alternative focused mainly on deconstruction-related physical hazards to workers.

A.6.2.1 Occupational

The numbers of worker fatalities and injuries associated with pipeline termination activities were estimated by using occupational hazards statistics available from the Bureau of Labor Statistics and the National Safety Council (NSC 2000, 2001). These projections were then compared with the historical safety performance data reported for the original pipeline construction project.

Fatality and injury risks for both recordable injuries and those involving lost workdays were calculated as the product of the appropriate incidence rate, the number of years for operations, and the number of full-time equivalent employees for operations. These calculations of risks of fatality and injury from industrial accidents are based on historical industrywide statistics, for which any activity would result in some estimated risk of fatality and injury.

The analysis of physical hazards to workers used historical occupational hazard data, as available, specifically annual fatality and injury incidence rates and the number of workers by location during the original pipeline construction project. Otherwise, fatality and injury incidence rates for the construction industry were substituted.

Potential impacts of most chemical exposures to workers were not quantified for the no-action alternative. It was assumed that residual crude oil would be removed from the pipeline and that low-level emissions of potentially toxic air pollutants occurring from the use of various chemicals during removal and restoration would be minor. It was also assumed that potential exposures of workers to chemicals used would be addressed by Occupational Safety and Health (OSHA) permissible exposure limits (PELs) and engineering mitigative controls (e.g., personal protective equipment, PPE). However, levels of particulate matter generated during removal and restoration activities were evaluated through comparison with health-based standards.

A.6.2.2 Public

Potential health impacts of most chemical exposures to the general public were not quantified for the no-action alternative. It was assumed that low-level emissions of potentially toxic air pollutants occurring from the use of various chemicals during removal and restoration would be minor. It was also assumed that spills onto gravel or soil surfaces would be cleaned up according to regulations, and, consequently, there should be no long-term impacts to soil or exposure to contaminants in soil. However, levels of particulate matter generated during removal and restoration activities were evaluated through comparison with health-based standards.

It was further assumed that physical hazards to the general public would be minimized through restricted access to areas where removal and restoration activities were occurring and, therefore, potential impacts were not quantitatively estimated for the FEIS.

A.7 Biological Resources

The biological resources assessment evaluated the direct and indirect impacts of the proposed action, the less-than-30-year renewal alternative, and the no-action alternative on aquatic (freshwater, estuarine, and marine), terrestrial, and wetland (freshwater and estuarine) systems. Particular attention was given to protected species and the habitats on which they depend. For the FEIS, protected species considered included the following:

- Species and their critical habitats listed by the federal government under the Endangered Species Act,
- Species of special concern listed by the State of Alaska and the BLM,
- Marine mammals (seals, sea lions, sea otters, and whales) protected by the Marine Mammal Protection Act,
- Bald and golden eagles protected by the Bald and Golden Eagle Protection Act, and

- Essential fish habitat protected by the Magnusen-Stevens Fishery Conservation and Management Act.

The region of influence for direct and indirect effects included the footprint of the 800-mi-long TAPS ROW and associated facilities included in the Federal Grant. These associated facilities included the Valdez Marine Terminal, material sites, disposal areas, previously contaminated sites, and support facilities (e.g., airports, access roads, and work camps). The region of influence of indirect impacts also included adjacent areas that would be affected secondarily by activities within the project footprint. Examples include areas adjacent to pump stations affected by noise, the Dalton Highway (used to transport materials and people to various locations along the pipeline), areas affected by runoff from the TAPS workpad or other exposed ground surfaces, and areas affected under various spill scenarios.

A conceptual impact model was developed to structure the assessment of impacts (Table A-1). This model identified impacting factors associated with the proposed action, the less-than-30-year renewal alternative, and the no-action alternative environmental changes that impacting factors would produce, and the biological resources that would be affected by these changes. Impacting factors associated with the proposed action and the less-than-30-year renewal alternative include facility existence, normal operations, routine maintenance and system upgrades, and spills. Impacting factors associated with the no-action alternative would be the result of the termination activities needed to return the area to a stable condition and the natural succession that would proceed once termination activities were completed.

Environmental changes that would occur in response to these factors and that were evaluated in the biological resources assessment included direct habitat modification, erosion of soils and sedimentation of areas receiving runoff, changes in flow patterns, changes in water quality and temperature, impacts to permafrost areas and the development of thermokarst, contamination of

areas affected by spills, barriers to animal movements, changes in air quality, disturbance associated with noise and human activities, and changes in human access. In various ways, these changes affect habitat characteristics and the species supported by these habitats. Changes in species composition, species diversity, species distributions, and population density can result from these environmental changes.

Facility existence refers to the physical presence of the TAPS and its associated facilities in the environment. The existence of the TAPS (even without operation or maintenance) affects biological resources. Existing facilities considered in the assessment included the pipeline, workpad, cleared areas of the ROW, the Valdez Marine Terminal, access roads, disposal sites, material sites, contaminated areas, pump stations, and the gas fuel line that supplies gas to PS 1 to 4. Continued facility existence would result in an extension of existing impacts of the TAPS into the future; these impacts would for the most part be limited to the ROW and vicinity. Impacts of facility existence include maintenance of habitat in an altered condition, changes in flow patterns resulting from either the impoundment of surface flows or diversion of flows, erosion of unvegetated areas (e.g., the workpad) and the subsequent sedimentation of areas receiving runoff and associated effects on water quality, modification of permafrost areas, existing contamination of areas affected by previous spills, barriers to animal movements presented by the pipeline and associated roads, and continued increase in human access and its associated impacts (e.g., noise, disturbance, and hunting).

Normal operations and routine maintenance of the TAPS include oil pumping, transportation of materials and supplies, waste management activities, workpad and access road maintenance, security operations, routine inspections, vegetation control, revegetation activities, and quarry operations at material sites. Impacts of normal operations and routine maintenance would be limited to areas already affected by facility existence. Only quarry operations would be likely to involve actions in areas not currently affected.

TABLE A-1 Conceptual Model for the Effects of the Proposed Action, the Less-Than-30-Year Renewal Alternative, and No Action on Biological Resources

Impact Sources	Environmental Changes	Affected Biological Resources
<i>Proposed Action and Less-Than-30-Year Renewal Alternative</i>	Habitat modification	Terrestrial and vegetation wetlands
Facility existence	Movement barriers	Fish
Normal operations	Changes in flow patterns	Birds and mammals
Routine maintenance and monitoring	Erosion and sedimentation	Threatened, endangered, and protected species
System upgrades	Noise and disturbance	
Spills	Air quality	
	Introduction of exotic organisms	
	Water quality and temperature	
	Alteration of natural permafrost patterns	
<i>No Action</i>	Contamination	
Termination activities	Changes in human access to remote areas	
Natural succession		

Environmental changes resulting from normal operations and routine maintenance include habitat modification resulting from vegetation control and revegetation activities; erosion and sedimentation from the workpad, access roads, disposal sites, and material sites; impacts to water temperature in areas where the pipeline is buried in and adjacent to streams; changes in permafrost patterns and the occurrence of thermokarst resulting from the pumping of warm oil through the pipeline; noise and disturbance resulting from human activities, especially at the pump stations, Valdez Marine Terminal, and Dalton Highway; potential introduction of exotic organisms from tanker ballast water into marine environments; and degradation of air quality by emissions at pump stations, the Valdez Marine Terminal, and transport vehicles along the Dalton Highway.

System upgrades include corrosion digs, pipeline reroutes, stream modifications, valve replacement, and vertical support member (VSM) replacement. System upgrades could result in impacts in areas outside of the current disturbed areas of the ROW. Depending on the nature of the upgrade, any of the environmental changes identified in the conceptual model (Table A-1) could result.

Spills include the accidental release of any material associated with pipeline operations; the assessment, however, focused on oil spills. Although the obvious effect of spills is related to contamination of soil and water, spills can also result in habitat modification, erosion and sedimentation, noise and disturbance associated with cleanup activities, degradation of air quality resulting from the release of oil vapors, effects on water quality, and melting of permafrost. Spills could occur along the pipeline, at pump stations, and at the Valdez Marine Terminal.

The no-action alternative would involve not renewing the TAPS ROW Federal Grant. Upon expiration of the Federal Grant, at least portions of the TAPS would be removed, and the environment would be restored to some agreed-upon condition. This process — referred to as dismantling, removal, and restoration — could affect biological resources both during and after the activities. All of the environmental changes identified in the conceptual model (Table A-1) could occur, but the direction of the impacts (beneficial or adverse) would, in some cases, be the reverse of the direction of impacts under the proposed action. Environmental changes associated with dismantling, removal, and restoration of the TAPS include erosion and

sedimentation from work areas, noise and disturbance from human activities, release of air emissions (dust and vehicle exhaust) and effects on air quality, impacts to water quality from work in and adjacent to streams and other water bodies, and possible contamination resulting from spills and treatment of waste. These changes would occur during the dismantling, removal, and restoration process; eventually they would cease once restoration activities were complete. Over the long-term, the no-action alternative would eliminate impacts associated with facility existence, normal operations, routine maintenance, and system upgrades.

Existing data and research were reviewed to determine past TAPS impacts and describe the baseline conditions that are presented in the description of the affected environment, as well as to project the impacts of continued operations of the pipeline under the proposed action. This approach could be used because most characteristics of the proposed action are within the scope of past activities. Activities that went beyond the scope of past actions (e.g., some system upgrades) were evaluated on the basis of the findings of past research.

The biological resources assessment was spatially based and focused on the effects of environmental changes on habitat characteristics (structure and function), food resources, species composition, species diversity, species distributions (including movement patterns), and population characteristics (e.g., growth, reproduction, survival). Impact significance was predicted from the areal extent of change, including the project footprint and affected adjacent areas; characteristics of the area affected; the magnitude of the change (deviation from the baseline) anticipated; the time period when the impact would occur; the duration of impacts; the sensitivity of biological resources to change; and the rarity and importance of affected components.

Spill scenarios were developed that were representative of a range of spills (both in terms of consequence and frequency) that might occur during pipeline operations. These scenarios included spills in areas where the consequences to biological resources were especially

significant because of the sensitivity of the resources (rare or protected species or habitats). The analysis of spill impacts focused on direct impacts to vegetation and animals (resulting in either mortality or changes in productivity), chronic toxicity effects (decreased survivorship, decreased reproduction, food chain effects), and indirect effects resulting from these changes (e.g., effects of organisms in higher trophic levels or those dependent on affected habitats). The assessment of toxicity effects was based on an extensive review of the relevant literature, particularly studies of the effects of the Exxon Valdez oil spill and experimental or actual spills that have occurred in terrestrial habitats and wetlands.

A number of data sources from federal, state, and environmental organizations were used to describe the affected environment and support the biological resources assessment. Sources included, but were not limited to, the Alaska Department of Fish and Game (ADF&G), Alaska Department of Natural Resources, Alaska Natural Heritage Program, APSC, Boreal Partners in Flight Working Group, Exxon Valdez Oil Spill Trustee Council, National Oceanic and Atmospheric Administration, Marine Mammal Commission, U.S. Army Corps of Engineers, Region 7 of the U.S. Fish and Wildlife Service (USFWS), U.S. National Marine Fisheries Service (NMFS), and University of Alaska Museum. In addition, scientific literature on biological resources of Alaska and on impacting factors associated with construction, operation, maintenance, oil exploration, and revegetation was reviewed.

Information on life histories, population estimates, species distributions, and harvest summaries were obtained from ADF&G publications, including the Wildlife Notebook Series; game management unit reports; annual performance reports; fish habitat assessment reports; finfish management reports; and the *Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes* (ADF&G 1998).

Information on fish and wildlife resources of Alaska was also obtained from reports produced by the American Cetacean Society (fact sheets), Exxon Valdez Oil Spill Trustee Council (updates on injured resources), USFWS (Cyber Salmon

and other reports), NMFS (stock assessments), and USGS (Alaska Land Characteristics Data Set).

Various mapping sources were also used for distributional information on vegetation, fish, and wildlife. These sources included USFWS National Wetland Inventory maps, Environmental Sensitivity Index Files for the North Slope and Prince Williams Sound, ecoregion maps, the *Environmental Atlas of the Trans Alaska Pipeline System* (APSC 1993), and Essential Fish Habitat maps developed by the NMFS.

Consultation with the USFWS and NMFS, pursuant to Section 7(a)(2) of the Endangered Species Act [16 USC §1536(a)(2)], was conducted as part of the Federal Grant renewal process. A biological evaluation (BE) for the proposed action that addresses impacts of the proposed action on listed species and designated critical habitat was prepared (BLM 2002).

A.8 Economics

A.8.1 Introduction and Background

The analysis of the economic and demographic impacts of the proposed action, the less-than-30-year renewal alternative, and the no-action alternative used the Man in the Arctic Program (MAP) model developed at the University of Alaska-Anchorage Institute for Social and Economic Research (ISER) (Berman et al. 1986; ISER 1985). The MAP model has three essential components: an economic module, a demographic module, and a fiscal module.

The economic module is an economic base model that essentially divides the Alaska economy into two forms of economic activity — basic and nonbasic (or support) activities. Basic activities are the key economic sectors that are the source of economic growth in the economy; they bring in money from outside the state in exchange for the goods or services produced. These activities do not depend on other sectors

in the economy of the state as the source of growth. All other activities in the state are characterized as nonbasic activities. They support basic activities and are dependent on them for their source of growth.

The demand for the goods or services produced by the basic sector generates money from outside the state, and the resulting multiplier effect on the economy of the state affects the nonbasic sectors in the state economy as basic activities purchase goods and services in local markets from nonbasic activities and as households with workers in these activities are hired. For example, oil produced in Alaska and transported to West Coast refineries generates wages and salaries for oil production workers, pipeline transportation workers and marine transportation workers, some of whom are based in Alaska. Oil sales also generate wages and salaries in the many industries supporting these transactions, including utilities, pipeline maintenance contractors, and accounting firms supplying the oil companies with goods and services as the oil is pumped and transported out of the state. The procurement of goods and services also generates employment and wages and salaries in oil auxiliary industries in the state, such as those producing specialized equipment and providing environmental services.

The procurement of goods and services and wages and salaries in the oil sector and in supporting activities has additional effects on the state economy. Oil production, transportation, and auxiliary industry employees spend their wages and salaries in grocery stores, banks, utilities, hospitals, and other support facilities and services. The employees of these support facilities, in turn, spend their wages and salaries in other support activities. Money brought into the state as a result of the initial purchase of oil from Alaskan oil fields continues to multiply through the economy of the state until purchases are made outside the state or money flows into savings, at which point the multiplier process stops.

The size of the multiplier effect varies among industries as a result of differences in the extent to which the various basic and nonbasic support industries purchase goods and services from within Alaska. Changes over time in the

composition of the state's economy mean that the size of the aggregate multiplier for the state also changes over time.

The MAP model characterizes 12 sectors in the economy of Alaska as basic. The petroleum, seafood, mining, timber, and agriculture sectors produce commodities that are primarily for export to other parts of the United States. Tourism and air cargo are also basic industries selling services primarily to nonresidents of Alaska. Each of these industries depends on out-of-state markets as the primary sources of demand for production of goods and services that would not otherwise take place. An additional source of funds from outside the state that contributes to the economy of the state is federal government employment, including military employment. The portion of the Alaska Permanent Fund that comes from earnings on investments made outside the state and income on assets and private pensions are also classified as forms of basic activity. More information on the assumptions used to develop the MAP model and more details on the role of each of the basic sectors in the model can be found in Goldsmith (1997), Berman et al. (1986), and ISER (1985).

The demographic module contains two elements. The age and sex distributions of the population are combined with fertility and mortality rates in an age-cohort survival framework to determine the natural increase in the population. Estimates provided for the Alaska population are specified for both the Alaska Native and non-Native portions of the population to capture differences in the birth rates across the two groups. Net civilian migration to the state is estimated on the basis of Alaskan employment and income growth relative to the United States as a whole. Rapid employment growth in the state has historically attracted large numbers of in-migrants as the new jobs have tended to be relatively highly paid, particularly those in the oil sector.

The fiscal module estimates each major source of revenue at both the state and local level on the basis of the existing tax structure and measures of overall economic activity in the state. The model also incorporates revenue sharing between the state and the various local governments and assumes that total government

revenues, plus any change in the balances of state financial assets, and including any allocations from the Permanent Fund, are equal to total government expenditures at both the state and local level.

A.8.2 Impacts of the Proposed Action, Less-Than-30-Year Renewal Alternative, and No-Action Alternative

After validation of the MAP model for use in this FEIS, the model was used to produce forecasts for each of the variables likely to affect the impact analysis results. These variables include employment; personal income; gross state product; oil revenues; and state, regional, and local revenues and expenditures. Sectoral employment forecasts were also prepared for the major sectors in the Alaskan economy, including petroleum, mining, seafood, tourism, international freight handling, forest products, and government.

The MAP model was then used to calculate economic and demographic impact data for the proposed action and the no-action alternative for the state and for the six census areas and boroughs in the pipeline corridor region. This region includes Anchorage, the Fairbanks North Star and North Slope Boroughs, and the Southeast Fairbanks, Valdez-Cordova, and Yukon-Koyukuk Census Areas. Impacts at the regional level were not presented at the same level of detail as those at the state level, and no data were available for gross regional product and state and local revenues and expenditures. An analysis of potential national impacts was also developed. Table A-2 lists the parameters analyzed for the proposed action and the no-action alternative, respectively.

The analysis also included an assessment of the impacts of potential accidents on the economy of the state and pipeline corridor region. For TAPS ROW renewal, the analysis considered the impact of oil spills on property values in the pipeline corridor region and on overall economic activity in the state in terms of the loss of oil revenues to the state and the consequent impact on the Permanent Fund

TABLE A-2 Economic and Demographic Impact Parameters Examined for the Proposed Action, Less-Than-30-Year Renewal Alternative, and No-Action Alternative

State of Alaska

- Population, including natural increases and migration
- Total employment, including direct TAPS employment, and overall employment levels in the state
- Sectoral employment (the impact of TAPS on employment in other sectors of the Alaska economy, such as seafood, tourism, air cargo, and government)
- Personal incomes in the state, including the role of the Permanent Fund Dividend
- Gross state product (a measure of overall economic activity)
- Fiscal impacts, including the impacts on state and local government revenues and expenditures, the Alaska Permanent Fund, and state government employment

Pipeline Corridor Region

- Population, including natural increases and migration
- Overall employment levels in the region
- Personal incomes, including the role of the Permanent Fund Dividend

National Economy

- Domestic oil production and national security (comparison of North Slope production with domestic oil production and impact of North Slope output on imports from other countries over the renewal period)
- Federal tax revenues
- Transportation, in particular shipbuilding and tanker employment
- Overall economic activity

dividend. The impact of accidents that may potentially occur in Prince William Sound as a result of tanker accidents were assessed as part of cumulative impacts.

A.8.3 Data Sources

A significant amount of data currently exists in the MAP model. Additional data were collected to update the state and regional economic and demographic baselines in the model.

Data needed to update the economic baseline were obtained from publicly available federal and state databases. Federal sources included the U.S. Bureau of the Census, U.S. Department of Commerce, U.S. Department of Agriculture, and the U.S. Department of Transportation. State data came from the Alaska

Department of Labor and Workforce Development, Alaska Department of Revenue, Alaska Department of Community and Economic Development, and Alaska Permanent Fund Corporation. These data were used to validate forecasts of the key economic variables used in the model for each year in the TAPS renewal period. Additional data came from oil companies, APSC, and other industry and academic sources.

Fiscal data required for impact analysis consist of revenue and expenditure data for the State of Alaska and for local governments. Fiscal data were collected from the relevant jurisdictions and from federal government sources. Data were also collected from State of Alaska sources on oil revenues derived from TAPS operations.

Total population data and data by gender and age cohort, for the state and for the pipeline corridor region, were used in the model, both to provide estimates of the baseline population for the TAPS renewal period and to provide estimates of in-migration that would occur with changes in TAPS activities. These data came from the U.S. Bureau of the Census.

The assessment of the impacts of potential accidents used literature based on data from previous accidents, including the Exxon Valdez spill in Prince William Sound.

A.9 Subsistence

The methods used to evaluate subsistence impacts in this FEIS focused on how the proposed action, the less-than-30-year renewal alternative, and the no-action alternative may affect the customary and traditional acquisition and use of naturally occurring renewable resources for personal or family consumption.

Subsistence is an issue of considerable importance in Alaska, both to Alaska Natives and non-Natives, where many rely on hunting, fishing, trapping, and collecting to provide food, clothing, construction materials, and other items necessary for survival. Moreover, subsistence plays a particularly crucial role in Alaska Native sociocultural systems, helping to reaffirm social relations during both the acquisition and exchange of resources and to redefine sociocultural systems in times of increasing change. For years, many have believed that the TAPS has had important impacts on subsistence, primarily in disrupting migrations or otherwise affecting the availability of subsistence resources and in providing access to others seeking the same resources for other reasons (primarily recreational).

The region of influence for the subsistence analysis corresponded approximately to the aggregation of traditional harvest areas that may have been (or may be) affected by the TAPS. Communities in this region of influence consisted of 44 places anticipated to experience direct effects due to continued TAPS operation.

Residents in 11 of these places are excluded from subsistence activities by federal

regulations that limit subsistence to rural places (as stipulated in the *Subsistence Management Regulations for the Harvest of Wildlife on Federal Public Lands in Alaska* [Office of Subsistence Management 2001]).

The evaluation of subsistence attempted, when possible, to examine community-specific impacts, and this formed the core of the subsistence analysis. As necessary, the subsistence analysis considered data presented by Fishery Management Area or Game Management Unit, although those units do not correspond to community subsistence areas and, strictly speaking, did not contribute to the expansion of the region of influence for subsistence.

Data for the evaluation of subsistence impacts included both quantitative and qualitative information. Quantitative data supporting the subsistence analysis included weight of subsistence resources taken, total fish and game harvested, and households participating in subsistence. The analysis for this FEIS examined these types of data, if available, for each community or management area. Qualitative data for the evaluation of impacts to subsistence similarly consisted of a range of information, including oral summaries of subsistence patterns, activities, and harvests over time; statements about game migration patterns; and summaries of seasonal subsistence activities for particular Alaska Native villages or groups.

In the absence of more complete, systematic coverage of quantitative subsistence over time, the analysis combined available quantitative and qualitative information in a complementary fashion. Nevertheless, it is important to acknowledge that incomplete data greatly compromise what one can say definitively about subsistence, the changes it has recently experienced, the causes of these changes, and their possible direct or indirect relationships to the TAPS.

The approach taken in this analysis was to examine subsistence patterns in each community or harvest area. When the data permitted, the analysis considered subsistence change over time, in part to help identify any relationship with the TAPS and also to

understand how subsistence patterns have evolved in recent years. The aim of the analysis was to define changes in subsistence harvests due to a reduction in subsistence resources available, as a consequence either of decline in resource population or a change in resource migratory behavior. The analysis considered the range of resources harvested for subsistence purposes in each community, recognizing that potential impacts under any alternative might affect different resources in a dissimilar manner. The focus of the analysis was mainly geographic, depending on data availability to examine community subsistence patterns or harvests in resource management units in the proximity of the TAPS. Hypotheses on changing subsistence yields were evaluated through interviewing experts for traditional knowledge of particular areas or resources — both researchers with particular geographic or topical expertise and people engaged in subsistence activities. For the no-action alternative, the analysis explored anticipated shifts in economic activity identified in the economic evaluation, using these changes as a basis for projecting shifts in subsistence activity in the region of influence.

The factors that had an impact on subsistence were those that reduced access to subsistence resources. Main factors included changing migration patterns and declining game populations. Each of these factors has possible TAPS-related causes, and the analysis considered these as well as alternative explanations. One likely cause of subsistence declines is the Dalton/Richardson Highway, both in supporting traffic that is disrupting the migration patterns of certain species and in providing access to competitors for subsistence resources. It is important to remember in evaluating subsistence impacts that although many consider this road part of the TAPS, it is both separate from the system and considered part of existing conditions. It is likely to remain in place under any TAPS alternative considered in this FEIS.

Subsistence impacts are closely linked to certain other disciplines. Most notably, the ecology analysis provided key information on main subsistence resources and related impacts associated with the TAPS. Similarly, the

recreation analysis provided insight on recreational hunting and fishing harvests, yielding an appreciation for how competition for resources contributed to subsistence changes. The hydrology analysis revealed potential impacts on fish and other water-related subsistence species, while the accident analysis presented scenarios that might affect water or terrestrial subsistence resources. The economic analysis, in turn, provided a sense of how other economic opportunities might lead to reduced subsistence activity.

A.10 Sociocultural Systems

The methods used to evaluate sociocultural impacts focused on aspects of the proposed action, the less-than-30-year renewal alternative, and the no-action alternative that particularly affect Alaska Natives and rural non-Natives.

Sociocultural system is a concept that encompasses a broad range of characteristics about a particular group, including social organization, administration, economy, ecology, demographics, and cultural values. As a result, all of the concerns explored have implications for some aspect of Alaska Native and rural non-Native sociocultural systems; a point made all the more obvious because of the large number of Alaska Natives living both in the State of Alaska and in the vicinity of the TAPS. Other disciplines worth noting include those with a particularly close relationship to Alaska Natives, such as subsistence, or those having particular importance to Alaska Natives and rural non-Natives, such as economics. They also include environmental justice, which has a special importance for Alaska Natives both because of the minority status and the frequent low-income status of indigenous groups in the state.

Issues examined specifically under sociocultural systems comprise primarily those topics related to Alaska Natives that are not covered elsewhere — location, sociopolitical characteristics, settlement patterns, and, where possible, more elusive concepts such as cultural values. The sociocultural analysis also considered certain characteristics of rural non-Natives that help distinguish them from the

remainder of mainstream Alaskan and American society, such as location, adaptive patterns, and (again, as possible) cultural values.

The region of influence for the sociocultural analysis varies. This FEIS considered certain impacts at the level of the entire state — such as changes in institutional-administrative organization that have affected all Alaska Natives as a consequence of the Alaska Native Claims Settlement Act. The study also examined impacts at the level of eight Alaska Native regional sociocultural systems intersected by or close to the TAPS. Finally, the sociocultural analysis examined individual communities likely to experience direct effects under either the proposed action or the no-action alternative. On the basis of likely impacts on subsistence, employment, culture, and land selection, the BLM (2001) identified 21 communities as deserving particular attention: Alatna, Allakaket, Anaktuvuk Pass, Chenega, Chitina, Copper Center, Cordova (Eyak), Evansville, Gakona, Gulkana, Hughes, Manley Hot Springs, Minto, Nanwalek, Nuiqsut, Port Graham, Rampart, Stevens Village, Tanana, Tatitlek, and Tazlina.

Primarily because of their geographic proximity to the TAPS, this FEIS also considered possible sociocultural impacts to 23 additional communities: Big Delta, Coldfoot, College, Copperville, Deadhorse, Delta Junction, Ester, Fairbanks, Fox, Glennallen, Harding-Birch Lakes, Kenny Lake, Livengood, Moose Creek, North Pole, Paxson, Pleasant Valley, Prudhoe Bay, Salcha, Tonsina, Two Rivers, Valdez, and Wiseman.

Data requirements for the evaluation of sociocultural impacts included both quantitative and qualitative information. Quantitative data supporting the sociocultural analysis included population data, Native regional corporation characteristics, and data on social problems, such as substance abuse and suicides. Quantitative data vary widely both in their availability over space and time and in their reliability. The types of qualitative data employed in the assessment of sociocultural impacts included information on social organization, cultural values, economic activities, and administrative structure; how these components of the Alaska Native and rural non-Native world have changed over time; and Alaska Native and

key informant impressions of how the TAPS has affected and would continue to affect these sociocultural systems. Much of this information came from prior anthropological and sociological research. Some of the more detailed work dates back several decades, thereby providing a valuable historical perspective but often lacking in current insight. Once again, other disciplines focused on topics that are closely related to sociocultural systems, such as economics and subsistence.

The approach used to analyze sociocultural impacts was to examine the various sociocultural systems over time in an effort to identify changes in location, demographics, sociopolitical characteristics, and settlement patterns of those systems; the degree to which the TAPS contributed to these changes; and likely future changes. Two major challenges were faced in evaluating sociocultural impacts. One was to identify the impacts to sociocultural systems as defined above. The second challenge, no less important and in many ways much more daunting, was to isolate those impacts partially or totally associated with the TAPS — recognizing that Alaska Native sociocultural systems in particular have experienced considerable change throughout much of the past century. Ultimately, impacts were associated as possible with the proposed action or the no-action alternative. Identifying effects related to the TAPS, and the probable processes underlying their emergence, makes it possible to propose likely impacts of any of the alternatives.

The factors that lead to sociocultural impacts tend to involve major components of sociocultural systems — such as the economy — as well as interaction with other, different sociocultural systems. Increased involvement in a cash economy and the growing opportunities, challenges, and frustrations of this involvement have been proposed as sources of key impacts on Alaska Natives. Growing interaction with non-Natives and the increased socioeconomic disparities between Alaska Natives and non-Natives have been seen as contributing to social pressures and resulting social ills such as substance abuse and suicides. Ultimately, impacting factors associated with the proposed action and the alternatives are determined

through empirical examinations of the sociocultural systems affected by the TAPS and how these systems have changed over time, both in key characteristics (location, sociopolitical organ, and others noted above) and in the emergence or increase in social ills.

As noted above, certain other disciplines were particularly important in the examination of potential sociocultural impacts. Subsistence, of considerable importance to rural Alaskans in general and especially important to Alaska Native culture, provides not only a source of nutrition and other materials, but also plays a central role in social organization and the maintenance of social relations.

Economics, which has important implications for all Alaskans in the context of the TAPS, assumes perhaps a more important role for Alaska Natives and rural non-Natives who often fall below the poverty level and for whom sources of cash income often are fewer than for non-Natives and nonrural residents. However, virtually all other disciplines in this FEIS have implications for sociocultural systems, particularly for Alaska Natives given the relatively large number in the state and their broad geographic distribution. Nevertheless, because they were not exclusively sociocultural in nature, these other impacts are best dealt with under other disciplines, with the Alaska Native and rural non-Native components identified as possible and necessary.

A.11 Cultural Resources

The methods used to evaluate impacts to cultural resources focused on assessing the potential disturbance to archaeological sites, historic structures, and traditional cultural properties under the proposed action, the less-than-30-year renewal alternative, and the no-action alternative. As noted below, the assessment of impacts to cultural resources relied primarily on National Register of Historic Places (NRHP) eligibility status, either determined or potential. However, the evaluation also considered the quality of the available data and the condition of cultural resources (based largely on current levels of ground disturbance). The region of influence for cultural resources

includes the ROW and any additional areas affected, or likely to be affected, by TAPS operation or maintenance.

The evaluation of impacts to cultural resources required specific information on those resources. Archaeological sites, traditional cultural properties, and historic structures within the region of influence were identified and assessed on the basis of site location information provided by the Alaska State Historic Preservation Office, archaeological survey reports associated with the original construction of the TAPS and all later clearance requirements, architectural survey reports identifying historic structures, and general texts on the historic and prehistoric materials and properties found along the ROW and associated activity areas.

For each cultural resource within the region of influence, the above materials also provided information on the type of site, NRHP status (if determined), level of disturbance, sacred status, age, depth, and spatial extent. The project team consulted the State Historic Preservation Officer to confirm NRHP status, discuss potential future determinations of NRHP status, and identify any particular preservation issues or problems associated with specific cultural resources. Other information used included APSC procedure manuals on cultural resource protection and background information on pipeline technology to assess the potential historical importance of the TAPS itself.

The assessment of potential impacts to cultural resources involved identifying those activities that would result in surface or subsurface disturbance within the region of influence. Activities evaluated included maintenance that would likely disturb areas containing known cultural resources. Impacts, in turn, were defined as the effect of identified activities on intact known cultural resources. The identification of impacts relied on GIS-based overlays, emphasizing either co-occurrence or geographical proximity of potential disturbance to known resources. Other potential sources of impacts included the effect of increased accessibility to intact cultural remains and any effects resulting from spills and spill response activities.

Several disciplines provided relevant data. Geology and soils studies provided information on soil types and the effect that a spill would have on soils. Erosion was a concern during the analysis, primarily because of the number of waterways that the TAPS crosses that could alter archaeological resources. Consideration of erosion was also important in assessing the effects of spill removal on cultural resources. Hydrology studies provided information on changing waterways and the resulting erosion. Personnel working on the pipeline maintenance sections of this FEIS provided information on procedures and activities in place for the pipeline that were needed to identify potential impacts.

A.12 Land Use and Coastal Zone Management

A.12.1 Land Use

The TAPS and associated facilities are located primarily on federal and state lands, with about 10% on private lands. In addition to varying land ownership of the ROW itself, land use also varies in the vicinity of the TAPS; potential uses are often related closely to ownership. The methodology used to assess impacts to land use considered anticipated changes under the proposed action, less-than-30-year renewal alternative, and no-action alternative, focusing in particular on major land use categories and how these would likely change.

This analysis assumed that the region of influence for land use consisted of the area within the ROW that varies from about 54 ft to more than 100 ft wide, and areas near the ROW that experienced past TAPS-related land use effects. It was also assumed that under the proposed action, no-action alternative, and less-than-30-year renewal alternative, the Dalton Highway would remain open to the public and the existing airports in the utility corridor would remain. The analysis assumed that recent trends in land use change would provide a reasonable basis for projected future conditions and impacts under the proposed action.

The primary data used to support the analysis of land use impacts consisted of information on existing land ownership and use patterns within the TAPS region of influence, as well as prior patterns of ownership and uses — the latter to establish trends in land use change over time. The analysis used quantified land use data when possible, consistent with the appearance of many of these data in map form. Ownership and use maps included the *State of Alaska TAPS Lease Renewal Project Map of Existing Leases and Permits* (ADNR 2001) and the *Environmental Atlas of the Trans Alaska Pipeline System* (APSC 1993). In addition, applicable land use plans were identified and reviewed, as discussed further below. Argonne staff contacted government officials and private landowners to obtain supplemental information and to collect additional information on use and ownership patterns in areas where such configurations were unclear. Applicable federal and state statutes and regulations provided information on locations and types of permitted and restricted activities in the region of influence.

The evaluation of land use impacts used a phased approach. It began with the definition of current (recent) land ownership and use patterns, as well as prior configurations, to provide the basis for any impact analysis. Special status lands, such as state parks, National Parks, National Wilderness Areas, and National Wildlife Refuges, were also identified. The analysis then determined (when possible) trends in land use change during the last 25 years and projected these into the future to support an analysis of the proposed action and less-than-30-year renewal alternative.

Impacts under the no-action alternative, in turn, were projected on the basis of results of the economic analysis, notably the negative economic impacts anticipated in the region of influence (and elsewhere in Alaska) if the ROW was not renewed. Impacts on land use from termination activities were also considered. EIS team members reviewed existing federal, state, and local land use plans to determine consistency with the continued operation of the TAPS and its (TAPS) removal and restoration. Federal plans included the river management plans for the Delta National Wild and Scenic River and Gulkana National Wild River

(BLM 1983a,b), *Utility Corridor Proposed Resource Management Plan and Final Environmental Impact Statement* (FEIS) (BLM 1989), *Dalton Highway Recreation Area Management Plan* (BLM 1991); *Management Framework Plan for the South Central Planning Area* (BLM 1980); and *Fort Greely Proposed Resource Management Plan FEIS* (BLM and U.S. Department of Defense 1994).

State plans included the *Tanana Basin Area Plan for State Lands* (ADNR 1991); *Copper River Basin Area Plan for State Lands* (ADNR and ADF&G 1986); *Prince William Sound Area Plan for State Lands* (ADNR and ADF&G 1988); and *Dalton Highway Master Plan* (Dalton Highway Advisory and Planning Board 1998). Local plans included the *Fairbanks North Star Borough Comprehensive Master Plan* (Fairbanks North Star Borough 1999), *North Slope Borough Comprehensive Plan* (North Slope Borough 1983), and *Valdez Comprehensive Plan* (City of Valdez 2000).

Private land use plans and data also were reviewed and analyzed, as available. In all cases, the evaluation of land use impacts compared anticipated changes in land use configurations with current configurations and with stipulations of current land use plans to determine levels of effect throughout the region of influence.

The analysis of land ownership and use shared key links with several other disciplines considered in this FEIS. Land use affects aesthetics, just as visual resource management objectives may dictate land use. In addition, recreation, wilderness, subsistence, and transportation corridors are all types of land use; each is addressed in a separate section. Suitable land use is determined by a combination of elements related to socioeconomics and the physical environment, including topography, geology, ecology, and water resources. Because of the potential effects of a TAPS-related accident on current and future land use under the alternatives, the examination of various spill scenarios played a key role in the analysis of potential land use impacts. Impact determinations for accident scenarios were largely based on the results of the spill analyses for hydrology and ecology.

A.12.2 Coastal Zone Management

The TAPS begins and ends in Alaskan coastal zones. One hundred ten miles of the pipeline and related structures are encompassed in the North Slope Borough coastal zone where TAPS originates, and 25 miles of the pipeline and the Valdez Marine Terminal are within the Valdez coastal zone. The federal Coastal Zone Management Act (CZMA) of 1972 (amended in 2001) and the Alaska Coastal Management Act (ACMA) of 1977 (amended in 1994) regulate activities in Alaskan coastal zones, including the TAPS. The ACMA is implemented by the Alaska Coastal Management Program (ACMP) (approved in 1979), which encourages coastal districts to develop and adopt district coastal management programs (CMPs) that become part of the ACMP once they are fully approved. All activities, including those related to the TAPS, that occur within the coastal zone or that may affect coastal resources must be consistent with the enforceable policies in an approved CMP. Both the North Slope Borough and Valdez coastal zones have approved CMPs. The methodology for evaluating coastal zone impacts for the proposed action, less-than-30-year renewal alternative, and no-action alternative focused on their potential effects on coastal resources and their consistency with applicable statewide ACMP standards and the enforceable policies in the North Slope Borough and Valdez CMPs.

The coastal zone analysis focused on data that emphasized the identification of existing permitted activities, enforceable policies, and applicable statewide standards within the North Slope Borough and Valdez coastal zones and the evaluation of all alternatives in this FEIS in terms of these criteria. The analysis used quantitative data whenever available to support the impact analyses. In addition to the information available in the North Slope Borough and Valdez CMPs, the data used for the analyses covered impacts identified by other disciplines but occurring in a coastal zone. The EIS team contacted personnel from the Alaska Division of Governmental Coordination for supplemental data on currently permitted

activities. The CZMA, ACMA, and ACMP were also reviewed.

Potential impacts on both CMPs under the proposed action, less-than-30-year renewal alternative, and no-action alternative were analyzed in terms of the types of activities permitted in the two coastal zones of interest. The analysis focused on the magnitude and spatial distribution of any potential impacts and identified impacts that would result from activities under the alternatives that would not be consistent with CMP-enforceable policies or applicable statewide standards. Analysis of the no-action alternative assumes that termination activities would occur in both the North Slope Borough and Valdez coastal zones over a six-year period.

The coastal zone analysis shared links with several other disciplines in this FEIS. Permitted activities within the coastal zone affect the aesthetics of the area, and CMP-enforceable policies regarding aesthetics affect which activities are allowed, as well as associated mitigation measures. Recreation, subsistence, commercial and industrial development, and travel were important activities in coastal zones with associated CMP-enforceable policies and standards. Because a TAPS-related accident could potentially affect a variety of permitted activities in the coastal zone, spill scenarios were analyzed to determine coastal zone impacts. Impact determinations for accident scenarios were largely based on the results of the spill analyses for hydrology and ecology.

A.13 Recreation, Wilderness, and Aesthetics

A.13.1 Recreation

Recreational resources are abundant on the state and federal public lands in the vicinity of the TAPS. Some of the existing recreational opportunities include hiking, camping, boating, fishing, trophy hunting, floating, and winter sports. The methods used to assess potential impacts to recreational resources under the proposed action, the less-than-30-year renewal

alternative, and the no-action alternative considered how renewing or not renewing the TAPS ROW would affect the range of recreational opportunities available near the pipeline.

For purposes of this analysis, recreational resources consisted of designated recreational areas within a few miles of the TAPS where the level of use may have been affected by the construction and operation of the TAPS and its associated Haul Road. The region of influence encompasses federal and state lands, including a federally designated Wilderness Area, a National Wild and Scenic River (the Delta River), and a National Wild River (the Gulkana River). The analysis of the alternatives assumed that the TAPS Haul Road north of Fairbanks (Dalton Highway) would remain open to the public and that the existing airports in the utility corridor would remain as well. Under the alternatives, the analysis assumed that past trends provided a reasonable basis for projecting future conditions and impacts.

Recreational resources were identified within the region of influence. Particular consideration was given to BLM recreational opportunity spectrum (ROS) classifications and management objectives for the lands near the utility corridor. The actual evaluation of impacts on recreation focused on changes in ROS classes. Levels of use were evaluated on the basis of permit data as well as other use statistics compiled by the managing government agencies. Current use statistics were extrapolated to project potential impacts to recreational resources under the proposed action. Although quantitative data were employed when possible, the analysis did not discount the value of qualitative information, particularly in the form of opinions from various experts. Appropriate government officials were also interviewed to obtain descriptions of current conditions of recreational resources and their expected future levels of use.

In addition, existing recreational management plans were reviewed to determine consistency with both TAPS renewal and the no-action alternative. These plans included the river management plans for the Delta National Wild and Scenic River and the Gulkana National Wild River (BLM 1983a,b); *Utility Corridor Proposed*

Resource Management Plan and Final Environmental Impact Statement (BLM 1989); *Dalton Highway Recreation Area Management Plan* (BLM 1991); and *Management Framework Plan for the South Central Planning Area* (BLM 1980). Finally, various scenarios were analyzed to determine the potential impacts of spills on recreational resources and the ROS in the region of influence. Impact determinations for accident scenarios were based primarily on the results of the spill analyses for hydrology and ecology.

The analysis of recreational resources was linked to several other disciplines. Visual resources affect the types of recreational opportunities available, just as the number and type of recreational activities occurring affect visual resources. Land use dictates which recreational opportunities are available, whereas the demand for a particular recreational experience or facility dictates important aspects of land use. Changes in transportation modes affect access to recreational resources, with movement by road, air, boat, or foot all providing varying levels of access. Given the nature of recreational resources in the vicinity of the TAPS, ecology was of particular concern — influencing both the availability of recreational opportunities and the quality of the recreational experience. Depending on the level of use, recreational activities in turn also affect ecological resources. Because TAPS-related accidents could potentially affect a variety of recreational opportunities, the recreation analysis was closely coordinated with the spill analysis.

A.13.2 Wilderness

No designated or proposed state or federal Wilderness Areas exist within or adjacent to the TAPS corridor. However, one federally designated Wilderness Area is located within a few miles of the TAPS. Wilderness, as defined by the Wilderness Act of 1964, is a primitive area “. . . untrammeled by man, where man himself is a visitor who does not remain” [16 USC §1131(c)]. Wilderness Areas offer outstanding opportunities for solitude and primitive recreation, are at least 5,000 acres in size, and may contain ecological or other values that

contribute to the designation. The methodology for identifying potential impacts to federally designated Wilderness Areas near the TAPS focused on analyzing the effects to the qualities that qualify the area for wilderness designation. Any ecological impacts are identified as discussed in Section A.7 (Biological Resources).

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 also governs wilderness in Alaska. Specifically, ANILCA exempts Alaskan wilderness from the motorized vehicle prohibition established by the Wilderness Act of 1964. This exemption was considered in determining potential impacts to wilderness.

State-designated wilderness in Alaska is rare, and no state statute exists for such a designation. However, lands within state parks may be designated as wilderness by the Alaska Legislature. Currently, only two state parks are designated as wilderness in Alaska, and both are more than 100 mi from the TAPS. No state designations for wilderness are currently pending in legislature (Mylius 2002).

As noted above, the TAPS ROW corridor does not pass through any designated or proposed state or federal wilderness areas (BLM 1989). However, a federally designated Wilderness Area within Gates of the Arctic National Park and Preserve (NPP) is in the proximity of the TAPS. Important assumptions underlying the analysis of the proposed action, less-than-30-year renewal alternative, and no-action alternative are that the Dalton Highway would remain open to the public and that the existing airports in the utility corridor would remain. The potential environmental effects on both designated and proposed Wilderness Areas, including those related to access, were assessed, as were potential impacts from the no-action alternative, which involves six years of termination activities. Past trends provided a basis for predicting future changes in key variables.

Data were compiled and analyzed to assess the existing condition of the federally designated Wilderness Area in the vicinity of the TAPS and to analyze potential wilderness impacts from the alternatives. Maps showing Wilderness Areas provided basic information on location and

configuration, both key considerations given the importance of geographic proximity to potential sources of impact. Government officials also served as key sources of information. The analysis relied on quantifiable data whenever possible.

The evaluation of impacts to Wilderness Areas analyzed potential impacts to the values that originally qualified the Wilderness Area for designation. In particular, potential impacts to its primeval character, opportunities for solitude and primitive recreation, the ecological or other values for which it was designated, and its overall size were analyzed. Because no Wilderness Areas are within or adjacent to the TAPS, no direct impacts were identified. Impacts were indirect or cumulative, as in the event of a spill. Because of the potential effects of spills on wilderness values, the spill analyses played a particularly important role in the evaluation of Wilderness Area impacts. Impact determinations for accident scenarios were largely based on the results of the spill analyses for hydrology and ecology.

A.13.3 Aesthetics

Aesthetics, also called visual resources, are related to landforms, water, vegetation, animals, and structures. The aesthetics along most of the TAPS are both outstanding and complex — a function of the 800-mi length of the TAPS in a setting known for stunning natural beauty. About half the length of the TAPS is above ground and clearly visible from the air. The majority of the above-ground components are also visible from adjacent public roads (TAPS Owners 2001c). The methodology used to identify current visual resources and potential impacts to aesthetics aimed to examine this complex visual setting in a systematic manner by characterizing aesthetic resources present and assessing impacts under the proposed action, less-than-30-year renewal alternative, and no-action alternative. All considerations of aesthetic impacts recognize that the pipeline is in place and is part of the baseline condition.

The visual resources analysis in this FEIS included considerations of land, water, animals, vegetation, and structures. One important assumption underlying the analysis of these

resources under all of the alternatives was that the Dalton Highway would remain open to the public and that the existing airports in the utility corridor would remain. The region of influence for the aesthetics analysis was specified as *the viewshed*, or localities visible from the TAPS ROW (and vice versa).

Data from selected key sources were analyzed to assess the existing condition of visual resources and to assess potential aesthetic impacts under all alternatives. Visual resource management plans were reviewed for the areas where such plans exist (see below). In particular, this FEIS considered BLM visual resource management (VRM) classifications and objectives for the utility corridor. Officials from several government agencies were interviewed to complement written information. In addition to defining visual resources, VRM classifications, and management objectives, the evaluation of aesthetics impacts included a review of digital topographic data and consideration of existing visual resource mitigation measures.

Under the proposed action and the less-than-30-year renewal alternative, the evaluation of aesthetic impacts examined long-term impacts associated with the continuation of TAPS operation over 30 years or less. For the no-action alternative, the analysis evaluated both short-term (6 years of termination activities) and long-term impacts. Under the alternatives, the analysis began by defining the viewshed to focus attention on the appropriate geographic area. Within the utility corridor, the evaluation identified and plotted VRM classifications and objectives. In addition, it examined existing resource management plans that address aesthetics to determine consistency with the continued operation of the TAPS and the no-action alternative.

Pertinent plans included the river management plans for the Delta National Wild and Scenic River and the Gulkana National Wild River (BLM 1983a,b); *Utility Corridor Proposed Resource Management Plan and FEIS* (BLM 1989); *Dalton Highway Recreation Area Management Plan* (BLM 1991); *Management Framework Plan for the South Central Planning Area* (BLM 1980); and both the Federal Grant and State Lease for the TAPS ROW. These plans provided a basis for assessing likely

impacts under the proposed action, less-than-30-year renewal alternative, and no-action alternative in the region of influence. A number of factors contributed to the degree to which the TAPS could affect the public viewshed, including the distance of the ROW from roadways and public areas, the topography, and vegetation.

The evaluation of aesthetics considered analyses in several other disciplines. Visual resources affect the types of recreational opportunities available in the vicinity of the TAPS, just as the number and type of recreational activities occurring affects aesthetics. Land use, wilderness, transportation corridors, vegetation, and air quality all affect aesthetics — notably landscape and viewing distance. Conversely, aesthetics affect how land is used. Lastly, the aesthetics analysis also considered the range of accident scenarios examined in this FEIS and relied heavily on the results of the spill analyses for hydrology and ecology to determine potential aesthetic impacts of a spill.

A.14 Environmental Justice

The methods used to evaluate impacts relative to environmental justice emphasize issues identified in Executive Order 12898, which defined environmental justice as a topic requiring evaluation in federal actions. This analysis is focused on the identification of any high and adverse impacts to low-income and minority populations as a consequence of the proposed action, the less-than-30-year renewal alternative, and the no-action alternative. The impacts examined include those identified in all other individual disciplines considered in this FEIS. For example, impacts identified in the economic analysis are examined to see if they have environmental justice implications. As noted below, one discipline of particular concern in this study is *subsistence*. A topic of potential concern identified in the original executive order, subsistence is of particular interest in the present study because of the high reliance of rural populations in Alaska (often low-income) and Alaska Natives (minority and also often low-income) on food acquired by fishing, hunting, and collecting.

Minority and low-income populations are defined as follows:

- *Minority* — Individuals who classify themselves as belonging to any of the following racial groups: Black (including Black or Negro, African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian); American Indian, Eskimo, or Aleut; Asian or Pacific Islander; or “Other Race” (CEQ 1997). In the 2000 census, many individuals categorized themselves as belonging to more than one race. This FEIS considers individuals of multiple races to be minority, regardless of the races involved. This study also includes individuals identifying themselves as Hispanic in origin, technically an ethnic category, under minority. To avoid double-counting, the analysis included only White Hispanics, the above racial groups already accounting for non-White Hispanics.
- *Low-Income* — Individuals falling below the poverty line. For the 2000 census, the poverty line was defined by a statistical threshold based on a weighted average that considered both family size and the ages of individuals in a family. For example, the poverty threshold annual income for a family of five with one child younger than 18 years was \$21,024, while the poverty threshold for a family of five with three related children aged less than 18 years was \$19,882 (U.S. Bureau of the Census 2000). If a family fell below the poverty line for its particular composition, the census considered all individuals in that family to be below the poverty line. Low-income figures in the 2000 census reflect incomes in 1999, the most recent year for which entire annual incomes were known at the time of the most recent census.

The region of influence for environmental justice varies by impact area, ranging from the entire state of Alaska to geographic areas near the TAPS. Because the environmental justice evaluation relied heavily on analyses in other disciplines, it also incorporated the assumptions underlying those other inquiries.

Although a certain logic suggests a greater susceptibility of environmental justice

populations to many environmental impacts, perhaps because of less access to key nutrients or medical care than the population as a whole, presently there is no evidence of such differing vulnerability. As a result, the evaluation of impacts in terms of environmental justice generally assumed that minority and low-income populations respond to various impacts in the same manner as the population as a whole. Disproportionality therefore was used primarily as a geographic concept to define places with particularly high percentages of minority and low-income populations. Disproportionately high percentages are those that exceed the percentage of low-income or minority persons in the state of Alaska as a whole. The exception to the assumption that impacts affect all persons similarly are economic impacts because of per capita payments of the Permanent Fund dividend. Minority and low-income populations in Alaska, commonly with larger families than found in nonminority and non-low-income populations in the state (and thus receiving greater total payments), would experience disproportionately high impacts should the dividend be discontinued.

The data used to evaluate impacts related to environmental justice were of two types: census data used to define disproportionality and data on anticipated effects under the proposed action, the less-than-30-year renewal alternative, and the no-action alternative. Data from the most recent decennial census of population and housing, conducted in 2000, provided a recent, detailed basis for evaluating the distribution of minority and low-income populations.

This FEIS analysis examined minority and low-income populations with census data collected and presented for two different demographic units: census block groups and communities. Census block groups are clusters of census blocks (the smallest geographic unit used by the Census Bureau) generally containing 250 to 550 housing units, with the ideal size being 400 housing units. Because housing densities vary considerably, block groups cover a wide range of geographic sizes, with those in rural Alaska, which contains very few people and few houses, geographically quite broad. Individual communities include both incorporated places and *census designated*

places, the latter defined by the Census Bureau for purposes of data collection and presentation. Communities were selected in part on the basis of their geographic proximity to the TAPS, which would increase the likelihood of their experiencing TAPS-related impacts under normal operations, and in part on the basis of their inclusion on a list of directly affected places defined by the BLM (2001). This FEIS considered environmental justice impacts to a total of 44 individual communities. Through the use of these two different geographic units, the environmental justice analysis was geographically commensurate with analyses in two other disciplines having important environmental justice implications — human health (which used block groups) and subsistence (which used communities). Although the economic analysis, which also has important environmental justice implications, used larger analytical units (boroughs and census areas) than the environmental justice analysis, because the block groups aggregate to these larger entities, direct comparisons can be made with the economic impacts.

Environmental justice is not, in itself, an impact area per se. Rather, it encompasses other impacts that are both high and adverse and that affect minority and low-income populations disproportionately. As such, the results of assessments in these other disciplines were crucial in the evaluation of environmental justice; they essentially preceded the environmental justice evaluation.

Because of the reliance of environmental justice assessments on analyses in other disciplines, the actual methods used to evaluate environmental justice were those used in the various other analyses. Although all other disciplines were of concern, of particular importance were those three with important implications for minority or low-income populations: human health, economics, and subsistence. Because of the relationship between environmental justice and other disciplines, impacting factors generally were those associated with the analyses in other disciplines.

A.15 Spills (Accident) Analysis Methodology

A.15.1 General Spills Analysis

A.15.1.1 Introduction and Background

The main objective of the spills³ analysis is to estimate the frequency, quantity, and time dependence (e.g., instantaneous or prolonged) of unplanned releases of crude oil and potentially hazardous substances to the environment. Spill frequency, size, and duration are jointly considered in formulating accidental release scenarios used in estimating the environmental risk discussed in this FEIS.

The scenarios are designed to cover the risk that may be associated with a variety of spills that could affect sensitive environmental media, such as, surface and subsurface soils, groundwater and surface water resources, and the air. Included in the assessed impacts are the risk of damage or harm to plants, animals, and people that depend on and/or come in contact with resources contaminated by the postulated events. In addition to potential crude oil spills, releases involving refined petroleum products, including diesel fuel, jet turbine fuel, and gasoline, were also assessed. Where appropriate, hazardous materials used in the operation of various TAPS facilities, such as sulfuric acid and sodium hydroxide use at the Valdez Marine Terminal power plant, were considered in the postulated spill scenarios.

The scope of the spills analysis covers the entire TAPS, from production before the beginning of the pipeline (Milepost [MP] 0) to tanker loading and shipment at the end of the pipeline (MP 800). The potential impacts or risk of spills from TAPS operations from PS 1 to MP 800 at Valdez Marine Terminal and from the Valdez Marine Terminal through tanker loading

were treated as part of the proposed action to renew the Federal Grant of ROW lease. Impacts associated with the North Slope oil fields and pipelines up to the boundary of PS 1 and the transport of the petroleum from loading berths at Valdez Marine Terminal to approximately 15 mi past the Hinchinbrook Entrance to Prince William Sound (about 78 nautical miles from the Valdez Marine Terminal) were treated under the cumulative impact section of this FEIS. The risk of spills connected to decommissioning, removal, and recovery activities for the TAPS were assessed under the no-action alternative. Under no action, it is assumed that all oil production at the North Slope would stop. The only crude oil that could potentially be released to the environment under such conditions would be crude left in the pipelines and storage tanks. The no-action alternative scenarios were evaluated by using data obtained from the TAPS construction period to estimate the quantities of residual products (diesel fuel, gasoline, heating oil, etc.) released to the environment.

The approach described in Section A.15.1.2 on developing the spill scenarios does not account for what would be expected in a comprehensive spill response, nor should the developed scenarios be regarded as predictions of specific spill response procedure performance. The developed scenarios were intended for use in quantifying the potential magnitude of the environmental impacts assessed and reported in this FEIS. Actual spill responses would be tailored to the existing site conditions and the requisite response requirements.

The methodology used in developing spill scenarios required careful consideration of the type of oil that could be spilled in the proposed continued operation of the TAPS or in removal and restoration activities should the TAPS ROW grant not be renewed.

Oil can be divided into five broad classes on the basis of its physical and chemical characteristics and the possible toxicity, damage, or injury to humans and natural

³ The term spills as used in this appendix refers to unplanned or accidental releases of crude oil or other potentially hazardous materials to the environment. The spilled material can be in a liquid or vapor phase and/or occur as a secondary aerosol or gas formed in a crude oil fire or transformed to gases or aerosols in the atmosphere from the release of reactive or volatile hydrocarbons.

resources from exposure to spilled product or contaminants and/or contaminants evaporated from the original liquid state. Pertinent properties of each oil class are summarized in Table A-3. Two of the five types correspond to refined petroleum product used during pipeline operations.

Crude blends vary greatly in their chemical composition, depending on the geographical location of their origin and the particular compounds mixed with the petroleum products. Surfactants, often added to aid transport, will affect physical properties when spilled. The TAPS uses drag reducing agent as a throughput enhancing surfactant.

Hydrocarbons are by far the most abundant compounds in crude oils, accounting for 50 to 98% by volume. All crude blends contain lighter “fractions” of hydrocarbons (e.g., gasoline) as well as heavier tars and wax-like hydrocarbons.

North Slope crude blends are Type 3 oil products and are considered medium grade. The British Petroleum North Slope crude from PS 9 has a relatively high viscosity (23.9 cSt at 50°F) and an American Petroleum Institute (API) rating of 29.6 (NOAA 2001).

On the basis of their characteristics, Type 1 and Type 2 oils have differing direct effects on living organisms. Gasoline is more acutely toxic than diesel products, but evaporates faster. Diesel readily emulsifies in water, increasing its viscosity and its volume, while gasoline does not emulsify. Both types of products tend to penetrate the substrate rather than adhere to the surface.

A.15.1.2 Formulation and Development of Spill Scenarios

The first step in formulating the spill scenarios analyzed in this FEIS was to identify a representative range of accident scenarios and the associated source terms for the spills analysis by grouping or classifying potential spill events by frequency and associated magnitude. This process involved selection of four frequency classifications that would cover spills ranging

from those that would be considered as high-frequency, low-consequence events, to spills considered extremely low in frequency but of potentially high consequence. The frequency classification scheme chosen is summarized in Table A-4. Spill events grouped in the high or intermediate frequency categories are anticipated or likely spills that have occurred over the operational life of the TAPS. They have a spill occurrence of one or more times per year or one or more times over the original ROW lease period. It is reasonable in considering the historical record to assume that spill events in these two categories would be anticipated at a similar frequency or would likely occur over the proposed 30-year TAPS ROW renewal. The last two categories are low or extremely low frequency events that are unlikely or very unlikely to occur during the renewal period for the TAPS.

The Exxon Valdez oil spill that occurred in Prince William Sound in 1989 would be considered a catastrophic event (a marine spill of greater than 250,000 bbl of crude). All of the other spills into Prince William Sound since 1977, in comparison, would be considered small (less than 60 bbl). Over 90% of these spills involved less than a barrel of oil, with around 60% of the total less than a gallon. Because of the scheduled phaseout of single-hulled tankers, shipments of North Slope crude by double-hulled tankers as a percentage of tanker shipment volumes will increase from 38% in 2004 to 100% in 2014. Although the Exxon Valdez spill did occur during TAPS operations, because of the resulting and anticipated changes in tanker operations and design and in consideration of the risk assessment associated with future tanker operations in Prince William Sound (PWS 1999), repetition of such an event would still be considered extremely unlikely within the proposed grant renewal period.

Data on spill frequency, quantity, and duration from the TAPS historical record and relevant engineering information on the TAPS system were collected, reviewed, and analyzed. A total of around 80 “credible” spill or accident release scenarios (with likelihoods greater than 10^{-6}) were developed and sorted into the four frequency classes identified in Table A-4.

TABLE A-3 Types and Properties of Oil***Type 1 very light grade oils (gasoline)***

- Highly volatile and soluble
- Evaporates quickly, often completely within 1 to 2 days
- High acute toxicity

Type 2 light grade oils (jet fuels, diesel, No. 2 fuel oil, light crude)

- Moderately volatile
- Will leave residue (up to one-third of spill amount) after a few days
- Moderately soluble, especially distilled products
- Moderate to high acute toxicity; product-specific toxicity related to type and concentration of aromatic compounds

Type 3 medium grade oils (most crude oils)

- About one-third will evaporate within 24 hours
- Typical water-soluble fraction 10–100 ppm
- May penetrate substrate and persist
- May pose significant cleanup related impacts
- Variable acute toxicity, depending on the amount of light fraction

Type 4 heavy grade oil (heavy crudes, No. 6 fuel oil, bunker C)

- Heavy oils with little or no evaporation or dissolution
- Water-soluble fraction typically less than 10 ppm
- Heavy surface contamination likely
- Highly persistent, long-term contamination possible
- Weathers very slowly, may form tar balls
- May sink depending on product density and water density
- May pose significant cleanup related impacts
- Low acute toxicity relative to other oil types

Type 5 low API fuel grade oils (heavy industrial fuel oils)

- Neutrally buoyant or may sink, depending on water density
- Weathers slowly; sunken oil has little potential for evaporation
- May accumulate on bottom under calm conditions and smother subtidal resources
- Sunken oil may be resuspended during storms, providing a chronic source of shoreline oiling
- Highly variable and often blended with oils
- Blends may be unstable and the oil may separate when spilled
- Low acute toxicity relative to other oil types

Source: Adapted from Huguenin et al. (1996).

TABLE A-4 Event Frequency Classifications

Event Likelihood	Frequency Class	Consequence
High frequency (anticipated)		
Events anticipated to occur one or more times every few years	$f > 0.5$ per year	Small
Intermediate frequency (likely)		
Events that are likely to occur once or more during the ROW renewal period	$0.03 < f < 0.5$	Moderate
Low frequency (unlikely)		
Events that are unlikely to occur during the ROW renewal period	$(10^{-4} < f < 0.03)$	Large
Extremely low frequency (very unlikely)		
Events that are extremely unlikely to occur but, if they occurred, could have severe consequences	$(10^{-6} < f < 10^{-4})$	Very large or severe

Initiators that could generate a spill with likelihoods less than 10^{-6} were by definition deemed “incredible” events and therefore not considered for further analysis. The scenarios covered potential failures and associated frequencies in the major TAPS system components and subcomponents that could occur from a broad range of accident initiators (see Section A.15.1.5 for further discussion). Included were event causes (internal initiators) ranging from human error and failures in system subcomponents (e.g., check valves, corrosion and fatigue in the pipeline) to spills caused by external initiators such as earthquakes, landslides/avalanches, aircraft crashes, tsunamis, wildfires, flooding, and vandalism or sabotage.

The major TAPS components covered in the analysis included the main-line pipe, pump stations, crude oil tanks and tank farms, and loading berths. Subcomponents considered included pipeline gate and check valves, pipeline controls (e.g., leak detection, telecommunication, remote gate valve system), and the metering stations. In addition to potential crude oil releases to the environment, other material releases considered included refined petroleum products (e.g., gasoline, diesel fuel, turbine fuel, oils, and jet fuel), drag reducing agent, and other system-related chemicals (e.g., sulfuric acid).

A.15.1.3 Spill Analysis Output

For each of the scenarios, the quantity and rate of material released (the source term) were established as functions of pipeline operating assumptions or crude oil throughput (see discussion in Section A.15.1.4). Source terms were established for affected TAPS system components or subcomponents. A variety of system parameters and assumptions were required, including failure modes (e.g., pipe corrosion hole size, location on pipeline of guillotine break initiated by an external event), pipeline static and dynamic pressure and temperature, and other design and/or operating parameters (e.g., tank capacity). In some cases, the source term may be given as a range of values or as different amounts released for different locations along the pipeline. The time dependence and mode of release were also factored into the established spill scenarios. Although the most common or likely mode of release considered was a liquid crude oil spill along the pipeline, other release modes, such as an explosion, fire, and evaporation from a liquid spill, were also considered. Most of the scenarios were characterized as continuous releases over a finite duration or instantaneous, such as a vapor cloud explosion.

A.15.1.4 Major Assumptions

One of the key assumptions necessary for estimating potential future crude oil spill rates and spill volumes is a reasonably reliable forecast of pipeline throughput, typically expressed in millions of barrels of crude oil per day (bbl/d). The TAPS Emergency Preparedness and Contingency Plan is based on a throughput of 1.5 million bbl/d (APSC 2001a). The plan used estimates of spill volumes in accordance with the State of Alaska Planning Standard and used APSC's TAPS Spill Program to estimate spill volumes assuming this throughput. Historical throughputs over the past 10 to 15 years have ranged from around 1.0 million to 2.1 million bbl/d, the maximum design capacity throughput for TAPS. Since 1988 the average annual throughput has declined steadily, as shown in Figure A-1. The Environmental Report (TAPS Owners 2001a) referenced the U.S. Department of Energy (DOE) forecast of throughput that indicated a steady decline at around 4.2% per year for the next 18 years and then assumed a leveling off at around 0.49 million bbl/d through the end of the pipeline proposed action for ROW renewal through 2034. A daily throughput of around 0.7 million bbl/d was observed in October 2001, but projections of the annual average for 2001 are expected to be around 1 million bbl/d.

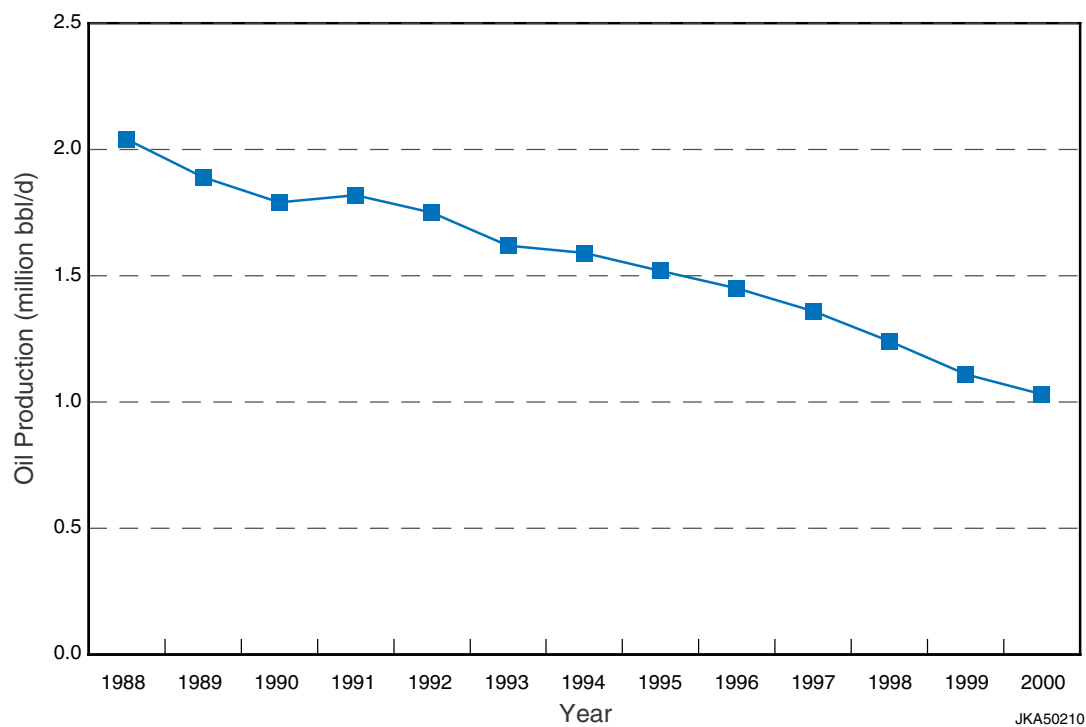
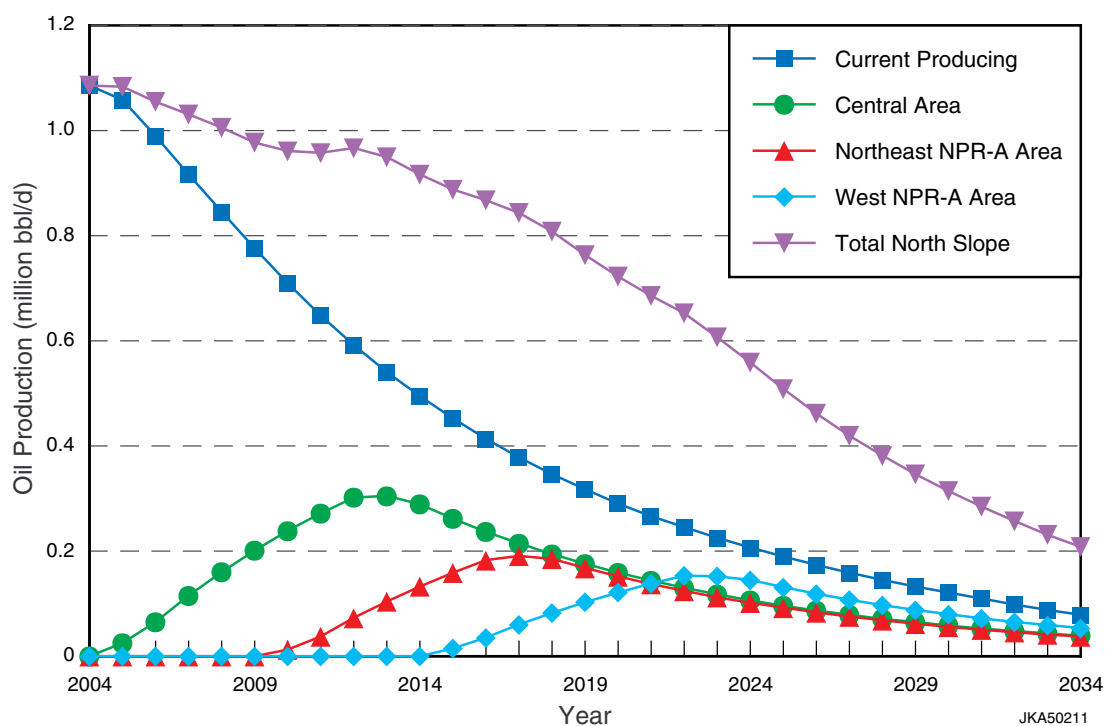
The DOE Energy Information Administration's (EIA's) Office of Oil and Gas, Reserves and Production Division, publishes annual updated data and forecasts of future oil production for the North Slope. The last report included a range of plausible production scenarios for the North Slope area of Alaska (DOE 2001). These scenarios were based on the decline of existing production, the anticipated start-up of identified field development projects, and future discovery and development of the remaining undiscovered oil resources estimated for the area by the USGS, the BLM, and the Minerals Management Service (MMS). The EIA's 30-year projections (2004 through 2034) show that crude oil production from existing producing and developing oil fields of the North Slope plus future production potential from three other areas (two in the National Petroleum Reserve and the Central North Slope) show a decline from around 1 million bbl/d in 2004 to around

200,000 bbl/d by 2034. The average over this 30-year projection period is 703,000 bbl/d. Figure A-2 shows the trend in total North Slope oil production projections along with the contributing projections from each four producing or potentially producing areas. Included in the figure is the 300,000 bbl/d number identified in the EIA report as the minimum operating volume or throughput lower limit. The TAPS maximum design capacity is 2.1 million bbl/d.

To limit the spill scenarios to a reasonable number, three throughput assumptions were used: the TAPS maximum design capacity of 2.1 million bbl/d, the minimum economically based operating value of 300,000 million bbl/d, and a base-case value of 1.1 million bbl/d that would represent a more likely throughput for continued operation of the TAPS. These throughputs provide upper and lower bounds to the spill scenarios analyzed in this FEIS, along with a value that would be considered representative of future operations.

In addition to throughput, the spills analysis assumed that all tankers loading crude at the Valdez Marine Terminal and shipping crude through the Prince William Sound would be double-hulled after May 2013. A recent review by the National Research Council (1998) concluded that double-hulled tankers are four to six times less likely than single-hulled tankers to spill oil in a vessel collision or grounding that penetrates the outer hull. The National Research Council estimated that the expected or average outflow is three to four times less with a double-hulled vessel compared with a single-hulled tank vessel and that the probability of a spill would be reduced by a factor of 4 to 6. Expected spill volume would be reduced by factor of 3 to 4.

Scenarios involving leaks from the pipeline under current operating controls and with leak detection systems in operation would allow small leaks to go undetected at a rate of 3,000 to 6,000 bbl/d (under slack line conditions) for around 4 to 7 days. Where practical, the spill scenarios and the assessed impacts gave credit for spill containment and cleanup actions consistent with records of TAPS historical spill response and cleanup, as coordinated from the APSC Fairbanks office and their SERVS unit at the Valdez Marine Terminal.

**FIGURE A-1 North Slope Crude Oil Production from 1988 to 2000****FIGURE A-2 Projections of North Slope Crude Oil Production**

A.15.1.5 Data Used in the Spills Analysis

As mentioned above, the high and intermediate frequency spill events were identified from the historical TAPS spill record. Several available existing databases were reviewed, including the ADEC and APSC data referenced in the Environmental Report (TAPS Owners 2001a). The database, known as the Operations Oil Spill database, was the primary source of data used in developing spill scenarios with high and intermediate recurrence frequencies. The database, originally compiled by the TAPS Spills Database (TAPS Owners 2001b) with amendments and verification by Argonne, was updated with spill data for the period August 1999 through October 2001. Refinements to these spill scenarios and development of the low and extremely low frequency scenarios were made with the aid of several TAPS-related system and system component risk assessments. A snapshot from the spills database is given in Figures A-3 and A-4, which show the crude oil spill frequency by the major TAPS segments and by spill size groupings. The data reveal that the majority of the spills over the TAPS lifetime have occurred in the North Slope, with around 20% equally split between the pipeline and Valdez Marine Terminal spills. Almost 80% of the spills were in quantities of less than a barrel.

Where necessary, additional sources of data were collected to help identify creditable extremely low frequency events. The *Trans-Alaska Pipeline System Risk Assessment* (Technica, Inc. 1991) was one of the more quantitative of the risk assessments reviewed. An update to that assessment was in preparation, but the final report was not available in time for full consideration in developing the spill scenarios. Other risk assessment studies considered in formulating scenarios were those conducted for the major pipeline components, including the North Slope, Valdez Marine Terminal, and Prince William Sound, and for some of the systems subcomponents. Some of these studies are listed below:

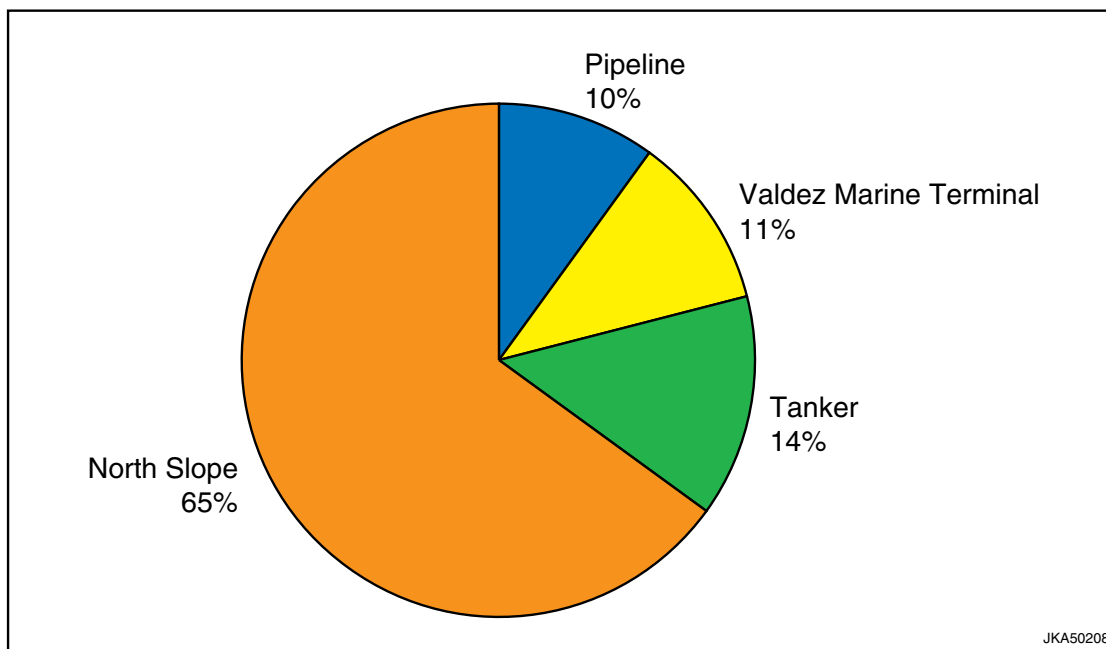
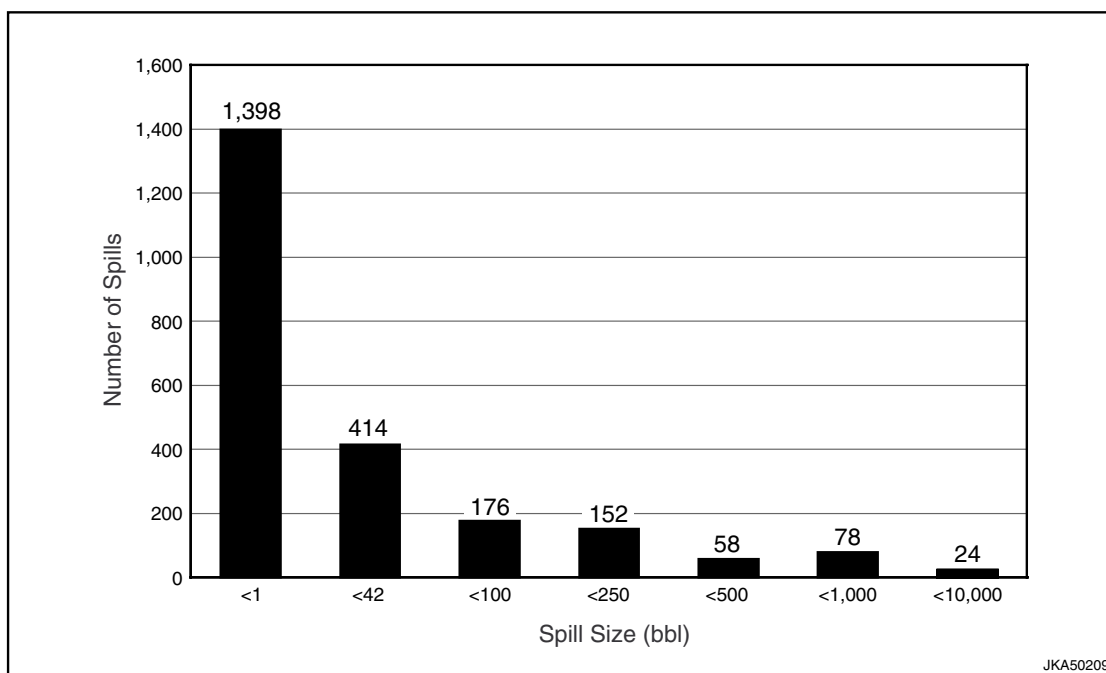
- *Risk Analysis Screening Study for the Trans-Alaska Pipeline System* (Taylor and Associates 1995);

- *Prince William Sound, Alaska Risk Assessment Study, Final Report* (Det Norske Veritas et al. 1996);
- *Trans-Alaska Pipeline System Primary Block Valve Risk Assessment* (Malvic and Weber 1997);
- *Estimation of Oil Spill Risk from Alaska North Slope, Trans-Alaska Pipeline, and Arctic Canada Oil Spill Data Sets* (Mach et al. 2000);
- *Valdez Marine Terminal Oil Spill Risk Assessment* (Emerald Consulting Group 2001);
- *10 Pipeline Valves with Leak-Through Risk Assessment* (Aus et al. 2001); and
- *Risk Assessment, Trans Alaska Pipeline System, Final Report* (Capstone 2001).

Information sources for development of the spill scenarios included the risk assessments, systemwide and component emergency preparedness and response plans, the TAPS ROW Environmental Report, and other related data. The data and assumptions used for spill analysis in this EIS were coordinated through interactions with the JPO and APSC engineers. Discussions covered reliability of system components, corrosion and metal fatigue data, historical incident databases, plans for drag reducing agent use, and transportation data along the pipeline.

A.15.1.6 Impacting Factors or Event Initiators

The accident scenarios covered both internal and external initiating events. The internal initiators considered included spills caused by equipment failure in valves, pumps, turbines, or tanks; human error; and aging effects, including corrosion and metal fatigue. Traffic accidents were covered under human error. External initiators covered natural phenomena, such as earthquakes, lightning strikes, floods, and climate change. Events caused by an aircraft crash into the pipeline or into a storage tank were also assessed as

**FIGURE A-3 Spill Frequency by TAPS Segment****FIGURE A-4 Number of Spills by Size over TAPS Lifetime**

external initiators or impacting factors. Finally, acts of vandalism, sabotage, or terrorism were also considered as initiators.

A.15.1.7 Links to Environmental Resource Impact Disciplines

The output of the spills analysis consists of source terms or accidental environmental releases used in support of risk assessments conducted for other disciplines or environmental impact areas covered in this FEIS. Spill quantities, duration, and recovery or cleanup assumptions were provided to support the hydrological (surface and subsurface), ecological (land and marine based), human health and safety (immediate and long-term), and air resource (concentrations and deposition) risk assessments. The risk of spills to these resources was factored into associated social and economic impacts. Potential iteration and refinements were made to the spill scenarios from consultation with each of the disciplinary teams and from the review and discussion of results.

A.15.2 Calculations Relative to Oil Spills to Surface Water and Groundwater

A.15.2.1 Calculations for the Potential Capture of Crude Oil

In the event of a pipeline break that releases crude oil to flowing water, estimates are needed for several parameters in order to calculate the potential for recovery of the oil. Parameters involved include the location of the leading edge of the oil in the water at the response time of the containment crew (based on time needed for the response team to arrive at the containment site and begin containment activities); the length of the oil plume; the percent of oil subject to capture at the containment location; and the width of a spill downstream of the break.

The location of the leading edge of the oil in the stream or river at the response time was estimated by multiplying the velocity of the water times the response time. The oil is assumed to travel at the water velocity; the water velocity is assumed to be equal to values presented in the contingency plans for the TAPS ROW. Response times were provided by Folga et al. (2002).

The length of the oil smear in the moving water was estimated as the product of the water velocity and the time needed to discharge the designated volume of oil from the break. Release volumes and emptying times were obtained from Folga et al. (2002). For this calculation, the oil slick is assumed to move downstream as a plug, with distinct leading and trailing edges. The first drop of oil into the water defines the leading edge, and the last drop of oil defines its trailing edge. Under actual conditions, the length of the oil slick would extend from the leading edge of the plume to the location of the break because of hangup along the route, regions of slower moving water, bends in the river, turbulent mixing and dispersion, and remobilization of oil from banks and stream beds.

If the flow of oil in the water is conservatively treated as plug flow (i.e., flow in which the leading and trailing edge of the flow are abrupt), the following equation can be used to estimate the percent of oil subject to capture at the containment site:

$$PC = 100 \times \frac{T_{empty} - T_{response} + T_{cs}}{T_{empty}}, \quad (E-1)$$

where

PC = percent of crude oil subject to capture at the location of the containment site,

T_{cs} = time for the oil to reach the containment site,

T_{empty} = time to discharge the oil from the pipeline break, and

$T_{response}$ = time for the response team to reach the containment site and begin containment activities.

The time for the oil to reach the containment site is calculated as the distance from the break to the containment site divided by the velocity of the water in the river or stream. Two methods were used to estimate the time to discharge the oil from the break (T_{empty}). For a guillotine break (instantaneous release), the time was estimated as the volume of oil that would be released divided by the throughput value (Folga et al. 2002). For prolonged discharges, the emptying time was estimated as the volume of oil released divided by the duration time (e.g., 48 hours). Response times were obtained from values provided by Folga et al. (2002).

Because the above equation assumes plug-flow conditions, the result is likely to underpredict the amount of oil that could be captured at the containment site. However, more detailed calculations would require extensive site-specific hydrological information (e.g., flow rates, stream widths, bed and bank conditions, wind speed and direction, temperature, and ice cover) that would only be available at the time of an actual release.

The final parameter for estimation is the width of the slick downstream of the break. In many applications, crude oil spills are assumed to spread circularly (Shen et al. 1988). This spreading is often represented by the following equation:

$$A_s = 10^5 vol^{3/4}. \quad (E-2)$$

where

A_s = area of the spill (m^2), and

vol = volume of the spill (m^3).

The width of the slick, w_{slick} , is then obtained from the relationship:

$$w_{slick} = 2 \times \sqrt{\pi A_s}. \quad (E-3)$$

A.15.2.2 Groundwater Calculations for a Subsurface Guillotine Break

In an underground guillotine break, crude oil would be released to the area adjacent to the buried pipe. In regions of stable permafrost, the pipe would release its contents to thaw bulbs formed under normal operations by heat transfer from warm oil flowing in the pipeline. In areas in which permafrost is absent, the release would be to the surrounding soil. As discussed in Section 4.4.4.4.2, a guillotine break in the Brooks or Alaska Ranges would release a maximum of 46,994 bbl of oil to stable permafrost and thaw bulbs. In the Chugach Range, a maximum release of 38,773 bbl would occur to the backfilled trench. If the trench was not sufficiently buried, the pressure from the oil could force the fluid to the surface of the ground. The presence of ice above the pipeline could reduce the possibility of this type of event; however, the warm oil could melt the ice and force its way up to the surface anyway. Impacts from this type of spill are addressed in Section 4.4.4.1 for an aboveground guillotine break. For an underground guillotine break of the pipeline, the oil is assumed to remain belowground in either thaw bulbs in permafrost areas or along the pipeline trench in areas where permafrost is not present.

In the Brooks and Alaska Ranges, thaw bulbs have developed along sections of the buried pipeline. Precise information is not available on their size; however, in the vicinity of PS 3, the thaw bulb is estimated to have a diameter of 60 ft (Keyes 2002). For this analysis, the thaw bulbs are assumed to be circular, with a width equal to 60 ft. The cross-sectional area, A_t , of the thaw bulb is then calculated as:

$$A_t = \pi R^2, \quad (E-4)$$

where R is the radius of the thaw bulb. The total area is thus about 2,800 ft^2 .

This entire area is not available for transporting fluids because of the presence of solid material such as sands, gravel, and the pipeline, which has an effective area of about 12.6 ft^2 . For the backfilled trench, the ratio of the volume of void space present to the total volume (i.e., porosity) is assumed to be 0.3 (Freeze and

Cherry 1979). The area of the thaw bulb that can transmit a fluid is called the effective area and is designated as A_e . This area can be calculated from the total area by multiplying the total area, less the area of the pipeline, by the porosity of the fill material, ϕ . That is:

$$A_e = (A_t - A_{pipe})\phi. \quad (E-5)$$

For a porosity of 0.3, the effective area of the thaw bulb zone is about 850 ft².

The maximum volume of oil released for an underground guillotine break in the Brooks or Alaska Ranges would be 46,994 bbl (about 2 million gal). Converting this volume to cubic feet gives a spill volume of about 263,900 ft³. Dividing the volume of the spill by the effective area gives an estimate of the length of oil-filled space along the pipe. For an effective flow area of 850 ft², the oil could occupy a length of about 300 ft.

Once in the thaw bulb, the oil would flow downhill. Because it would be in a porous material, it would have an apparent velocity given by the expression:

$$V_{el} = \frac{K \nabla h}{\phi}, \quad (E-6)$$

where

K = the hydraulic conductivity (measure of the ability of a material to transport a fluid) of the fill material in the trench and

∇h = the hydraulic gradient (change in elevation with respect to distance).

For a gravel-like fill, the hydraulic conductivity is about 280 ft/d (Freeze and Cherry 1979). Neglecting the initial pressure of the oil in the pipe, the hydraulic gradient for a mountainous region is assumed to be 0.2 (TAPS Owners 2001c). The velocity of the oil in the thaw bulb would, therefore, be about 200 ft/d. It would thus take about 1.6 days for the oil to travel 300 ft. Because the pipeline operates at a pressure of about 1,180 psi (APSC 2001b), the initial velocity of the emergent oil will be higher than that calculated, assuming that the oil would

flow under the conditions of the natural hydraulic gradient present. For a pressure of 1,180 psi, the equivalent pressure head (elevation) of the oil can be found from the expression:

$$h_{oil} = \frac{P}{\rho_{oil} g}. \quad (E-7)$$

The pressure head of the oil is thus about 3,130 ft for a crude oil density of 0.8699 g/cm³ (Folga et al. 2002). This pressure head would increase the velocity by about 50 to 10,430 ft/d if a separation distance of 300 ft is used to define the gradient. The travel time would, therefore, be reduced to about 1 hour. Because the pressure head of the oil is so high, the spilled oil would probably escape the thaw bulb and discharge at the ground surface. Once all of the oil in the broken pipeline segment was released to the thaw bulb, it would continue to move downgradient until there was a sufficient topographic change to reduce the hydraulic gradient to zero, or until the oil found a path to the surface of the ground.

Depending on the time needed to respond to the spill, more than 300 ft of thaw bulb would be contaminated by the spilled oil. Because the spilled oil in the thaw bulb would still be under pressure, care would have to be taken in excavating down to the pipeline.

In addition to contaminating the water in thaw bulbs along the TAPS, oil released from an underground guillotine break could melt the surrounding permafrost. The melting would occur because the crude oil from the pipeline would be warmer than the ice.

It is assumed that initially, the oil in the pipeline in the vicinity of the spill would be 110°F (43°C) and the temperature of the permafrost would be 23°F (-5°C). It is assumed that at equilibrium, the oil would cool to 32°F (0°C), and the permafrost would convert to water at 32°F (0°C). The change in energy in the oil would warm the permafrost to its melting point and then melt it. Sufficient ice is assumed to be present to prevent the melt water from increasing in temperature to a value greater than 32°F (0°C). This thermodynamic process can be represented by the following equation derived from phase change information presented in Sears (1964):

$$Cp_{oil}\Delta T_{oil}M_{oil} = M_{ice}h_f + Cp_{ice}\Delta T_{ice}M_{ice}, \quad (E-8)$$

where

Cp_{oil} = specific heat capacity of oil (j/kg/K),

Cp_{ice} = specific heat capacity of ice (j/kg/K),

h_f = latent heat of fusion (ice to water) (j/kg),

M_{oil} = mass of oil spilled (kg),

M_{ice} = mass of ice melted (kg),

ΔT_{oil} = temperature change of the oil (K), and

ΔT_{ice} = temperature change for the ice (K).

Equation 5 can be solved for the mass of ice that could be melted by the warm oil:

$$M_{ice} = \frac{Cp_{oil}\Delta T_{oil}M_{oil}}{h_f + Cp_{ice}\Delta T_{ice}}. \quad (E-9)$$

The mass of oil spilled is calculated as its density (0.8699 g/cm³ times the spill volume (46,994 bbl). The specific heat capacity of the crude oil was assumed to be constant and equal to about 2,100 j/kg/K (mid-continent crude with an API gravity of 30° [Bradley 1992]). This value is consistent with the finding that the specific heat capacity of crude oil is about one-half that of water (Davies et al. 1999), which is about 4,190 j/kg/K (Weast 1968). Other values needed to evaluate Equation E-9 are listed in Table A-5.

TABLE A-5 Physical Constants for Ice-Melt Calculation

Parameter	Value
H_f	335,000 j/kg (Weast 1968)
ΔT_{ice}	5°C
ΔT_{oil}	43°C
Cp_{water}	4,184 j/kg/K (Weast 1968)

The maximum volume of ice that could be melted according to Equation E-9 for the given input parameters is about 1.7×10^6 kg. For an ice density of 917 kg/m³ (Davis 2001), about 65,300 ft³ (1,850 m³) of ice could melt. If ice melted from around the thaw bulb in a concentric circle, the radius of the melted zone can be found from the following relation:

$$\pi(r^2 - r_0^2)L = Vol_{ice}, \quad (E-10)$$

where

L = the length of the region that would fill with oil,

r_0 = the radius of thaw bulb (30 ft), and

Vol_{ice} = the volume of ice melted.

Solving for the radius of the melt zone gives:

$$r = \sqrt{\frac{Vol_{ice}}{\pi L} + r_0^2}. \quad (E-11)$$

For a volume of ice of 65,000 ft³, the radius of the circle melted by the warm oil would be about 31 ft. The new diameter of the thaw bulb would be about 62 ft.

In the Chugach Range, an underground guillotine break would release crude oil to the soil. In that region, the pipeline trench is assumed to have a width of 8 ft and a depth of 12 ft, with about 4 ft of fill material on top of the gravel pack. The total cross-sectional area of the gravel pack and pipe is assumed to be 64 ft². Subtracting the area of the pipe and multiplying by an assumed porosity of 0.3 gives an effective area of about 15 ft². For a release of 38,773 bbl (about 220,000 ft³), the oil could fill an annulus of about 2.7 mi.

A.15.3 Fire Analysis of Spill Events

The spills analysis identified six spill scenarios involving fires that could be defined as credible events (frequency of occurrence greater than once in a million years). The first two crude oil fire events considered are those occurring at fixed pipeline facilities. Each of these events

involves very large crude oil pool fires from an aircraft impact: one in the secondary containment dike at the Valdez Marine Terminal East Tank Farm (identified as Scenario 10 in Section 4.4.1), and one resulting from a pipeline guillotine break near Fairbanks (identified as Scenario 19b Section 4.4.1). The last four fire spill scenarios are vehicle transportation accidents. Three of the scenarios involve rollovers of fuel tanker trucks carrying liquid turbine fuel during shipments between (1) Williams North Pole Refinery to PS 7 and 3, (2) Williams North Pole Refinery to PS 9, and (3) PetroStar Refinery in Valdez to PS 12. The sixth transportation spill scenario involving a fire is a fuel truck shipment carrying arctic grade diesel from the Williams North Pole Refinery to Deadhorse. Because the transportation spill scenarios involved much smaller spill quantities compared with the Valdez Marine Terminal and pipeline fire scenarios, quantitative analysis of these events was not performed. The associated consequences and risk of truck accidents involving flammable and/or explosive materials can be found in the DOT National Transportation Risk Assessment (Brown et. al. 2000a).

To estimate fire impacts, simulations were performed with two models: the Fire Dynamics Simulator (FDS) and FIREPLUME. The near-field (distances less than 1 km from the dike fire) air quality impacts from this dike fire were assessed with the FDS model for locations near the dike and pipeline, and at distances from the fire where workers or nearby residences may be exposed. FIREPLUME was used to estimate soot and other combustion product impacts from a few kilometers to 50 km downwind of the dike fire. Considering the uncertainty in any model's predictions, a decision was made to err on the conservative side by using the results from the model producing the largest concentration estimates in the downwind range from 3 to 10 km.

Earlier versions of FDS have been applied in estimating particulate concentrations from in-situ

burning of crude oil in Alaska as far out as 4 to 6 km (McGrattan et al. 1995). The strongest limitation of the FIREPLUME analysis for the Valdez cases is the neglect of terrain considerations since FIREPLUME is based on a flat terrain representation of the atmospheric boundary layer. The mountains surrounding Valdez may lead to higher ground-level impacts than predicted by the model because of the large amount of vertical mixing that can occur on the lee sides of mountain ranges.

The FDS (version 2.2) model was used to estimate key fire buoyancy parameters (temperature, vertical velocity, and plume density) and near-field soot and other combustion product impacts. The model is capable of simulating fire-induced flows or wind fields that influence smoke ground concentrations close to or within a few kilometers of the fire. A detailed description of the model can be found in McGrattan et. al. (2001). The fire combustion product air emissions were estimated using emission factors derived from the Newfoundland offshore burn experiment as reported in McGrattan et. al. (1997) and with an average constant burn rate of $0.051 \text{ kg/m}^2\text{-s}$ for North Slope crude oil (McGrattan et. al. 1997).⁴ Emission factors, which express pollutant mass release per unit mass of fuel consumed, were available for smoke/soot particles in various size fractions and for six gaseous fire combustion products (CO , SO_2 , NO_x , VOCs, PAH, and CO_2). Laboratory and field experiments involving various crude oil pool fire sizes show that larger fires tend to produce larger soot yields (ranging from around 5 to 15%). The quantity of soot generated in pool fires is by far the largest quantity on a mass basis of any of the major pollutants emitted from such fires. On the basis of smoke production data collected in large crude oil mesoscale burn experiments, a soot yield of 13.7% was assumed for the Valdez Marine Terminal and pipeline scenarios (Notarianni et al. 1993). A soot emission factor can be computed by taking the ratio of the mass

⁴ As multicomponent mixtures do not evaporate at uniform rates, fires involving fuel blends, such as crude oil, do not burn at uniform rates. At the beginning of the fire the burning rate is characteristic of the more volatile lower boiling point components (e.g., butane burns at around $0.8 \text{ kg/m}^2\text{-s}$), while near the end of the fire the higher boiling point components burn at a slower rate, typically around $0.04 \text{ kg/m}^2\text{-s}$ (Mudan 1994). Because the light-ends burn off so rapidly, the average burn rate is closer to slower and, therefore, longer burning heavy-ends (higher molecular weight and higher boiling point components, such as acetone).

of soot released in the fire (soot yield $\times$ mass of oil burned) to the mass of oil burned. The soot emission factor with a 13.7% yield is calculated to be 137 g/kg (estimated soot generation mass/mass of crude oil burned). Data on smoke particle size distributions reported by McGrattan et al. (1997) show that 87% of the particulate mass from burns of several crude oil types, including North Slope and Cook Inlet crudes, was represented by particles less than or equal to 10 μg in diameter. These data assume a 13% soot emission factor.

The buoyancy parameters generated with the FDS model were used as input to the FIREPLUME model (Brown et al. 2000b). The FIREPLUME model predicts the ground-level concentration field resulting from chemicals or combustion products emitted from or within (1) fires that generate hot continuous plumes such as the oil fires considered in this analysis; (2) instantaneously discharged thermal or explosive discharges; or (3) smoldering or decaying fires, including the nominal case of passive or neutrally buoyant releases, which serve as a limiting case for a smoldering fire. There are four classes of fires, categorized according to the kind of material that is burning. Both of the TAPS pool fire scenarios would generate very hot plumes typical of Class B fires, which involve flammable and combustible liquids that are best extinguished by foam, CO_2 , or dry chemicals. All petroleum fires, including fires involving crude oil, are considered Class B fires, which can be very hot and do not exhibit a smoldering combustion phase.

The FIREPLUME model consists of two components. The first is a single particle Lagrangian dispersion model that estimates vertical dispersion of both buoyant and nonbuoyant releases in the atmospheric boundary layer. The second component is a puff dispersion model that translates the vertical dispersion estimates to ground-level concentrations taking into account horizontal dispersion and transient source emission characteristics. The calculation is broken up in this manner to reduce computational time. Taken together, these components provide time varying concentration fields resulting from releases in which both the buoyancy and chemical release rate vary with time. The framework for treating

source buoyancy closely follows from the so-called Briggs's two-thirds law (see Briggs 1984), which is applicable in cases in which the buoyant source has low initial momentum. Fires clearly fall into this category (Weil 1982). The plume rise relationships incorporated into FIREPLUME provide a mean vertical velocity for the individual particles. The final or limiting rise of the particles is established using published relationships for a variety of atmospheric conditions that incorporate natural statistical variability in plume rise observed in experimental studies. Using this framework, the vertical dispersion from a variety of buoyant release scenarios can be evaluated; from intensely buoyant sources typical for large oil fires to very low buoyancy sources, such as in the residual stages of smoldering biomass. Additional details on the underlying basis of FIREPLUME are contained in Brown et al. (1997).

Ground-level concentration-emission ratios (χ/Q , commonly referred to as *Chi over Qs*) were computed with FIREPLUME at 500-m intervals with downwind distances ranging from 3 to 50 km. Air pollutant concentrations at these distances were derived by multiplying these ratios by the computed fire combustion product pollutant emission rates. The fire emission rates were calculated by multiplying the North Slope crude oil fire emission factors by the assumed burn rate flux (i.e., rate of crude oil burn per unit area) and the estimated fire pool area.

A variety of meteorological conditions were considered in the analysis of fires at Valdez and Fairbanks. However, because of the large size of the hot fires in each of these locations, very buoyant high-rising plumes would be expected either to fully penetrate or become partially trapped below the mixing layer. The largest downwind concentrations of soot and smoke would be expected to occur under unstable atmospheric conditions. However, those conditions would also need to be accompanied by sufficiently inversion layer heights to prevent penetration of the plume and loss of soot particles above the boundary layer. Complete penetration of this layer would result in pollutant transport above the boundary layer over large downwind distances. In considering daytime unstable conditions (as represented with Pasquill Gifford stability Classes A, B, or C), the

plume fully penetrates the temperature inversion, marking the top of the atmospheric boundary layer, and becomes confined above that level. The conditions necessary for a portion of the plume to become trapped within the boundary layer include both a wind speed in excess of 7 m/s at 10 m and a strong elevated inversion layer. If these conditions are met, it is estimated that significant ground-level impacts would be possible. Even for these cases, though, most of the plume rises above the inversion and is, therefore, prevented from reentering the mixing layer and thereby through vertical advection and dispersion make it possible for soot impacts at ground level. During the daytime cases studied for Valdez and Fairbanks, it is estimated that 90 and 80%, respectively, of the material penetrates the inversion and is therefore trapped above. The remaining quantity cools within the region of the inversion and then disperses back down to ground level after a few hours. The occurrence of plume penetration and the percentages of the plume trapped above the boundary layer are conservatively estimated based on formulation presented in Weil (1988).

The same general considerations apply for stable conditions; namely, ground-level impacts do not occur when wind speed is less than about 7 m/s. The mechanism here is a little different, however, in that the plume rises to a height at which the atmosphere is very stably stratified, thus preventing the plume from dispersing back down to ground level. Depending on the low-level stability of the atmosphere and the lapse rate, this final plume height can be as low as 300 m or as high as 3,000 m. Cases in which the plume rises to a height exceeding the boundary layer height (which for stable conditions is the height at which shear-induced turbulence falls to negligible value) led to no ground-level impacts in our analysis. In practice, however, these cases may result in some ground-level impacts when strongly stable conditions (say F stability) are followed by fairly rapid warming, thus creating a classic fumigation condition. This is a fairly unlikely scenario in Alaska, although, because of the slower warming caused by the generally low solar elevation angles coupled with the very gradual increase of solar elevation angle with time. Nighttime cases that lead to ground-level impacts are characteristic of D

stability as is the case for the daytime cases, due to the need for high wind speeds. Boundary layer heights chosen for these cases (between 700 and 1,500 m) are at the upper range of possible values and were selected to capture as much of the plume within the boundary as reasonably possible given the wind speed.

A.16 Cumulative Assessment

A.16.1 Introduction

Cumulative effects would result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what government agency or private entity undertakes such actions. Cumulative effects can result from individually minor impacts that when viewed collectively over space and time can produce significant impacts (40 CFR 1508.7).

The analysis of cumulative impacts presented in Section 4.7 focuses on human and natural resources or environmental receptors that can be affected by the incremental impacts of the proposed action and alternatives. Generally, the geographic area for a cumulative impact analysis is defined by the specific resource or receptor of concern and the spatial extent of the interacting (cumulative) impact generators. The temporal extent of the cumulative analysis extends from the past history of impacts to each receptor through the anticipated life of the project, including additional time necessary for decommissioning and restoration, if appropriate.

Cumulative analyses, by definition, incorporate an extensive range of potential stressors and thus provide decision makers and the public with an overview of the condition (past, present, future) of a receptor or resource within the region of interest. This broader overview of the set of potential impacts to a resource allows decision makers to place the direct and indirect impacts of the proposed action within the context of other potential stressors.

As a starting point, the cumulative analysis uses the direct and indirect effects of the proposed action and alternatives developed during the scoping phase of this EIS. For the proposed action (renew the Federal Grant for the TAPS ROW) and the less-than-30-year renewal alternative, a number of impacting factors would result from the continued operation and maintenance of TAPS facilities. The impacting factors and the resultant direct and indirect impacts of the proposed action on receptors and resources are developed in Chapter 4 of this FEIS. The no-action alternative also has a set of impacting factors with another set of direct and indirect impacts. Examples of impacting factors include accidental spills of oil, operation of material and disposal sites, operation of support facilities (e.g., airports, access roads, work camps), repair and maintenance activities, pipeline surveillance activities, and the transportation of goods and services for pipeline operation or pipeline disassembly, removal, and ROW restoration.

Direct effects would be the initial impacts caused by the proposed action, less-than-30-year renewal alternative, and no-action alternative and would occur at the same time and place as those actions. Indirect effects would also be caused by the proposed action and the alternatives, but generally would be subsequent to or caused by the initial direct impacts. Indirect effects may occur at a later time or in another location than direct effects. For example, changes in land use, population density, or economic conditions that are a direct result of the proposed action or no-action alternative could then impact air or water quality, ecosystem function, or the introduction of invasive species. In addition, indirect effects can result in positive or negative feedback systems that further exacerbate positive or negative changes in environmental quality.

The cumulative analysis for the proposed renewal of the TAPS ROW encompasses energy development and transportation activities that begin on the North Slope and end with transport of oil in tankers departing from the Valdez Marine Terminal at Prince William Sound. The primary energy activities include oil exploration, oil field development, the transportation of oil in pipeline systems located within developed oil

fields (including oil fields located in offshore areas), the transportation of oil in the TAPS, operations at the Valdez Marine Terminal, and the transport of oil in tankers. Energy activities (development, extraction, and transportation) constitute a primary set of potential impacting factors for the cumulative analysis of the proposed action and alternatives. Additional activities include oil refining, potential natural gas development and transportation, human habitation and development, other transportation (roads, rails), legislative actions related to land use, land management, natural resource use, and petroleum spills.

A.16.2 General Approach

The general approach for the cumulative assessment follows the principles outlined by the CEQ (1997) and the guidance developed by the EPA (1999b) for independent reviewers of environmental impact statements. The cumulative assessment conducted for the renewal of the Federal Grant of ROW for the TAPS incorporates the following basic specifications:

- Individual receptors described in Chapter 4 become the end points or units of analysis for the cumulative assessment;
- Direct and indirect effects described in Chapter 4 form the basis for the impacting factors used in the cumulative analysis;
- Impacting factors are derived from a set of past, present and reasonably foreseeable future actions or activities; and
- Each individual receptor and the set of past, present, and reasonably foreseeable future actions or activities that could impact the receptor define the temporal and spatial boundaries of the cumulative analysis.

The evaluation of significance incorporates data, analysis, and results on probability of impact, consequences of impact, spatial and temporal extent of the impacting factor and receptor, recovery potential, and mitigation actions. Some of the information can be quantified, such as the spatial extent of the impacting factors, while other analyses and

results could require estimates based on summaries of published literature or scientifically based first principles developed within each discipline. First principle can also be defined as professional judgment; the judgment, however, is based on accepted theories, experiments, and analytical constructs developed under standard scientific methods for each scientific discipline.

A.16.3 Methodological Steps

The methodology of cumulative impact assessment follows the steps presented below. The cumulative analysis uses results produced in Chapter 4 of the EIS and the set of past, present, and reasonably foreseeable activities developed specifically for the cumulative analysis. The methodology is consistent with guidance developed by the CEQ and the EPA. The procedure used is outlined below:

- **Step 1, Define Alternatives for the EIS:** The alternatives considered in the TAPS EIS include (1) proposed action (renew the grant of ROW for up to 30 years) (2) less-than-30-year renewal (renew the grant of ROW for a period less than 30 years), and (3) no action (do not renew the grant of ROW). Each alternative is described in Chapter 2. On the basis of the impacting factors associated with each alternative, the direct and indirect effects of the alternatives are developed in Chapter 4.
- **Step 2, Define the Region of Influence:** The cumulative analysis delineates TAPS oil production and delivery components into three major geographic categories: (1) North Slope (including off-shore) exploration, development, and production activities; (2) the TAPS ROW and associated facilities; and (3) the transportation of oil in tankers from the Valdez Marine Terminal, especially transportation activities in Prince William Sound. While these geographic areas for the cumulative analysis are not used to constrain individual analyses, the spatial delineation along three major components of oil production and distribution activities provides a useful format for organizing the document and presenting results.
- **Step 3, Define Past, Present, and Reasonably Foreseeable Actions:** The set of past, present, and reasonably foreseeable actions is developed from consultations with other government agencies, elected officials, Alaska Native organizations and nongovernmental organizations; through public scoping; and in consultation with knowledgeable private entities, such as the TAPS owner companies. The past, present, and reasonably foreseeable actions include actions directly related to the proposed action. These actions are dependent on renewal of the grant of ROW and are strongly tied to future pipeline operations. In addition, the past, present, and reasonably foreseeable actions include indirect activities that were dependent on past TAPS actions, such as construction or past pipeline operations. Finally, past, present, and reasonably foreseeable actions include activities that are unrelated to the renewal of the ROW or TAPS present and future operations, but which could have impacts on receptors identified in Chapter 4 and that are located in the TAPS region of influence.
- **Step 4, Develop the List of Receptors:** The list of receptors (end points) for the cumulative assessment was derived from the receptors developed in Chapter 4. If possible, the receptors are placed or binned into a smaller number of categories. For example, habitat condition could be described in a way that a number of ground nesting birds can be examined together, rather than a species by species analysis.
- **Step 5, Incorporate the Direct and Indirect Effects Developed in Chapter 4:** The direct and indirect effects are taken from the direct and indirect effects developed in Chapter 4. Direct effects are caused by implementing each alternative and occur at the same time and place. Indirect effects are caused by the alternative, but are later in time or farther removed in distance. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or

growth rate, and related effects on air and water and natural system function (e.g., ecosystem function).

- **Step 6, Determine the Impacting Factors of Each Cumulative Action or Activity:** For each action developed under Step 3, a description (qualitative or quantitative) of the impacting factors is developed. The impacting factors are categorized so that similar impacting factors from different activities are considered as a single cumulative impacting factor. However, the spatial extent of the single impacting factor incorporates all the cumulative actions that contribute to the impacting factor. Intensity is defined in terms of some aspect of quantity (e.g., volume, land or water area affected, toxicity level, persistence) for the impacting factor.
- **Step 7, Evaluate Cumulative Impacts on the Receptors:** For each receptor or category of receptors, an evaluation of the cumulative impacts addresses the following:
 - The collective magnitude, importance, and significance of all actions;
 - The incremental contribution of the proposed action to the magnitude, importance, and significance of the cumulative impact; and
 - The magnitude, importance, and significance of the impact that could occur under the alternatives, including no action.

The cumulative assessment uses the following set of criteria to judge the magnitude, importance, and significance of an impact on a receptor:

- Likelihood of the impact,
 - Consequences of the impact,
 - Geographic or spatial extent of the potential impacting factor,
 - Geographic or spatial extent of the receptor,
 - Temporal extent of the impacting factor,
 - Regulatory considerations (e.g., threatened and endangered species, marine mammals, cultural resources),
 - Potential for recovery of the receptor after removal of the impacting factor, and
 - Potential for effective mitigation.
- **Step 8, Presentation of the Cumulative Impacts in the EIS:** The cumulative impacts are presented in text form incorporating the information developed in Step 7. A summarization of impacts is presented in Table 2.1.

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Appendix B:
Agreement and Grant of Right-of-Way
for Trans-Alaska Pipeline

**Agreement and Grant of
Right-of-Way for Trans-Alaska Pipeline
between
The United States of America
and
Amerada Hess Pipeline Corporation,
BP Pipelines (Alaska) Inc.,
Exxon Mobil Pipeline Company,
Phillips Transportation Alaska, Inc.,
Unocal Pipeline Company, and
Williams Alaska Pipeline Company, L.L.C.**

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APPENDIX B

Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline

This Agreement and Grant of Right-of-Way (hereinafter referred to as the "Agreement")* is entered into as of this 23rd day of January, 1974 (hereinafter referred to as the "Effective Date"), by the United States of America, party of the first part (hereinafter referred to as the "United States"), acting through the Secretary of the Interior, and by

Amerada Hess Pipeline Corporation,
BP Pipelines (Alaska) Inc.,
Exxon Mobil Pipeline Company,
Phillips Transportation Alaska, Inc.,
Unocal Pipeline Company, and
Williams Alaska Pipeline Company, L.L.C.

parties of the second part (hereinafter sometimes referred to as the "Original Permittees").

The parties have entered into this Agreement taking into consideration the national authorizations, directives, and policies expressed in applicable legislation, including Section 202 of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 584, *et seq.* (1973).

It is the intent of the parties that, in the performance of this Agreement, the following principles shall apply:

- (1) In the construction (including, but not limited to, design), operation, maintenance (including but not limited to a continuing and reasonable program of preventive maintenance) and termination of the Pipeline System, Permittees shall employ all practicable means and measures to preserve and protect the environment, as provided in this Agreement.
- (2) The parties shall balance environmental amenities and values with economic practicalities and technical capabilities, so as to be consistent with applicable

national policies. In so doing, the parties shall take into account, among other considerations, the following:

- (a) The benefit or detriment to persons, property and the environment that may be anticipated to result from a proposed course of conduct;
 - (b) The particular environmental, technical, and economical benefits or detriments reasonably expected to flow from a proposed course of conduct;
 - (c) The effect on the energy needs of the United States, including the possible effects of a disruption of national or regional oil supply, that may result from a particular course of conduct.
- (3) Permittees shall manage, supervise and implement the construction, operation, maintenance and termination of the Pipeline System in accordance with sound engineering practice, to the extent allowed by the state of the art and the development of technology. In the exercise of these functions, Permittees consent and shall submit to such review, inspection and compliance procedures relating to construction, operation, maintenance and termination of the Pipeline System as are provided for in this Agreement and other applicable authorizations. The Parties intend that this Agreement shall not in any way derogate from, or be construed as being inconsistent with, the provisions of Section 203(d) of the Trans-Alaska Pipeline Authorization Act, 87 Stat. 585 (1973), relating to the National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. § 4321 *et seq.*

In consideration of the grant hereby made, and the provisions of this Agreement, the United States and Permittees agree as follows:

*NOTE.— Terms having special meaning are defined in the body of this Agreement or in Exhibit D hereof. Such terms are capitalized herein.

I. Grant of Right-of-Way

A. Pursuant to the provisions of the Trans-Alaska Pipeline Authorization Act, the United States hereby grants to Permittees in the several undivided interests specified in subsection B of this Section, for the period of limited duration prescribed in Section 7 hereof and for the purpose prescribed in subsection A of Section 2 hereof, a right-of-way (hereinafter referred to as the "Right-of-Way"), the width and location thereof being subject to the provisions of Sections 5 and 6 hereof, across, through and upon the Federal Lands (as that term is defined in Section 28 of the Mineral Leasing Act of 1920, 41 Stat. 449, as amended, 30 U.S.C. § 185 *et Seq.*, including public and acquired lands, and lands withdrawn, reserved, classified, or otherwise set apart for National Forests, military purposes, power development, or other purposes) along the route of the Pipeline, identified in the applications as amended and as described in Exhibit A hereof.

B. The grant made hereby is of the following undivided interests in and to the Right-of-Way:

Amerada Hess Pipeline Corporation, an undivided interest of 1.5000% of the whole;
BP Pipelines (Alaska) Inc., an undivided interest of 46.9263% of the whole;
ExxonMobil Pipeline Company, an undivided interest of 20.3378% of the whole;
Phillips Transportation Alaska, Inc., an undivided interest of 26.7953% of the whole;
Unocal Pipeline Company, an undivided interest of 1.3561% of the whole; and
Williams Alaska Pipeline Company, L.L.C. an undivided interest of 3.0845% of the whole.

C. There is hereby excepted from the grant hereby made all lands selected and validly tentatively approved to the State of Alaska, pursuant to the Alaska Statehood Act, 72 Stat. 339, as amended, other than lands withdrawn under Section 11(a)(2) of the Alaska Native Claims Settlement Act, 85 Stat. 696, 43 USC § 1610.

D. There is hereby reserved to the United States all rights reserved, or directed to be reserved, to the United States under any applicable law or regulation of the United States or elsewhere under this Agreement.

E. The grant hereby made is subject to: (1) the provisions of this Agreement; (2) all applicable laws and regulations of the United States; (3) any valid existing rights in the lands subject to the Right-of-Way, including without limitation the valid pre-existing rights, if any, of the State of Alaska; and (4) the condition that the Right-of-Way granted hereby across Category 1(c) Lands and Category 1(d) Lands* shall take effect upon the occurrence of one of the following events, whichever shall first occur:

- (a) The Commissioner of Natural Resources of the State of Alaska notifies the Secretary in writing that it is essential for the expeditious construction of the Pipeline System that the Right-of-Way in and to some or all of the Category 1(c) Lands or Category 1(d) Lands, or both, becomes effective;** or
- (b) Category 1(d) Lands have not been tentatively approved to the State of Alaska and a valid right-of-way lease or other grant in and to those lands has not been issued by the State of Alaska, for the construction and operation of the Pipeline System, by March 10, 1974; or
- (c) The Category 1(e) Lands have not been tentatively approved to the State of Alaska and a valid right-of-way lease or other grant in and to those lands has not been issued by the State of Alaska, for the construction and operation of the Pipeline System, by June 1, 1974.

* "Category 1(c) Lands" and "Category 1(d) Lands" are defined in Exhibit D hereto. These terms are derived from Paragraph 1 of Part I of the Cooperative Agreement between the State of Alaska and the Department, attached hereto as Exhibit E for informational purposes.

**The Secretary has received notice from the State Commissioner of Natural Resources that the expeditious construction of the Pipeline System on the Category 1(d) Lands is essential. Therefore, the Right-of-Way across those lands is hereby effective.

F. With respect to the Category 1(c) Lands and the Category 1(d) Lands, the grant hereby made is further subject to the limitation and condition that upon either valid tentative approval or valid patent of any of such lands to the State of Alaska, the existence or subsequent issuance of a valid State right-of-way lease or other grant in and to those lands terminates the Right-of-Way and other Federal authorizations, if any, and the State right-of-way lease or other grant thereupon applies in all respects to those lands.

G. Permittees agree that they will not challenge the validity of the State's right-of-way lease or other grant on the basis of the existence of the Federal Right-of-Way and other authorizations or their interest therein.

2. Purpose of Grant; Limitation of Use to Permittees

A. The Right-of-Way is granted for the purpose of the construction, operation, and maintenance of one (1) Oil transportation pipeline, consisting of one (1) line of forty-eight (48)-inch diameter pipe and its Related Facilities (such pipeline and Related Facilities being herein referred to as the "Pipeline").

B. Permittees, their agents, contractors, and subcontractors (at any tier) shall not use the Right-of-Way or the land subject thereto for any other purpose and shall not locate or construct any other pipelines (including looping lines) or other improvements, within the Right-of-Way without the prior written approval of the Secretary.

C. The Pipeline shall be used for only the transportation of Oil, and it shall not be used for any other purpose without the prior written approval of the Secretary.

D. Each Permittee shall not allow or suffer any Person or Business Entity, with the exception of the other Permittees under this Agreement, to use the Right-of -Way for the purpose set forth in subsection A of this Section.

E. Nothing above in subsection D of this Section is intended to: (1) excuse or preclude Permittees from complying with their obligations under Section 3 of this Agreement, or

(2) preclude Permittees from employing agents, contractors, or subcontractors (at any tier) to effect construction, operation, maintenance or termination of the Pipeline System.

3. Transportation of Oil

Each Permittee shall, to the extent of its interest in the Right-of-Way, and in accordance with the provisions of Section 28 of the Mineral Leasing Act of 1920, 41 Stat. 449, as amended:

- (1) Construct, operate, and maintain the Pipeline as a common carrier;
- (2) Accept, convey, transport, or purchase without discrimination, Oil delivered to the Pipeline without regard to whether such Oil was produced on Federal or non-Federal lands; and
- (3) Accept, convey, transport, or purchase, without, discrimination, Oil produced from Federal Lands or from the resources thereon in the vicinity of the Pipeline in such proportionate amounts as the Secretary may, after a full hearing with due notice thereof to Permittees and a proper finding of facts, determine to be reasonable.

4. Exhibits; Incorporation of Certain Documents by Reference

A. The Exhibits that are attached to this Agreement and that are listed below in this subsection are, by this reference, incorporated into and made a part of this Agreement as fully and effectually as if the Exhibits were set forth herein in their entirety:

- (1) Federal Grant of Right-of-Way F-12505 and AA-5847 Legal Description, attached hereto as Exhibit A.
- (2) Requirements of the Department of Defense relating to military installations, with attached letters dated November 14, 1973, and November 23, 1973, from the Director of Real Estate, Department of the Army, Office of the Chief of Engineers, attached hereto as Exhibit B.

- (3) Requirements of the Federal Power Commission relating to power sites, attached hereto as Exhibit C.
- (4) Stipulations for the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline, being numbered 1 through 3.11.2, inclusive, attached hereto as Exhibit D, which are sometimes referred to in this Agreement as the "Stipulations."

B. The cooperative agreement attached hereto as Exhibit E is not incorporated into, and is not intended to be made a part of, this Agreement. Said cooperative agreement is attached hereto only for informational purposes.

5. Width of Right-of-Way

The width of the Right-of-Way, in terms of surface measurement, is fifty (50) feet plus the ground occupied by the Pipeline; *provided, however,* that up to and including the date on which Permittees may file an application for modification of the Right-of-Way boundaries in accordance with subsection D of Section 6 hereof, Permittees may apply for, and the Authorized Officer may direct or authorize, increases in the width of the Right-of-Way at specified points if he finds, and records the reasons for his finding, that in his judgment a wider Right-of-Way is necessary for operation and maintenance of the Pipeline after construction, or to protect the environment or public safety.

6. Location of Right-of-Way

A. The site for each Construction Segment of the Pipeline shall be determined in accordance with the provisions of Stipulation 1.7.

B. After completion of construction of the Pipeline within a particular Mapping Segment, the Federal Lands subject to the Right-of-Way shall be the land occupied by the Pipeline and, in terms of surface measurement, twenty-five (25) feet on each side of the Pipeline measured from its outermost extremities. With respect to Related Facilities, the width shall be twenty-five (25) feet around the perimeter of the Related Facility.

C. Upon completion of construction of the Pipeline within a Mapping Segment, as well as upon the issuance of any authorization or directive that the Authorized Officer may issue in accordance with the provisions of Section 5 hereof, Permittees shall, if directed by the Authorized Officer, physically mark on the ground the proposed boundaries of the Right-of-Way at such locations and in such manner as is acceptable to the Authorized Officer.

D. At any time prior to the sixtieth (60th) day preceding the filing of the maps of survey as provided in subsection E hereof, Permittees may file an application for modification of the Right-of-way boundaries provided that, after modification, the Right-of-Way will include the ground occupied by the Pipeline plus fifty (50) feet adjacent thereto and such additional land as authorized by the Authorized Officer pursuant to Section 5 hereof. Upon approval of such application for modification of boundaries and acceptance of the documents and maps required by subsection E hereof, the Right-of-Way shall be as delineated on said maps of survey.

E. Within three hundred and sixty (360) days after the date of Commissioning of the Pipeline (and, in the case of any addition, deletion or alteration of the Pipeline following the date of Commissioning, within one hundred and eighty (180) days after the addition, deletion or alteration has, in the judgment of the Authorized Officer, been fully completed), Permittees shall survey and provide adequate monumentation to locate and describe the Right-of-Way and shall file: (1) proof of construction of the Pipeline in accordance with the applicable regulations of the Department; (2) such documents of relinquishment of land not included in the modified Right-of-Way, if any, as may be required by the Authorized Officer; (3) appropriate references to applications in which requests were made for Right-of-Way widths greater than the normal limitations specified in Section 5 of this Agreement, and applications for modification of the Right-of-Way boundaries as provided in subsection D hereof; and (4) a map, or maps of survey, prepared in such manner as shall be required by the Authorized Officer, showing the final "as built" location of the completed Pipeline, including the final locations of all buried and above ground

improvements, the centerline of the Right-of-Way, as definitely located, and, referenced to the centerline, the boundaries of the Right-of-way, as definitely located. Each portion of the Pipeline as depicted on the said survey map or maps, and for which a Notice to Proceed, or an authorization, issued in accordance, with Stipulation 1.7.4.4 altering either the route or the initially approved location along the route of the Right-of-Way, has been issued, shall be referenced to the relevant Notice to Proceed or authorization.

7. Duration of Right-of-Way Grant

A. The grant of the Right-of-Way as originally issued began on the 23rd day of January, 1974 and as renewed continues from the 22nd day of January, 2004, at noon, Washington, D.C. time, and shall come to an end and expire on the 22nd day of January, 2034, at noon, Washington, D.C. time, unless prior thereto it is relinquished, abandoned, or otherwise terminated pursuant to the provisions of this Agreement or any applicable Federal law or regulation.

B. Upon the expiration of the initial or any subsequent grant of the Right-of-Way, or its earlier relinquishment, abandonment, or other termination, the provisions of this Agreement, to the extent applicable, shall continue in effect and shall be binding on the parties hereto, their successors or assigns, until they have fully performed their respective obligations and liabilities accruing before or on account of the expiration, or the prior termination, of the grant.

C. The Right-of-Way shall be renewed, subject to and in accordance with the provisions of the Trans-Alaska Pipeline Authorization Act.

D. Any subsequent conveyance, transfer or other disposition of any right, title or interest in the Federal Lands or any part thereto, burdened by and subservient to the Right-of-Way, shall, to the extent allowed by law and subject to the termination provision of subsection F of Section 1, be subject to the Right-of-Way and the provisions of this Agreement, including Permittees' right to renew the Right-of-Way under subsection C of this Section.

8. Use Charge for Right-of-Way

A. Permittees shall pay to the United States, annually and in advance, the fair market rental value of the Right-of-Way, as determined by the Secretary. (Such rental value is hereinafter called the "Use Charge".)

B. The initial Use Charge shall be One Hundred Five Thousand and 00/100 Dollars (\$105,000) for each calendar year. The first annual Use Charge shall be prorated to cover that portion of the calendar year 1974 which remains after the Effective Date hereof and shall be due and payable by not later than the Effective Date hereof. The Use Charge for the first full calendar year commencing after the Effective Date hereof and for each subsequent calendar year shall be due and payable by not later than the last full business day immediately preceding the first day of January of the calendar year for which the Use Charge is payable. The Use Charge for each calendar year shall be billed to Permittees at least thirty (30) days in advance of the due date thereof. All such payments shall be delivered to the Authorized Officer and shall be accepted subject to collection.

C. The Use Charge for the seventh (7th) and for each succeeding calendar year shall be subject to adjustment from time to time in accordance with the regulations of the Department. The Secretary also may adjust retroactively the amount of the annual Use Charge for any calendar year that is based on an appraisal which is made before the Right-of-Way is, in its entirety, finally located, surveyed and monumented; any sum determined by the Secretary to be payable (by either the United States or Permittees) in connection with an adjustment, as provided for in this sentence, shall be due and payable within thirty (30) days after notice is given of the amount due.

9. Construction Plans and Quality Assurance Program

A. Permittees shall submit construction (including design) plans, a quality assurance program, and other related documents as deemed necessary by the Authorized Officer, for review and approval prior to his issuing Notices to Proceed.

B. The quality assurance program shall be comprehensive and designed to assure that the environmental and technical Stipulations in this Agreement will be fully complied with throughout all phases of construction, operation, maintenance and termination of the Pipeline System.

C. The following criteria shall be included in the quality assurance program, although Permittees are not limited to these criteria:

- (1) Provide adequate and appropriate means and procedures for the detection and prompt abatement of any actual or potential condition that is susceptible to abatement by Permittees which arises out of, or could affect adversely, the construction, operation, maintenance or termination of all or any part of the Pipeline System and which at any time may cause or threaten to cause: (a) a hazard to the safety of workers or to public health or safety (including but not limited to personal injury or loss of life with respect to any person or persons) or (b) serious and irreparable harm or damage to the environment (including but not limited to areas of vegetation or timber, fish or other wildlife populations, or their habitats, or any other natural resource).
- (2) Provide adequate and appropriate means and procedures for the repair and replacement of improved or tangible property and the rehabilitation of natural resources (including but not limited to revegetation, restocking fish or other wildlife populations and reestablishing their habitats) that shall be seriously damaged or destroyed if the immediate cause of the damage or destruction arises in connection with, or results from, the construction, operation, maintenance or termination of all or any part of the Pipeline System.
- (3) Provide for component and systems quality through adequate quality control management and planning, and inspection and test procedures.

- (4) Assure that the selection of Permittees' contractors, subcontractors and contract purchases of materials and services are based upon the above quality control procedures.

- (5) Determine quality performance by conducting surveys and field inspections of all of the facilities of Permittees' contractors and subcontractors.

- (6) Maintain quality determination records on all of the above procedures to insure satisfactory data identification and retrieval.

10. Compliance with Notices to Proceed

All construction of the Pipeline System undertaken by Permittees shall comply in all respects with the provisions of Notices to Proceed that are issued by the Authorized Officer.

11. Reservation of Certain Rights to the United States

A. The United States reserves and shall have a continuing and reasonable right of access to any part of the lands (including the, subsurface of, and the air space above, such lands) that are subject to the Right-of-Way, and a continuing and reasonable right of physical entry to any part of the Pipeline, for inspection or monitoring purposes and for any other purpose or reason that is reasonably consistent with any right or obligation of the United States under any law or regulation, this Agreement, or any other agreement, permit or authorization relating in whole or in part to all or any part of the Pipeline.

B. The rights of access and entry reserved in subsection A of this Section shall extend to and be enjoyed by any contractor of the United States, any subcontractors (at any tier) of the contractor and their respective agents and employees, as well as such other persons, as may be designated from time-to-time in writing by the Authorized Officer.

C. There is reserved to the United States the right to grant additional permits or easements for rights-of-way to third parties for

compatible uses on, or adjacent to, the lands subject to the Right-of-Way. Before the United States grants an additional right-of-way or permit for a compatible use, the United States will notify Permittees of its intentions and shall consult with Permittees before taking final action in that regard.

12. Reimbursement of Department Expenses

A. Permittees shall reimburse the United States for all reasonable administrative and other costs heretofore or hereafter incurred directly or indirectly by the Department for: (1) processing applications filed by Permittees in connection with the Pipeline System; and (2) monitoring the construction, operation, maintenance, and termination of all or any part of the Pipeline System, including without limitation those portions of the System that shall be located on State-owned lands.

B. Subject to collection, receipt is hereby acknowledged by the Department of the sum of Twelve Million Two Hundred Fifty Three Thousand Seven Hundred Thirty and 00/100 Dollars (\$12,253,730) which has been paid to the United States by Permittees at the time of execution of this Agreement. Said sum represents the amount of the costs referred to in subsection A of this Section, which were incurred by the Department through September 30, 1973.

C. Permittees shall hereafter pay to the United States such sums as the Secretary shall determine to be required to reimburse the Department for the costs, referred to in subsection A of this Section, incurred or to be incurred by it subsequent to September 30, 1973. Such payments shall be made in accordance with the provisions of subsection F of this section.

D. Permittees acknowledge that the Department has employed or may employ one or more independent consultants, contractors and subcontractors and also has utilized and may utilize personnel and services of other agencies to assist it with: (1) processing applications heretofore or hereafter filed by Permittees in connection with the Pipeline System; and (2) monitoring the construction, operation,

maintenance and termination of the Pipeline System. Before employing such consultants, contractors, or subcontractors, the Secretary shall notify Permittees of such employment and shall inform the Permittees of the purpose of employment, the scope of the work to be undertaken, the duration of the employment and the estimated cost thereof; *provided, however*, this notice requirement shall not limit the authority of the Secretary to enter into agreements with consultants, contractors or subcontractors. Costs incurred by the Department in connection with the employment of consultants, contractors and subcontractors and with respect to utilizing the personnel and services of other agencies shall be included in the costs for which the Department is to be reimbursed by Permittees under the provisions of subsection A of this Section.

E. Agreements entered into by the Secretary with respect to the Pipeline System which result in costs for which reimbursement is required by this Section shall be drawn to avoid unnecessary employment of personnel and needless expenditure of funds. The Department shall administer this Agreement and such other agreements to reasonably assure that unnecessary employment of personnel and needless expenditure of funds are avoided.

F. Reimbursement by Permittees, as provided for in this Section and Section 18 hereof, shall be made for each quarter ending on the last day of March, June, September and December. On or before the sixtieth (60th) day after the close of each quarter, the Authorized Officer shall submit to Permittees a written statement of the costs incurred by the Department during that quarter which are reimbursable.

G. Permittees shall have the right to conduct, at their own expense, reasonable audits by auditors or accountants, designated by Permittees, of the books, records and documents of the Department and of its independent consultants, contractors and subcontractors relating to the items on any particular statement, that shall be submitted in accordance with the procedure outlined in subsection F of this Section, at the places where such books, records and documents are usually maintained and at reasonable times; *provided*,

however, that written notice of a desire to conduct such an audit must be given the Authorized Officer: (1) at least fifteen (15) days prior to such audit; and (2) by not later than the seventy-fifth (75th) day after the close of the quarter for which the books, records and documents are sought to be audited; and *provided further*, that any such audits shall be completed within ninety (90) days after receipt by Permittees of the statement containing the items to be audited.

H. Nothing herein shall be deemed to require the Department, its bureaus or offices, or its independent consultants, contractors and subcontractors to maintain books, records or documents other than those usually maintained by them, provided that such books, records and documents reasonably segregate and identify the costs for which reimbursement is required by this Section. Such books, records and documents shall be preserved or caused to be preserved for a period of at least two (2) years after the Department submits a statement for reimbursement based on such books, records and documents. The auditors or accountants designated by Permittees shall have reasonable access to, and the right to copy, at their expense, all such books, records and documents, including all audit reports prepared by or furnished to the Department, together with supporting documents in the possession of the Department, concerning agreements with other agencies employed by the Department and with its independent consultants, contractors and subcontractors, which result in costs for which reimbursement is required by this Section.

I. With respect to the audits by Permittees of any books, records and documents of the Department and its independent consultants, contractors or subcontractors under agreements which result in costs for which reimbursement is required by this Section, such audits shall be conducted by independent certified public accountants, designated by Permittees. Prior to conducting any such audits, such accountants shall confer with the auditors auditing such consultants, contractors or subcontractors for the Department for the purpose of coordinating and expediting their respective audits. Any such audits by such accountants shall be conducted as supplementary audits, reviewing and spot

checking the audits of the Department's auditors for the purpose of determining the accuracy of costs reflected in the billings of the Department which are reimbursable under subsection A of this Section, and auditing such other matters as may be appropriate in the circumstances. The Authorized Officer may designate a representative to observe any such audits by such accountants. The Authorized Officer shall have reasonable access to, and the right to copy, all such audit reports prepared by such accountants and furnished to Permittees, together with supporting documents in the possession of the Permittees. In the event that the Authorized Officer believes that the scope of any such supplementary audit is unreasonable, he shall promptly notify Permittees and such accountants, and such supplementary audit shall be suspended pending consultation by the Authorized Officer and the Permittees of the appropriate scope of audit in the circumstances. Any complaints which Permittees may have with respect to such agreements, their performance or the statement of the Department for the reimbursement of costs based on such agreements shall be made only to the Authorized Officer.

J. Permittees shall pay to the United States, through the Authorized Officer, the total amount as shown on each statement by not later than the due date thereof, namely the ninetieth (90th) day following the close of the quarter to which the statement relates; *provided, however*, that if any one or more of the Permittees decides to dispute or audit any item of a statement that shall be rendered in accordance with the provisions of this Section or Section 18 hereof, Permittees on or before the said 90th day on which the statement is due and payable, shall give the Authorized Officer written notice of each item that is disputed, accompanied by a detailed explanation of their objection, or written notice of each item to be audited, and shall pay to the United States, through the Authorized Officer, those amounts for the items that are not disputed or are not to be audited. If any item of a statement is audited, Permittees shall give the Authorized Officer prompt written notice of the completion of the audit of all the items of a statement being audited. On a date fixed by the Authorized Officer, but in any event to be within thirty (30) days after notice of a disputed

statement or after notice of the completion of the audit, as the case may be, the Authorized Officer and Permittees shall meet to discuss, and attempt to resolve, all items which are disputed or which have not been resolved by the audit. If at that time they are unable to resolve all such items, Permittees may appeal any unresolved items to the Secretary in accordance with the provisions of subsection A of Section 26 of this Agreement. Any items resolved as being payable to the United States shall be paid within thirty (30) days after being resolved, together with interest thereon up to the date of payment at a total annual percentage rate equal to the discount rate of the Federal Reserve Bank for District 12 (San Francisco) in effect on the original due date of the statement, and such interest shall accrue and be computed from, and so as to include, the aforesaid due date. The items shown on any statement that are not the subject of both: (1) a notice to the Authorized Officer of a disputed item or notice of audit, and (2) a notice of appeal as provided for in subsection A of Section 26, shall be deemed conclusively to be payable to the United States by Permittee.

K. In addition to the right to audit quarterly statements as provided in subsection G of this Section, if Permittees believe that unnecessary employment of personnel or needless expenditure of funds has occurred or is likely to occur contrary to the provisions of subsection E of this Section, Permittees may request the approval of the Authorized Officer for Permittees to conduct promptly and at their own expense a full and complete audit by auditors or accountants designated by Permittees, of the books, records and documents concerning the matters to be audited, at the places where such books, records and documents are usually maintained and at reasonable times. Such request shall be in writing, shall specify the matters to be audited and shall state the information available to Permittees upon which the request is based. The Authorized Officer shall approve or deny such request promptly, and approval of any such request shall not be unreasonably withheld. If and to the extent that any such audit concerns any agreements of the Department with independent consultants, contractors or subcontractors which have resulted or may result in costs for which

reimbursement is required by this Section, such audit shall be conducted by independent certified public accountants designated by Permittees. The Authorized Officer may designate a representative to observe any audit allowed by this subsection and the Authorized Officer may have access to, and the right to copy, the audit report prepared by such accountants and furnished to Permittees. Any complaint which Permittees may have as a result of any audit under this subsection shall be made only to the Authorized Officer and shall be governed by the procedure set forth in subsection J of this Section, to the extent applicable.

13. Damage to United States Property; Repair, Replacement or Claim for Damages

A. Subject to the provisions of subsection 204 (a) (2) of the Trans-Alaska Pipeline Authorization Act, at the written demand of the Authorized Officer, Permittees:

- (1) shall repair or replace promptly, to the written satisfaction of the Authorized Officer, all improved or tangible property of the United States, whether real, personal or mixed, that has been seriously damaged or destroyed and is included in the demand, and
- (2) shall rehabilitate (including, but not limited to, revegetation, restocking fish or other wildlife populations and reestablishing their habitats), to the written satisfaction of the Authorized Officer, any natural resource that shall be seriously damaged or destroyed,

if the immediate cause of the damage or destruction arises out of, is connected with, or results from, the construction, operation, maintenance or termination of all or any part of the Pipeline System; *provided, however*, that Permittees shall not be obligated to repair or replace any property or to rehabilitate any natural resource that was damaged or destroyed: (a) by an act of war or (b) solely by (i) the negligence of the United States and/or (ii) the negligence or willful misconduct of Persons who are authorized to enter upon, use or occupy the damaged property or areas pursuant to any

Federal lease, permit, or other written authorization that is issued for any use of purpose other than in connection with the construction, operation, maintenance or termination of the Pipeline.

B. The repair or replacement by the Permittees of any improved or tangible property of the United States, as provided for in subsection A of this Section, shall operate to preclude the United States from asserting any claim for direct (as opposed to consequential) money damages with respect to the damage or destruction that was so repaired or replaced.

C. Except to the extent that a claim by the United States for money damages against any one or more of the Permittees shall be barred in accordance with the provisions of subsections A and B of this Section, Permittees shall be liable to the United States, with respect to improved or tangible property of the United States, whether real, personal or mixed, that is damaged or destroyed in connection with or resulting from activities along or in the vicinity of the Right-of-Way in accordance with the provisions of Section 204 of the Trans-Alaska Pipeline Authorization Act.

D. In the event that a Permittee shall be liable to the United States for any damage, destruction or loss of improved or tangible property of the United States whether real, personal or mixed, the collection by the United States of money damages on account of the particular loss, damage or destruction, shall to the extent collected operate to preclude the United States from enforcing the provisions of subsection A of this Section with respect to such loss, damage or destruction.

14. Indemnification of the United States

A. Permittees shall indemnify and hold harmless the United States, its agents and employees, against and from any and all liabilities or damages of any nature whatsoever which the United States, its agents, employees, contractors or subcontractors (at any tier) become legally obligated to pay, and which arise out of, or are connected with, any one or more of the following: (1) the construction, operation, maintenance or termination of the Pipeline

System; (2) the approval (as distinguished from the ordering of a modification pursuant to Stipulation 1.3.2.) by the United States, its agents, employees, contractors or subcontractors (at any tier), of any design, plan, Construction Mode, construction or research pertaining to the Pipeline System or any part thereof ; or(3) the physical entry by any Person upon, or the use or occupancy by any Person of, any Federal Land that is the subject of any use or right which is granted or afforded to Permittees, or to their respective agents, employees, contractors or subcontractors (at any tier) in connection with the Pipeline System; *provided, however,* that the provisions of items (1) and (3) of this Section shall not be deemed to apply to liabilities or damages that are caused: (a) by an act of war; or (b) solely by (i) the negligence of the United States, and/or (ii) the negligence or willful misconduct of an agent, employee, contractor or subcontractor (at any tier) of the United States not acting within the scope of his authority or employment, and/or (iii) the negligence or willful misconduct of persons who are authorized to enter upon, use or occupy the damaged property or areas pursuant to any Federal lease, permit, or other written authorization that is issued for any use or purpose other than in connection with the construction, operation, maintenance or termination of the Pipeline System.

B. Permittees shall be notified in writing of any claim for which indemnity under the provisions of this Section is sought, and such claim shall not be compromised without the written consent of Permittees, which consent Permittees agree shall not be unreasonably withheld or delayed.

C. The regulations of the Department relating to indemnification of the United States against any liability for damages to life, person or property arising from the occupancy or use of the lands under a right-of-way (43 CFR 2801.1-5(f) (1972)) shall not be applicable to this Agreement.

15. Guaranty

A. Upon being notified by the Secretary to do so, each Permittee shall cause to be delivered to the Secretary a valid and unconditional guaranty of the full and timely

payment of all liabilities and obligations of the Permittee to the United States under or in connection with this Agreement or any other agreement, permit or authorization to be issued or granted to the Permittees by the Secretary that relates in whole or in part to all or any part of the Pipeline System.

B. It is recognized that a proposed guarantor of a Permittee may be a corporation (or an individual stockholder thereof), a partnership (or an individual partner thereof), an association that is authorized and empowered to sue and be sued and to hold the title to property in its own name (or an individual associate thereof), a joint stock company that is authorized and empowered to sue and be sued and to hold the title to property in its own name (or any individual participant therein), or a business trust (or an individual settlor thereof), and may or may not directly or indirectly own a legal or beneficial interest in the Permittee whose liabilities and obligations are sought to be guaranteed. In the case of multiple guarantors that are acceptable to the Secretary, each shall be severally liable for only its proportionate share of any sum or payment covered by the guaranty.

C. Each guaranty shall be satisfactory to the Secretary in all respects including, without limitation, the form and substance of the guaranty, the financial capability of a proposed guarantor, the availability of such guarantor to service of process, the availability of the assets of such guarantor with respect to the enforcement of judgments against the guarantor, and the number of guarantors that will be necessary to guarantee all of the liabilities and obligations which will be covered by a particular guaranty; *provided, however*, that the Secretary shall not unreasonably withhold his approval with respect to a guaranty or guarantor.

D. The Secretary shall have the right at any time, and from time to time, to require the substitution and delivery of a new form of guaranty in the event that an outstanding guaranty is held to be invalid or unenforceable, in whole or in part, by a court of competent jurisdiction or, that the controlling law shall, by statute or judicial decision, be so altered as to impair, prevent or nullify the enforcement or exercise of any right or option of the United States under an outstanding guaranty; *provided*,

however, that the outstanding guaranty (to the extent of its validity or enforceability, if any) shall continue in full force and effect with respect to any claim, suit, accrued liability or defense thereunder that exists at the time of substitution; *provided further*, that the new form of guaranty, in each such case, shall be required as to all Permittees that at the time of substitution have delivered, or are required to deliver, a guaranty.

E. Each guaranty shall be accompanied by such certificates and opinions of legal counsel as the Secretary may require to establish its validity. The guaranty shall include an appointment of an agent for service of process that is satisfactory to the Secretary.

16. Laws and Regulations

A. Permittees, and each of them, shall comply with all applicable Federal laws and regulations, existing or hereafter enacted or promulgated.

B. In any event, Permittees, and each of them, shall comply with: (1) all regulations hereafter promulgated to implement the Trans-Alaska Pipeline Authorization Act, and (2) all applicable regulations hereafter promulgated to implement Section 28 of the Mineral Leasing Act of 1920, as amended.

17. No Right of Set Off

With respect to any sum now or hereafter owing, or claimed to be owing, to the United States and that arises out of or is connected in any way with the construction, operation, maintenance or termination of all or any part of the Pipeline System, Permittees, and each of them, shall not set off against, or otherwise deduct from, any such sum:

- (1) Any claim or judgment for money of any one or more of the Permittees against the United States not arising out of the construction, operation, maintenance or termination of all or any part of the Pipeline System;
- (2) Any claim or judgment for money of any one or more of the Permittees against the United States that arises out of the construction, operation, maintenance or

termination of all or any part of the Pipeline System, if the sum now or hereafter owing, or claimed to be owing, to the United States is or shall be for any sum or charge required to be paid to the United States pursuant to Section 8, Section 12 or Section 18 hereof; or

- (3) Any claim or judgment for money of any one or more of the Permittees against the United States their arises out of, or pursuant to, any statute administered by any department or agency of the United States other than the Department.

18. Right of United States to Perform

A. If, after thirty (30) days, or in an emergency such shorter period as shall not be unreasonable, following the making of a demand therefor by the Authorized Officer, in the manner that is provided in Stipulation 1.6 for giving written notices, Permittees, or their respective agents, employees, contractors or subcontractors (at any tier), shall fail or refuse to perform any of the actions required by the provisions listed in subsection B of this Section, the United States shall have the right, but not the obligation, to perform any or all of such actions at the sole expense of Permittees. Prior to the delivery of any such demand, the Authorized Office shall confer with Permittees, if he deems it practicable to do so, regarding the required action or actions that are included in the demand. The Authorized Officer, following the procedure outlined in subsection F of Section 12 hereof, shall submit to Permittees a statement of the expenses incurred by the United States during the preceding quarter in the performance by the United States of any required action and, in the absence of a dispute, the amounts shown to be due on each such statement shall be paid by Permittees in accordance with the provisions of the said last mentioned subsection. If any one or more of the Permittees shall dispute the amount of any item in any statement that shall be rendered in accordance with the provisions of this Section, the procedures outlined in subsection J of Section 12 shall apply with equal force and effect to any such dispute. Permittees may dispute whether the work involved an action required by a provision listed in subsection B of this Section, whether Permittees' failure or refusal to perform any such action was justified,

as well as the reasonableness of the specifications for, and the cost of, such work.

B. Required Action (In General) and Reference:*

Survey, map and mark the Right-of-Way-Sec. 6.
Repair, replace, rehabilitate property and natural resources-Sec. 13.
Discharge liens-Sec. 19.
Abate any condition causing or threatening to cause a hazard, harm or damage-Sec. 24.
Provide emergency aid-Sec. 30.
Provide an archeologist to perform certain duties-Stip. 1.9.
Remove improvements and equipment and restore land-Stip. 1.10.1.
Put areas "to bed"-Stip. 1.10.2.
Protect certain improvements; remove obstructions; repair damage to public utilities and improvements-Stip.-1.11.
Regulate public access-Stip. 1.12.1.
Provide alternative routes for roads and trails-Stip. 1.12.2.
Provide public crossings-Stip. 1.12.3.
Screen, filter, suppress electronic devices-Stip. 1.13.1.
Post the Right-of-Way against hunting, etc.-Stip. 1.14.1.
Restore survey monuments, etc.-Stip. 1.16.2.
Take measures to protect health and safety; abate hazards-Stip. 1.20.
Provide for environmental briefings-Stip. 2.1.1.
Remove waste-Stip. 2.2.6.2.
Stabilize disturbed areas-Stip. 2.4.2-2.
Remove temporary fill ramps-Stip. 2.4.3.2.
Seed and plant disturbed areas-Stip. 2.4.4.1.
Dispose of excavated material-Stip. 2.4.5.
Provide for uninterrupted movement and safe passage of fish-Stip. 2.5.1.1.
Screen pump intakes-Stip. 2.5.1.2.
Plug, stabilize abandoned water diversion structures-Stip. 2.5.1.3.
Construct levees, etc.-Stip. 2.5.1.4.
Construct new channels-Stip. 2.5.2.2.

* "Sec." Refers to Sections of this Agreement.
"Stip." Refers to the Stipulations, attached as Exhibit D hereto.

Protect Fish Spawning Beds from sediment; construct settling basins-Stip. 2.5.2.3.
 Repair damage to Fish Spawning Beds-Stip. 2.5.2.4.
 Assure big game passage-Stip. 2.5.4.1.
 Remove certain debris-Stip. 2.7.2.5.
 Dispose of slash (where "otherwise directed.")-Stip. 2.7.2.8.
 Take certain mitigation measures-Stip. 2.8.1.
 Restore disturbed areas-Stip. 2.12.1.
 Stabilize slopes-Stip. 2.12.2.
 Dispose of certain materials-Stip. 2.12.3, Stip. 2.12.4.
 Remove equipment and supplies-Stip. 2.12.5.
 Clean up, repair, if Oil or other pollutant is discharged-Stip. 2.14.4.
 Inspect welds-Stip. 3.2.2.3.
 Inspect Pipeline System construction-Stip. 3.2.2.4.
 Perform seismic monitoring-Stip. 3.4.2.3.
 Construct stilling basins; stabilize pool sides-Stip. 3.6.2.1.
 Provide Oil spill containment structures-Stip. 3.11.1, Stip. 3.11.2.

19. Liens

A. Each Permittee shall, with reasonable diligence, discharge any lien against Federal Lands that results from any failure or refusal on its part to pay or satisfy any judgment or obligation that arises out of or is connected in any way with the construction, operation, maintenance or termination of all or any part of the Pipeline System.

B. However, Permittees shall prevent the foreclosure of any lien against any title, right, or interest of the United States in said lands.

C. The foregoing provisions of this Section shall not be construed to constitute the consent of the United States to the creation of any lien against Federal Lands or to be in derogation of any prohibition or limitation with respect to such liens that may now or hereafter exist.

20. Insolvency

If at any time there shall be filed by or against any Permittee, or any guarantor furnishing a guaranty in accordance with the provisions of Section 15 hereof, in any court of

competent jurisdiction, a petition in bankruptcy or insolvency or for reorganization or for the appointment of a receiver or trustee of all or a portion of the Permittee's or such guarantor's property, or if any Permittee, or any such guarantor, makes an assignment for the benefit of creditors or takes advantage of any insolvency act, and, in the case of an involuntary proceeding, within sixty (60) days after the initiation of the proceeding the Permittee or such guarantor fails to secure a discontinuance of the proceeding, the Secretary may, if the Secretary so elects, at any time thereafter, declare such to be a breach of this Agreement by the Permittee or, in cases involving a guarantor, the Permittee for which the guaranty was furnished.

21. Breach; Extent of Liability of Permittees

The liabilities and obligations of each Permittee under this Agreement are joint and several except that the liabilities and obligations of each Permittee are several under the following Sections: 2.D (Purpose of Grant; Limitation of Use to Permittees), 3 (Transportation of Oil), 8 (Use Charge for Right-of-Way), 12 (Reimbursement of Department Expenses), 13.C (Damage to United States Property; Repair, Replacement or Claim for Damages), 14 (Indemnification of United States), 15 (Guaranty), 18 (Right of the United States to Perform), 19.A (Liens), 20 (Insolvency), 22 (Transfer), 32 (Release of Right-of-Way), 33.B and 33.C, to the extent that performance may be required by less than all of the Permittees (Agreements Among Permittees), 34. (Access to Documents), 41 (Authority to Enter Agreement), Stipulation 1.4 (Common Agent), and Stipulation 1.10.1 (Completion of Use); *provided, however*, that as to any obligation to pay money to the United States, each such Permittee shall not be liable for any greater portion thereof than an amount which is equal to the product of the total obligation or liability when multiplied by a fraction, the numerator thereof being the individual Permittee's interest in the Right-of-Way at the time of the breach (such interest being expressed as a percentage for purposes of the numerator), and the denominator thereof being the aggregate of all of the interests in the Right-of-Way that were held by all of the Permittees at the time the obligation becomes

due and payable (the aggregate of such interest being expressed as a percentage for purposes of the denominator).

22. Transfer

A. Permittees, and each of them, shall not, without obtaining the prior written consent of the Secretary, Transfer in whole or in part any right, title or interest in this Agreement or the Right-of-way. Any such Transfer other than with to an Involuntary Passage of Title, without in each instance obtaining the prior written consent thereto of the Secretary, shall be absolutely void, and, at the option of the Secretary, shall be deemed to be a breach of this Agreement by each Permittee so violating this Agreement.

B. Any Involuntary Passage of Title with respect to any right, title or interest in this Agreement or the Right-of-Way that shall be attempted or effected without in each instance obtaining the prior written consent thereto of the Secretary shall, to the extent permitted by law, be voidable at the option of the Secretary, and, in addition, at the option of the Secretary, shall be deemed to be a breach of this Agreement by the affected Permittee; *provided, however*, that nothing in this subsection shall be deemed to prohibit, or to limit in any way, the exercise of any right or option of the United States under Section 20 of this Agreement.

C. With respect to any Transfer that shall relate to this Agreement or the Right-of-Way, the Transferor, the Transferee and the guarantor or guarantors, if any, of the Transferee shall apply for the Secretary's written consent to the Transfer by filing with the Secretary all documents or other information that may be required by law or regulation, this Agreement or any other agreement, permit, or authorization of the United States relating to the Pipeline System or any part thereof and, upon request from the Secretary, such other documents and information as may be relevant to the Secretary's determination.

D. Before the Secretary acts in connection with an application for his consent with respect to the Transfer of an interest in the Right-of-Way, the Transferee shall demonstrate, to the satisfaction of the Secretary, that the Transferee is capable of performing all of the liabilities and

obligations of the Transferor relating to the interest to be transferred. In considering an application for such consent, the Secretary shall make a determination, in accordance with Section 28(j) of the Mineral Leasing Act of 1920, as amended, concerning: (1) the technical capability of the Transferee, and (2) the financial capability of the Transferee, or of the Transferee together with, if any, its proposed guarantor or guarantors as approved by the Secretary, to perform all of the liabilities and obligations of the Transferor relating to the interest to be transferred.

E. In connection with any Transfer, the Secretary may request the right to audit and/or inspect, in whole or in part, the pertinent books, records, accounts, contracts, commitments, and property of the Transferee and of the proposed guarantor or guarantors, if any, of the Transferee, at the sole expense of the Transferor, which expense shall be paid to the United States upon completion of the inspection and/or audit and before the Secretary acts in connection with the application for his consent to the Transfer. If any such request shall be refused such refusal shall be deemed to be a sufficient reason for the Secretary to withhold his consent to the pertinent Transfer. The Transferee and its guarantor or guarantors, if any, shall consent in writing to the provisions of this subsection when applying for the consent of the Secretary.

F. The Secretary, shall not unreasonably withhold his consent to any Transfer hereunder, but may withhold or revoke his consent to any Transfer if:

- (1) At the time of, or before, the consummation of the Transfer, there shall have occurred any breach, by the Transferor or any predecessor of the Transferor, of this Agreement or of any other agreement, permit, or authorization relating to the Pipeline System that the United States may make with, issue to, or grant to the Transferor, and that was not cured to the satisfaction of the United States before the consummation of the Transfer, or
- (2) With respect to Transfers other than those referred to in subsection H of this

Section, the Transferee, or the Transferee together with, if any, its guarantor or guarantors as approved by the Secretary: (a) is not, or are not, capable, in the judgment of the Secretary, of performing all of the liabilities and obligations of the Transferor relating to the right, title or interest to be transferred, or (b) shall refuse to allow an audit and/or inspection as provided for in subsection E of this Section; or

- (3) Applicable laws and regulations in effect at the time of a Transfer shall not have been complied with by the parties to the Transfer.

G. A Permittee seeking to be divested in whole or in part of its right, title, and interest in and to the Right-of-Way and this Agreement in connection with a Transfer shall be released from its liabilities and obligations (accrued, contingent, or otherwise) to the United States under this Agreement to the extent and limit that the Transferee assumes unconditionally the performance and observance of each such liability and obligation, *provided*:

- (1) All of the provisions of this Agreement with respect to the approval or disapproval of the Transfer have been fully complied with to the satisfaction of the Secretary;
- (2) The Secretary has consented in writing to the Transfer; and
- (3) Thereafter the Transfer and the attendant assumption agreement, if any, are in fact duly consummated on the basis of the documents previously presented to the Secretary for his review, and the Secretary is so notified in writing by the parties to the Transfer.

H. The Secretary shall consent to the Transfer of an interest in the Right-of-Way between:

- (1) Any of the Original Permittees, their Affiliates or any of them, or

- (2) One or more of the Original Permittees, their Affiliates or any of them, and a corporate Transferee, all of the outstanding capital stock of which Transferee at the time of the Transfer is owned by one or more of the Original Permittees or their Affiliates; or
- (3) One or more of the Original Permittees, their Affiliates or any of them, and a partnership consisting of two (2) or more of the Original Permittees or their Affiliates;

provided, that the Transferor or Transferee are not in breach of this Agreement; *provided further*, that all applicable laws and regulations in effect at the time of Transfer are complied with; *provided further*, that the application for any such Transfer be filed with the Secretary within eight (8) years of the Effective Date hereof or prior completion of construction of the Pipeline at its maximum design capacity (i.e. approximately two million (2,000,000) barrels per day) whichever shall first occur; and *provided further*, that no substantial reduction in the financial worth of the Transferee (or its Parent), or of the Transferee (or its Parent) together with its guarantors, if any, has occurred since the date the Transferee (or its Parent) acquired its original interest in the Right-of-Way.

23. Port Valdez Terminal Facility

A. The provisions of this Section shall apply to the construction and operation of the terminal facility of the Pipeline System located at Port Valdez, Alaska.

B. Permittees shall maintain and operate a waste-water treatment facility in conjunction with the terminal facility at Port Valdez. All oily water (including, but not limited to, discharge from fuel tanks, cargo tanks, ballast tanks, and bilges) discharged from any tanker or other seagoing, bulk Oil carrier (hereinafter referred to as a "Vessel") loading at or from the terminal facility shall be received and treated by said wastewater treatment facility. Water discharged from the waste-water treatment facility shall not contain more than 10 parts of oil per million parts of water, on a weekly (seven (7) day) average.

C. At reasonable intervals, but at least once in every five (5) year period, the Authorized Officer and Permittees, at the request of either, shall meet to review and consider in depth: (1) the operation of the wastewater treatment facility; (2) such advances and improvements in water pollution control and waste-water treatment, technology and equipment, as they relate the terminal facility, as have taken place; and (3) the feasibility of improving the performance of the facility through installation of new or additional equipment, or modification of existing-equipment. Consideration of such feasibility shall include consideration of the degree of technological advances that have occurred, costs and economic feasibility, the types of equipment commercially available, and the benefits that would be derived from the installation of new or additional equipment or the modification of existing equipment.

D. Permittees, and their respective agents, employees, contractors and subcontractors (at any tier) shall not release, or suffer be released, from the terminal facility any Oil be loaded on any Vessel unless the provisions of subsections E and F of this Section have, in each case, been fully complied with.

E. Prior to loading Oil on any Vessel, Permittees shall require the master thereof to provide Permittees with a legible copy, certified under oath by the master as being true and correct, of:

- (1) in the case of Vessels of United States registry, that part of the oil record book of such Vessel that pertains to the voyage of the Vessel the terminal facility from its last Oil discharge port;
- (2) in the case of Vessels of foreign registry that may now or hereafter be required to maintain an oil record book, or similar records, that part of the oil record book, or said records, that pertains the voyage of the Vessel to the terminal facility from its last Oil discharge port; and
- (3) in the case of any Vessel of foreign registry that is not required the maintain an oil record book, or similar records, Permittees shall require the master

thereof to provide Permittees with an affidavit, duly sworn to and signed by the master, stating any and all facts bearing upon any discharge of Oil or oily water from the Vessel during its voyage to the terminal facility from its last Oil discharge port.

F. If the said record book entries or affidavit, as provided by the master, disclose:

- (1) that the Vessel has discharged any Oil or oily water from its fuel tanks, cargo tanks, bilge, or otherwise, and
- (2) that such discharge was not necessary for the safety of the Vessel or its crew,

Permittees shall promptly notify the Authorized Officer of the pertinent facts and shall not load the Vessel or suffer the Vessel to be loaded, unless at the time of such discharge:

- (a) The United States Coast Guard or other agency of the United States has promulgated and implemented regulations under one or more treaties, conventions, or statutes that are designed to deter Vessels subject to such treaties, conventions or statutes from discharging any Oil or oily water at sea and that apply to, and can be enforced by the United States Coast Guard or such other agency of the United States against, the offending Vessel; or
- (b) In the absence of the aforesaid regulations, or the inapplicability thereof to the offending Vessel, there shall be in effect port rules, approved in writing by the Authorized Officer for the purposes of this subsection F, for the port of Valdez or, as the case may be, the terminal facility, (which rules may provide for a demurrage charge against offending vessels) that are designed to deter any Vessel using the terminal facility from discharging Oil or oily water at sea and that apply to, and can be enforced against, the offending vessel; or

(c) If neither subsection F (a) or F (b) above in this Section shall be applicable, Permittees may proceed subject to applicable laws and regulations, to load the Vessel at the terminal facility; *provided, however*, that during its next return voyage the terminal facility, one of either of the following alternatives must be complied with before the Vessel can be loaded:

(i) (AA) The Vessel shall, prior to loading, remain for ten (10) consecutive hours (the "Standdown Period") in an area designated by the Authorized Officer, not nearer than fifty (50) nautical miles or farther than one hundred (100) nautical miles from the port of Valdez;

(BB) The Vessel's master shall enter in the ship's log the time and position of the Vessel at the commencement and termination of the Standdown Period, as well as the hourly positions of the Vessel during said period;

(CC) The Vessel's position at the point of departure, upon completion of the Standdown Period, shall not be greater than five (5) nautical miles from the Vessels position at the commencement of such period; and

(DD) Prior to loading the Vessel, Permittees shall receive from the master of the Vessel a legible copy, certified under oath by the master as being true and correct, of the aforementioned entries in the ship's log; or

(ii) (AA) The Vessel shall proceed to Valdez at a reduced rate of speed so that the voyage to Valdez (from its last port of call before such voyage) requires

at least ten (10) hours additional to the period of time the voyage would otherwise have taken; and

(BB) Prior to loading the Vessel, Permittees shall receive from the master of the Vessel a legible copy, certified as being true and correct, of the entries in the ship's log which demonstrate compliance with the aforementioned return-voyage requirements.

Notwithstanding the foregoing provisions of subsections F(c)(i) and F(c)(ii), the Authorized Officer may temporarily waive compliance with the return-voyage requirements (on such terms as the Authorized Officer may prescribe) if, from the ship's log and corroborative evidence, it is clearly demonstrated that compliance would have seriously jeopardized the safety of the ship or crew.

G. If a Vessel shall have been loaded at the terminal facility without being subjected to any of the alternatives that are prescribed in subsection F of this Section, and it should later be determined that the portion of the oil record book, a copy of which was furnished to Permittees prior to such loading, or affidavit, as the case may be, contained any false or misleading statement or did not contain a required entry or statement, and if the entry or statement had been properly made the Vessel would have been subject the aforesaid alternatives, then the Vessel shall be subject to the provisions of subsections E and F on its return voyage to the terminal facility next following the date on which the Authorized Officer notifies Permittees and the owner and/or, if any, the charterer of such Vessel of the aforementioned determination.

H. Permittees shall:

(1) Publish the restrictions placed on the loading of Vessels at the terminal facility under this Section in the port manual for the port of Valdez or, as the case may be, the terminal facility and, if legally permissible, in the tariff or tariffs

pertaining of the transportation of Oil through the Pipeline; and

- (2) Give the public such other notice of said restrictions as Permittees or the Authorized Officer may, from time to time, consider to be necessary or appropriate.

I. Permittees shall maintain books and records in connection with the operation of the waste-water treatment facility. Said books and records shall at least show, for each Vessel discharging into said facility, the name, tonnage (D.W.T.) and such other information as may be appropriate to identify the Vessel, the date of each discharge, the amount of ballast water discharged on each occasion, the amount of other oily water discharged on each occasion, and the amount of Oil that was loaded on each occasion from the terminal facility.

J. Permittees shall retain, for an appropriate period, as prescribed by the Authorized Officer, all documents furnished to Permittees pursuant to subsections E and F of this Section and the books and records specified in subsection I of this Section; and the Authorized Officer shall have access thereto at all reasonable times for the purpose inspection and copying.

K. Permittees shall comply with all Federal, State and local laws and regulations existing or hereafter enacted or promulgated affecting in any manner the construction and operation of the terminal facility. If any such law or regulation governs specifically any particular requirement or standard that is prescribed in this Section. Permittees shall comply with the requirement or standard established by such law or regulation and, so long as compliance is required, Permittees shall be relieved of any obligation to comply with the particular requirement or standard of this Section that is governed by such law or regulation.

24. Duty of Permittees to Abate

A. Permittees promptly shall abate, either completely or, as the case may be, as completely as possible using their best efforts, any physical or mechanical procedure, activity, event or condition, existing or occurring at any

time: (1) that is susceptible to abatement by Permittees, (2) which arises out of, or could affect adversely, the construction, operation, maintenance or termination of all or any part of the Pipeline System, and (3) that causes or threatens to cause: (a) a hazard to the safety of workers or to public health or safety (including but not limited to personal injury or loss of life with respect to any Person or Persons), or (b) serious and irreparable harm or damage to the environment (including but not limited to areas of vegetation or timber, fish or other wildlife populations, or their habitats, or any other natural resource).

B. Permittees shall cause their respective agents, employees, contractors and subcontractors (at any tier) to observe and comply with the foregoing provisions of this Section.

25. Temporary Suspension Orders of Authorized Officer

A. The Authorized Officer may at any time order the temporary suspension of any or all construction, operation, maintenance or termination activities of Permittees, their agents, employees, contractors or subcontractors (at any tier) in connection with the Pipeline System, including but not limited to the transportation of Oil, if in the judgment of the Authorized Officer:

- (1) An immediate temporary suspension of such activities is necessary protect: (a) public health or safety (including, but not limited to, personal injury or loss of life with respect any Person or Persons); or (b) the environment from immediate, serious, substantial and irreparable harm or damage (including, but limited to, harm or damage to areas of vegetation or timber, fish or other wildlife populations, or their habitats, or any other natural resource); or
- (2) Permittees, their respective agents, employees, contractors or subcontractors (at any tier) are failing or refusing, or have failed or refused, to comply with or observe: (a) any provision of this Agreement necessary to protect public health, safety or the environment; or (b) any order of the

Authorized Officer implementing any such provision of this Agreement or of any other agreement, permit or authorization that shall have been duly approved, issued or granted by the Secretary in connection with all or any part of the Pipeline System.

B. The following shall be applicable to any temporary suspension order that may be issued in accordance with the provisions of subsection A of this Section, if the order would have the effect of suspending (1) operation of the entire Pipeline, (2) transportation of Oil through the Pipeline, (3) operation of the entire Valdez terminal facility, or (4) construction of an entire Construction Subdivision:

- (a) If the order is issued in accordance with subsection A (1) of this Section, the Authorized Officer shall transmit a copy of the order, and a preliminary report with respect to the order, to the Secretary within six (6) hours after the order has been issued and, thereafter, the Authorized Officer's report and the order will be reviewed promptly by the Secretary; *provided, however*, that nothing therein shall require the Secretary to take any action following such review; or
- (b) If the order is to be issued in accordance with subsection A (2) of this Section, the Authorized Officer shall not issue the order unless and until the Secretary gives the Authorized Officer the Secretary's prior written approval with respect to the order.

C. The Authorized Officer shall give Permittees prior notice of the temporary suspension order as he deems practicable. If circumstances permit, the Authorized Officer shall consult with Permittees, prior to issuing the order, discuss appropriate measures (1) forthwith abate or avoid the harm or threatened harm that is the reason for the issuance of the order, or (2) effect compliance with the provision or order, whichever is applicable.

D. After a temporary suspension order has been given by the Authorized Officer, Permittees

shall promptly comply with all of the provisions of the order and shall not resume any activity suspended or curtailed thereby except as provided in this Agreement or pursuant court order.

E. Any temporary suspension order which, in an emergency, is given orally shall be confirmed in writing, as provided for in Stipulation 1.6.2. Each written order or written confirmation of an order shall set forth the reasons for the suspension. Each temporary suspension order shall be limited, insofar as is practicable, the particular area or activity that is or may be affected by the activities or conditions that are the basis of the order. Each order shall be effective as of the date and time given, unless it specifies otherwise. Each order shall remain in full force and effect until modified or revoked in writing by the Authorized Officer or the Secretary.

F. Resumption of any suspended activity shall be promptly authorized by the Authorized Officer in writing when he is satisfied that (1) the harm or threatened harm has been abated or remedied, or (2) Permittees have effected, or are ready, willing and able effect compliance with the provision or order, whichever is applicable.

G. Any temporary suspension order that is given or issued in accordance with this Section shall be subject the provisions of Stipulation 1.5.1.

26. Appeal Procedure

A. *Appeals from Temporary Suspension Orders of Authorized Officer; Appeals from Denials of Resumption of Suspended Activities*

(1) Permittees may appeal directly to the Secretary: (a) any temporary suspension order issued by the Authorized Officer pursuant to Section 25 of this Agreement; and (b) any denial by the Authorized Officer of a request for resumption of activities suspended pursuant to such a temporary suspension order. If a right of appeal is to be preserved, Permittees shall file a notice of appeal with the Secretary within fifteen (15) days from the effective date of the order or denial being appealed. The notice shall set forth with particularity the order or denial being appealed. To perfect an appeal, Permittees shall

file with the Secretary within thirty (30) days from the effective date of the order or denial being appealed a statement of the facts of the matter and a statement of the applicable law, supplemented by such documentation and arguments on the facts and the law as Permittees may wish to present to justify modification or reversal of the order or denial. All statements of fact shall be under oath.

(2) Except as provided hereinafter in this Section, the Secretary shall decide the appeal within thirty (30) days from the date Permittees' appeal is perfected. If the Secretary does not render a decision within that time, the appeal shall be considered to have been denied by the Secretary, and such denial shall constitute the final administrative decision of the Department.

(3) Except for any decision that may be made by the Secretary after his review as provided for in subsection b (a) of Section 25 hereof, any decisions of the Secretary, with respect any appeal within the Department as any matter arising out of this Agreement, shall constitute the final administrative decision of the Department.

B. Expedited Appeals

(1) Permittees shall be entitled to an expedited appeal the Secretary from any temporary suspension order, or order denying resumption of suspended activities (except any refusal to issue a Notice to Proceed or the issuance of a Notice to Proceed that may not be substantially in accord with the application therefor), issued by the Authorized Officer and that suspends, or denies resumption of, the following: (a) operation of the entire Pipeline; (b) transportation of Oil through the Pipeline; (c) operation of the entire Valdez terminal facility; or (d) construction of an entire Construction Subdivision.

(2) Permittees may occasionally, from time to time, during construction of the Pipeline System, designate an order not covered by subsection b (1) of this Section but which the Permittees deem critical and which the Secretary shall consider as an expedited appeal. Such designation shall be made in the notice of appeal and shall be supported by factual

information, under oath, to confirm that the affected activity is one of critical importance.

(3) The Secretary shall render a decision so as dispose of the expedited appeal within the shortest possible time and in all events within seven (7) days of the date of filing of the documents required to perfect an appeal. If the Secretary does not render a decision within such time, the appeal may be deemed by Permittees to have been denied by the Secretary, and such denial shall constitute the final administrative decision of the Department.

C. Appeals with Respect to Notices to Proceed

(1) Permittees may appeal to the Secretary if, with respect to a particular application for a Notice to Proceed: (a) the Authorized Officer has refused to issue the Notice to Proceed within the time prescribed pursuant to Stipulation 1.7.4; or (b) the Authorized Officer has issued a Notice to Proceed not substantially in accord with the application therefor. If the Authorized Officer has not acted within the prescribed time to either issue or deny the issuance of the Notice to Proceed, such failure to act shall be deemed to be a refusal by the Authorized Officer to issue the Notice to Proceed.

(2) The ground or grounds for such an appeal shall be one or more of the following: (a) The Authorized Officer has construed the applicable Stipulations erroneously; or (b) The Authorized Officer has imposed arbitrary and capricious requirements to enforce the Stipulations; or (c) Permittees have made a bona fide effort to meet the requirements of the Authorized Officer, but are unable to comply; or (d) By failing to act upon the requested Notice to Proceed, within the prescribed time, the Authorized Officer has been unreasonable.

(3) Each appeal under this subsection shall be subject to the appeal procedure set forth in subsection A of this Section.

27. Requests to Resume; Appeals

A. If by a temporary suspension order issued pursuant to Section 25 of this Agreement, the Authorized Officer has ordered the suspension of an activity of Permittees, Permittees may at any time thereafter file with

the Authorized Officer a request for permission to resume that activity on the ground that the reason for the suspension no longer exists. The request shall contain a statement, under oath, of the facts which in Permittees' view support the propriety of resumption.

B. The Authorized Officer shall render a decision, either granting or denying the request, within five (5) days of the date that the request was filed with him. If the Authorized Officer does not render a decision within that time, the request shall be considered denied and Permittee may appeal the denial to the Secretary in accordance with the provisions of Section 26 of this Agreement.

C. If, at the time the request to resume is filed with the Authorized Officer, the Authorized Officer's order suspending the activity is pending before the Secretary pursuant to a perfected appeal, the Authorized Officer shall nonetheless proceed to act upon the request. If the Authorized Officer grants the request that action shall be determinative of both the request and the pending appeal.

28. Nondiscrimination and Equal Employment Opportunity

A. Permittees shall assure that no person shall on the grounds of race, creed, color, national origin or sex be excluded from receiving or participating in any activity, including all aspects of employment and contracting, conducted under any permit, right-of-way, public land order, or other Federal authorization granted or issued under the Trans-Alaska Pipeline Authorization Act. Permittees shall comply with all regulations that shall be promulgated by the Secretary to implement this provision.

B. Permittees agree that, during the period of construction of the Pipeline System and for so long as the Pipeline System, or any portion thereof, shall be in operation, or for so long as this Agreement shall be in effect, whichever is the longer:

- (1) Permittees will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

Permittees will take affirmative action to ensure that applicants are employed, and that employees are equally treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Permittees agree to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Authorized Officer setting forth the provisions of this equal opportunity clause.

- (2) Permittees will, in all solicitations or advertisements for employees placed by or on behalf of Permittees, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- (3) Permittees will send to each labor union or representative of workers with which Permittees have a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Authorized Officer, advising the labor union or workers' representative of Permittees' commitments under this equal opportunity clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (4) Permittees will comply with Executive Order No. 11246 of September 24, 1965, as amended, and rules and regulations and relevant orders of the Secretary of Labor.
- (5) Permittees will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to Permittees' books, records, and accounts by the Authorized Officer and

the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

- (6) In the event of Permittees' noncompliance with this equal opportunity clause or with any of said rules, regulations or orders, this Agreement may be terminated or suspended in whole or in part by the Secretary, in accordance with the provisions of Section 403 of the Act of November 16, 1973, 87 Stat. 590 (1973) and in the manner provided in Section 31 hereof, and Permittees may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- (7) Permittees will include the provisions of an equal opportunity clause as established by regulation of the Secretary in every contract, subcontract or purchase order unless exempted so that such provisions will be binding upon each contractor, subcontractor (at any tier) or vendor. Permittees will take such action with respect to any contract, subcontract, or purchase order as the Authorized Officer may direct as a means of enforcing such provisions including sanctions for noncompliance; *provided, however*, that in the event Permittees become involved in or are threatened with litigation with a contractor, subcontractor (at any tier) or vendor as a result of such direction by the Authorized Officer, Permittees may request the United States to enter into such litigation to protect the interests of the United States.

Permittees further agree that they will be bound by the equal opportunity clause (i.e., subsections (1) through (7) of this subsection B) with respect to their own employment practices

when they participate in federally assisted construction work.

C. Permittees agree that they will assist and cooperate actively with the Authorized Officer and the Secretary of Labor in obtaining the compliance of contractors and subcontractors (at any tier) with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, pursuant to the Executive Order, that they will furnish the Authorized Officer and the Secretary of Labor such information as they may require for the supervision of such compliance, and that they will otherwise assist the Authorized Officer in the discharge of the Department's primary responsibility for securing compliance.

D. Permittees further agree that they will refrain from entering into any contract or contract modification subject to Executive Order No. 11246 of September 24, 1965, with a contractor debarred from Government contracts and federally assisted construction contracts and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the Authorized Officer or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, Permittees agree that if they fail or refuse to comply with these undertakings, the Secretary may take any or all of the following actions: terminate or suspend the Right-of-Way in whole or in part, in accordance with the provisions of Section 403 of the Act of November 16, 1973, 87 Stat. 590 (1973), and in the manner provided in Section 31 hereof; refrain from extending any further assistance to Permittees under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received from Permittees; and refer the case to the Department of Justice for appropriate legal proceedings.

E. By accepting this Agreement, Permittees certify that Permittees do not and will not maintain or provide for Permittees' employees any Segregated Facilities at any of Permittees' establishments and that Permittees do not and will not permit Permittees' employees to perform their services at any location, under Permittees' control, where Segregated Facilities are maintained. Permittees agree that a breach of

this certification is a violation of the equal opportunity clause of this Agreement. As used in this certification, the term "Segregated Facilities" means, but is not limited to, any waiting rooms, work areas, rest rooms, and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom or otherwise. Permittees further agree that (except where Permittees have obtained identical certifications from proposed contractors and subcontractors [at any tier] for specific time periods) Permittees will obtain identical certifications from proposed contractors and subcontractors [at any tier] prior to the award of contracts or subcontracts exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause; that Permittees will retain such certifications in Permittees' files; and that Permittees will forward the following notice to such proposed contractors and subcontractors (except where the proposed contractors or subcontractors have submitted identical certifications for specific time periods): "NOTICE TO PROSPECTIVE CONTRACTORS AND SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES." A Certification of Nonsegregated Facilities, as required by the order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a contract or subcontract exceeding \$10,000 which is not exempt from the provisions of the equal opportunity clause. The certification may be submitted either for each contract and subcontract or for all contracts and subcontracts during a period (i.e., quarterly, semiannually, or annually).

29. Training of Alaska Natives

A. Permittees shall enter into an Agreement with the Secretary regarding recruitment, testing, training, placement, employment, and job counseling of Alaska Natives.

B. During construction and operation of the Pipeline System, Permittees shall conduct a pre-employment and on-the-job training program for Alaska Natives designed to qualify them for initial employment in connection with the Pipeline System and for advancement to higher paying positions thereafter.

C. Permittees shall do everything practicable to secure the employment, in connection with the Pipeline System, of those Alaska Natives who successfully complete Permittees' training program. Permittees shall inform the Authorized Officer of the discharge from such employment of each and every Alaska Native and of the reason therefor, in advance of such discharge whenever possible or, if advance notice is impossible, as soon thereafter as is practicable.

D. Permittees shall furnish such information and reports concerning Alaska Native employment as the Authorized Officer shall require from time to time.

30. Native and Other Subsistence

A. To the extent practicable, Permittees shall not damage any fish, wildlife or biotic resources in the general area of the Right-of-Way upon which Persons living in the area rely for subsistence purposes; and Permittees will comply promptly with all requirements and orders of the Secretary to protect the interests of Persons living in the general area of the Right-of-Way who rely on the fish, wildlife and biotic resources of the area for subsistence purposes.

B. Upon the order of the Secretary, Permittees shall provide emergency subsistence and other aid, as required by the Secretary, to any affected Alaska Native, Native organization or other Person pending expeditious filing of, and determination of, a claim by such Alaska Native, Native organization or other Person under Section 204(a) of the Trans-Alaska Pipeline Authorization Act. The Secretary's decision to issue an order may be based on statements, made under oath, by such Alaska Native, Native organization or other Person seeking emergency aid.

31. Termination or Suspension of Right-of-Way

A. Any failure or refusal of any Permittee, its agents, employees, contractors or subcontractors (at any tier), or any of them, to observe or comply substantially with any applicable provision of Section 28 of the Mineral Leasing Act of 1920, as amended, the Trans-Alaska Pipeline Authorization Act, the regulations of the Secretary implementative thereof, or any provision of this Agreement required or authorized by such statutes, shall be deemed to constitute a breach of this Agreement, said breach being determined to be joint and several or several according to the provisions of Section 21 hereof, and, at the option of the Secretary, may be grounds for termination or formal suspension of such Permittee's interest in the Right-of-Way; *provided, however*, if, as determined in accordance with the provisions of Section 21 hereof, the breach results in several (as opposed to joint and several) liability, the interest in the Right-of-Way of a Permittee which is not liable for the breach shall not be subject to termination or formal suspension on account of the breach.

B. The failure or refusal of Permittees to proceed with reasonable diligence to construct the Pipeline shall be grounds for termination or formal suspension of the Right-of-Way in a proceeding brought under Section 28(o) of the Mineral Leasing Act, as amended; *provided, however*, that the Right-of-Way shall not be terminated or suspended if the failure to proceed to construct the Pipeline is due to circumstances beyond the control of the Permittees.

C. Abandonment of the Right-of-Way shall not constitute a breach of this Agreement but may, at the option of the Secretary, be grounds for termination of the Right-of-Way. Deliberate failure of Permittees, for any continuous two-year period (whether or not calculated on a calendar-year basis), to use the Right-of-Way for the purpose for which it was granted shall constitute a rebuttable presumption of abandonment of the Right-of-Way. However, where such failure to use the Right-of-Way is due to circumstances not within Permittees' control, the Secretary is not required to commence proceedings under Section 28(o) of the Mineral Leasing Act of 1920, as amended.

D. Administrative proceedings to terminate or formally suspend the Right-of-Way under subsections A and B of this Section shall be conducted pursuant to Title 5, United States Code, Section 554, and the applicable regulations of the Secretary.

E. Before the Secretary authorizes the commencement of any administrative proceeding under Title 5, United States Code, Section 554, for the termination or formal suspension of any interest in the Right-of-Way, the Authorized Officer shall give the affected Permittee or Permittees notice in writing of the alleged ground or grounds for termination or formal suspension, with sufficient particularity to enable the Permittee or Permittees to cure if the ground or grounds that are alleged constitute a breach of this Agreement. The Permittee or Permittees shall have:

- (a) thirty (30) days, in the case of any failure or refusal to pay money, and
- (b) sixty (60) days in all other cases, from (and not including) the date of delivery of the notice within which to cure the alleged breach or breaches of this Agreement. If the alleged breach or breaches (other than with respect to the payment of money) cannot be cured within sixty (60) days, the Permittee or Permittees shall be entitled to such additional time as may be necessary to cure; *provided, however*, that the affected Permittee or Permittees (whose interest in the Right-of-Way would be terminated or formally suspended if the United States prevailed in a proceeding to terminate or formally suspend the interest on the ground or grounds asserted in the notice) first demonstrate to the satisfaction of the Authorized Officer that the necessary curative actions were undertaken promptly and have been diligently prosecuted towards completion; *provided further*, that the aforesaid additional time to cure shall not exceed ninety (90) days from (and not including) the last day of the said sixty (60) day period, without the prior written consent of the Authorized Officer, which shall specify the last day (to be determined by the Authorized Officer)

upon which the curative action must be completed to the satisfaction of the Authorized Officer. The consent of the Authorized Officer to additional time (in excess of the said ninety (90) day period) to cure shall not be unreasonably withheld, and shall normally be given in situations involving physical activities of Permittees in connection with construction, maintenance, operation or termination of the Pipeline which Permittees can demonstrate require more time.

F. The foregoing provisions of subsection E of this Section shall not apply with respect to a breach under any one or more of the following Sections of the Agreement: 20 (Insolvency), 24 (Duty of Permittees to Abate), 25 (Temporary Suspension of Activities).

32. Release of Right-of-Way

A. In connection with the relinquishment, abandonment or other termination before the expiration of the grant of the Right-of-Way, of any right or interest in the Right-of-Way, and/or in the use of all or any part of the lands subject to the Right-of-Way, each Permittee holding such right or interest shall promptly execute and deliver to the United States, through the Authorized Officer, a valid instrument of release in recordable form, which shall be executed and acknowledged with, the same formalities as a deed. The instrument of release shall contain, among other things, appropriate recitals, a description of the pertinent rights and interests, and, for the benefit of the United States and its grantees or assigns, express representations and warranties by the Permittee that it is the sole owner and holder of the rights or interests described therein and that such rights or interests are free and clear of all liens, equities or claims of any kind requiring or that may require the consent of a third party, claiming in whole or in part by, through or under the Permittee, for the valid release or extinguishment thereof, except for such that are owned or claimed by third parties which have joined in the execution of the release. The form and substantive content of each instrument of release shall be approved by the Authorized Officer but, except as otherwise expressly provided for above in this subsection in no event

shall any such instrument operate to increase the then-existing liabilities and obligations of the Permittee furnishing the release.

B. Each release shall be accompanied by such resolutions and certifications as the Authorized Officer may require in connection with the power or the authority of the Permittee, or of any officer or agent acting on its behalf, to execute, acknowledge or deliver the release.

C. Neither the tender, nor the approval and/or acceptance, of any such release shall operate as an estoppel or waiver of any claim or judgment against a Permittee or to relieve or discharge, in whole or in part, any Permittee of and from any of its then-existing liabilities or obligations (accrued, contingent or otherwise); and, notwithstanding any such tender or delivery, or any approval of the Authorized Officer, if a release shall contain any provision that operates, or that by implication might operate, to discharge or relieve, in whole or in part, a Permittee of and from any of its liabilities or obligations (accrued, contingent or otherwise) or that operates or might operate as an estoppel or waiver of any claim or judgment against a Permittee, or as a covenant not to sue, such provision shall be, and shall be deemed to be, void and of no effect whatsoever insofar as it would have the effect of so discharging or relieving a Permittee or operating as an estoppel, waiver or covenant not to sue.

33. Agreements Among Permittees

A. The Original Permittees, and each of them, represent and covenant with the United States that they have entered into only the following agreements, and no other agreements, written or oral (excluding prior agreements that no longer have any force or effect), which establish each Original Permittee's interest in the Pipeline System venture and each Original Permittee's relationships with the common agent, as referred to in Stipulation 1.4, for all or any phase of the construction, operation, maintenance and termination of the Pipeline System or any part thereof:

- (1) Agreement entitled "Trans-Alaska Pipeline System Agreement", dated as of August 27, 1970, by and among

APPENDIX B

- Atlantic Pipe Line Company,* BP Pipe Line Corporation,* Humble Pipe Line Company,* Amerada Hess Corporation, Home Pipe Line Company, Mobil Pipe Line Company, Phillips Petroleum Company, and Union Oil Company of California, with Exhibit "C", entitled "Enabling Agreement", annexed thereto;
- (2) Agreement entitled "First Supplemental Agreement", dated as of August 27, 1970, by the same parties;
 - (3) Agreement entitled "Second Supplemental Agreement", dated as of August 27, 1970, by the same parties;
 - (4) Agreement entitled "Third Supplemental Agreement", dated as of August 27, 1970, by the same parties;
 - (5) Agreement entitled "Fourth Supplemental Agreement", dated as of August 27, 1970, by the same parties;
 - (6) Agreement entitled "Fifth Supplemental Agreement" dated as of August 27, 1970, by the same parties;
 - (7) Agreement entitled "Agreement for the Design and Construction of the Trans-Alaska Pipeline System" dated as of August 27, 1970, by and among Atlantic Pipe Line Company, BP Pipe Line Corporation, Humble Pipe Line Company, Amerada Hess Corporation, Home Pipe Line Company, Mobil Pipe Line Company, Phillips Petroleum Company, Union Oil Company of California, and Alyeska Pipeline Service Company;
 - (8) Agreement entitled "Shareholders Agreement for Alyeska Pipeline Service Company", dated as of August 27, 1970, by the same parties as those listed with respect to the agreement referred to immediately above;
 - (9) Assignment, Assumption, Release and Consent Agreement, dated as of August 28, 1970, in connection with the transfer by Home Pipe Line Company to the other participating companies of all of its rights, title, and interest in the Pipeline System and in the foregoing agreements, and as a shareholder in and to Alyeska Pipeline Service Company.
 - (10) Assignment, Conveyance, and Transfer Agreement, dated December 11, 1973, in connection with the transfer by Mobil Pipe Line Company to Mobil Alaska Pipeline Company, a Delaware Corporation, of all of the former company's rights under all agreements relating to the Trans-Alaska Pipeline System, to which the former company is a party, and all real or personal property in which the former company may have acquired an ownership interest pursuant to such agreements, and under which Assignment, Conveyance and Transfer Agreement Mobil Alaska Pipeline Company assumes all undischarged obligations of Mobil Pipe Line Company under any and all of the above mentioned Trans-Alaska Pipeline System agreements, together with certain supporting documents (five in number) each dated December 11, 1973; and
 - (11) Assignment, Conveyance, and Transfer Agreement, dated January 8, 1974, in connection with the transfer by Union Oil Company of California to Union Alaska Pipeline Company, a California Corporation, of all of the former company's rights under all agreements relating to the Trans-Alaska Pipeline System to which the former company is a party, and all real or personal property in which the former company may have acquired an ownership
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- * ARCO Pipeline Company, a Delaware corporation, represents and covenants that it is the successor by merger to all of the rights and obligations of Atlantic Pipe Line Company. Sohio Pipe Line Company, a Delaware corporation, represents and covenants that it is the successor by merger to all of the rights and obligations of BP Pipe Line Corporation. Exxon Pipeline Company, a Delaware corporation, represents and covenants that it is the same corporation as Humble Pipe Line Company, but that its name has been duly changed to "Exxon Pipeline Company."

interest pursuant to such agreements, and under which Assignment, Conveyance and Transfer Agreement Union Alaska Pipeline Company assumes all undischarged obligations of Union Oil Company of California under any and all of the above mentioned Trans-Alaska Pipeline System agreements.

B. Said agreements are referred to collectively as the "Ownership Agreements." Each affected Permittee shall file promptly with the Authorized Officer true and complete copies of all modifications of the Ownership Agreements and of all instruments superseding, supplementing, canceling or rescinding, in whole or in part, any one or more of the Ownership Agreements.

C. In the event Permittees execute an "Operating Agreement", as contemplated in Section 5.1 of the agreement described in subsection A (I) above in this Section, or any like or similar agreement with respect to the operation, maintenance, or termination of all or any part of the Pipeline System, Permittees shall file promptly with the Authorized Officer a true and complete copy thereof, together with like copies of all modifications of, and all agreements superseding, supplementing, canceling or rescinding, in whole or in part, the Operating Agreement or any such like or similar agreement.

34. Access to Documents

A. As to any documents or records not filed (or required to be filed under any other provision of this Agreement) with the Secretary or the Authorized Officer that shall be relevant to the exercise or enforcement by the Secretary of his authority or the rights of the United States under or in connection with this Agreement or with respect to all or any part of the Pipeline System the Secretary shall have the right, after notice to the affected Permittee, to inspect and copy: (1) any document or record which a Permittee is required by this Agreement to make or maintain, (2) any document or record that at any time has been filed by a Permittee with any governmental department or agency, access to which is not

prohibited or limited by law or regulation, or (3) any abstract, summary or other document that may have been prepared by any governmental department or agency in connection with any document or record referred to in (2) above.

B. Subject to the requirement that the documents or records, herein below referred to, shall be relevant to the exercise or enforcement by the Secretary of his authority or the rights of the United States under or in connection with this Agreement or with respect to all or any part of the Pipeline System, the Secretary, after notice to the affected Permittee, may inspect and, with the consent of the affected Permittee (which consent each Permittee agrees will not be unreasonably withheld or delayed), may copy any document or record that has been or may hereafter be filed by a Permittee with any governmental agency, access to which is prohibited or limited by law or regulation, and any abstract, summary or other document that may have been prepared by a governmental department or agency in connection with any such document or record; *provided, however*, that the rights of the Secretary under this subsection may be exercised only if, and to the extent that, this provision constitutes a valid waiver of any such prohibition or limitation.

C. Nothing in this Section shall be deemed to limit, prohibit, or waive any right or privilege of the United States, and particularly of the Secretary, to inspect or copy any document or record under any authority granted pursuant to law or regulations.

35. Rights of Third Parties

The parties hereto do not intend to create any rights under this Agreement that may be enforced by third parties for their own benefit or for the benefit of others.

36. Covenants Independent

Each and every covenant contained in this Agreement is, and shall be deemed to be, separate and independent of, and not dependent on, any other covenant contained in this Agreement.

37. Partial Invalidity

If any part of this Agreement is held invalid or unenforceable, the remainder of this Agreement shall not be affected and shall be valid and enforced to the fullest extent permitted by law.

38. Waiver Not Continuing

The waiver by any party hereto of any breach of any provision of this Agreement by any other party hereto, whether such waiver be expressed or implied, shall not be construed to be a continuing waiver or a waiver of, or consent to, any subsequent or prior breach on the part of such other party, of the same or any other provision of this Agreement.

39. Remedies Cumulative; Equitable Relief

Except as otherwise expressly provided in subsections B and D of Section 13 of this Agreement, no remedy conferred by this Agreement upon or reserved to the United States or to Permittees is intended to be exclusive of any other remedy provided for by this Agreement or by law, but each shall be cumulative and shall be in addition to every other remedy given hereunder or now or hereafter existing in equity or at law; and the United States, in a proper action instituted by it, may seek a decree against a Permittee or Permittees for specific performance, injunctive or other equitable relief, as may be appropriate.

40. Section Headings

The section headings in this Agreement are for convenience only, and do not purport to, and shall not be deemed to, define, limit or extend the scope or intent of the section to which they pertain.

41. Authority to Enter Agreement

Each Original Permittee represents and warrants to the United States that: (1) and by its charter and by-laws to enter into and perform this Agreement in accordance with the provisions hereof; (2) its board of directors, or

duly authorized executive committee, has duly approved, and has duly authorized, the execution, delivery and performance by it of this Agreement; (3) all corporate and shareholder action that may be necessary or incidental to the approval of this Agreement, and the due execution, delivery and performance hereof by Permittee, has been taken; and (4) that all of the foregoing approvals, authorizations and actions are in full force and effect at the time of the execution and delivery of this Agreement.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement as of the date first above written.

United States of America
By /s/ Gale Norton
Secretary of the Interior

Amerada Hess Pipeline Corporation
By /s/
Title

BP Pipelines (Alaska) Inc.
By /s/
Title

ExxonMobil Pipeline Company
By /s/
Title

Phillips Transportation Alaska, Inc.
By /s/

Unocal Pipeline Company
By /s/
Title

Williams Alaska Pipeline Company,
L.L.C.
By /s/
Title

EXHIBIT A
Federal Grant of Right-of-Way
F-12505 and AA-5847
Legal Description

APPENDIX B

EXHIBIT A

Federal Grant of Right-of-Way F-12505 and AA-5847 Legal Description

Those lands within the Trans Alaska Pipeline System Right-of-Way as described in:

Plats 81-1 (TAPS Centerline Monumentation Survey) filed January 7, 1981 in the Barrow, Fairbanks, Fort Gibbon and Rampart Recording Districts, respectively, and filed on January 12, 1981 in the Chitina and Valdez Recording Districts, respectively,

Plats 2001-8 and 2001-5 (TAPS Centerline Monumentation Survey at Atigun Reroute, MP 200 Reroute and Pump Station ["P.S."] 6 vicinity) filed January 10, 2001 in the Barrow and Fairbanks Recording Districts, respectively,

Plat 95-3 (P.S. 4) filed February 23, 1995 in the Barrow Recording District,

Plats 95-11 (P.S. 5) and 95-14 (P.S. 10) filed February 23, 1995 in the Fairbanks Recording District,

Plat 95-04 (P.S. 11) filed February 27, 1995 in the Chitina Recording District,

Plat 95-04 (P.S. 12) filed February 21, 1995 in the Valdez Recording District,

Plats 2001-6 (Communication Site (C.S.) Atigun) and 2001-7 (C.S. Margaret Hill) filed January 10, 2001 in the Barrow Recording District,

Plats 2000-14 (C.S. Gakona) and 2000-15 (C.S. Stuck) filed December 27, 2000 in the Chitina Recording District,

Plats 2001-6 (C.S. Kaaruk), 2001-7 (C.S. Coldfoot), 2001-8 (C.S. Eagle), 2001-9 (C.S. Fish), 2001-11 (C.S. Aggie), 2001-12 (C.S. Donnelly), 2001-13 (C.S. Nicole Knob) and 2001-14 (C.S. Yost) filed January 10, 2001 in the Fairbanks Recording District,

Plat 2001-1 (C.S. Bench) filed January 10, 2001 in the Rampart Recording District,

Plats 2001-17 (C.S. Kimball Pass), 2001-19 (C.S. Tiekell) and 2001-20 (C.S. Tsina) filed December 28, 2000 in the Valdez Recording District,

And further described in the TAPS Right-of-Way Boundary Description Report, Alyeska Manual No. ROW 214, as amended.

To the extent such lands are located with the following described townships:

UMIAT MERIDIAN

T. 1 S., R. 14 E.,

Sec. 2 E½

Sec. 10 SE¼

Sec. 11

Sec. 15 NE¼

T. 9 S., R. 13 E.,

Sec. 4, 5, 8, 7

T. 9 S., R. 12 E.,

Sec. 11, 12, 14, 15, 16, 17, 19, 20, 30

T. 9 S., R. 11 E.,

Sec. 25, 35, 36,

T. 10 S., R. 11 E.,

Sec. 2, 3, 10, 11, 14, 23, 26, 35

T. 11 S., R. 11 E.,

Sec. 1, 2, 12, 13, 24

T. 11 S., R. 12 E.,

Sec. 19, 29, 30, 32

T. 12 S., R. 12 E.,

Sec. 5, 8, 9, 16, 21, 28, 33

T. 13 S., R. 12 E.,

Sec. 3, 9, 10, 15, 16, 21, 28, 33, 32

T. 14 S., R. 12 E.,

Sec. 5, 7, 8, 17, 20, 29, 32

APPENDIX B

T. 15 S., R. 12 E.,
Sec. 5, 6, 7, 17, 18, 19

T. 15 S., R. 11 E.,
Sec. 23, 24, 26, 35, 34

T. 16 S., R. 11 E.,
Sec. 2, 3, 9, 10, 16, 19, 20, 21, 29, 30

T. 16 S., R. 10 E.,
Sec. 25, 35, 36,
Sec. 33 NE $\frac{1}{4}$,
Sec. 34 NW $\frac{1}{4}$

T. 17 S., R. 10 E.,
Sec. 2

FAIRBANKS MERIDIAN

T. 37 N., R. 10 W.,
Sec. 25, 26, 35

T. 36 N., R. 10 W.,
Sec. 2, 3, 10, 15, 16, 21, 28, 33

T. 35 N., R. 10 W.,
Sec. 4, 9, 16, 21, 28, 33

T. 34 N., R. 10 W.,
Sec. 4, 9, 10, 15, 22, 27, 26, 35

T. 33 N., R. 10 W.,
Sec. 2, 11, 13, 14, 21, 24, 25, 26, 35, 34

T. 32 N., R. 10 W., F.M.
Sec. 4, 9, 16, 21, 20, 29, 32, 31

T. 31 N., R. 10 W.,
Sec. 6, 7, 8, 18, 19

T. 31 N., R. 11 W.,
Sec. 25, 26, 35, 34, 33, 32

T. 30 N., R. 11 W.,
Sec. 5, 6, 7, 18, 19, 30

T. 30 N., R. 12 W.,
Sec. 25, 36

T. 29 N., R. 12 W.,
Sec. 1, 11, 12, 13, 14

T. 28 N., R. 12 W.,
Sec. 6 SE $\frac{1}{4}$
Sec. 15 and 16, those portions
within federal mining claim
F-63334
Sec. 29, 30, 31

T. 27 N., R. 12 W.,
Sec. 6

T. 27 N., R. 13 W.,
Sec. 1, 11, 12, 14, 23, 26, 35

T. 26 N., R. 13 W.,
Sec. 2, 11, 14, 23, 26, 25, 36

T. 25 N., R. 14 W.,
Sec. 35 NW $\frac{1}{4}$

T. 25 N., R. 13 W.,
Sec. 1, 12, 13, 23, 24, 26, 27, 33, 34

T. 25 N., R. 12 W.,
Sec. 6, 7

T. 24 N., R. 13 W.,
Sec. 5, 7, 8, 18

T. 24 N., R. 14 W.,
Sec. 13, 23, 24, 26, 27, 34

T. 23 N., R. 14 W.,
Sec. 3, 4, 8, 9 17, 18, 19, 30, 31

T. 22 N., R. 14 W.,
Sec. 6, 7, 18, 19, 20, 29, 32

T. 21 N., R. 14 W.,
Sec. 5, 6, 7, 18, 19, 30, 31

T. 20 N., R. 13 W.,
Sec. 30 SW $\frac{1}{4}$

T. 20 N., R. 15 W.,
Sec. 2, 10, 11, 15, 22, 26, 27, 35

T. 19 N., R. 15 W.,
Sec. 2, 11, 12, 13, 24

T. 19 N., R. 14 W.,
Sec. 19, 30, 31, 32

T. 18 N., R. 14 W.,
Sec. 4, 5,
United States Survey ("USS") 6892, Lot 6
(in Sec. 9)
Sec. 9, 10, 14, 15, 23, 25, 26, 36

T. 17 N., R. 14 W.,
Sec. 1

T. 17 N., R. 13 W.,
Sec. 6, 7, 8, 17, 20, 21, 28, 33, 34

T. 16 N., R. 13 W.,
Sec. 3, 4, 10, 15, 14, 23, 24, 25, 36

T. 16 N., R. 12 W.,
Sec. 31

T. 15 N., R. 12 W.,
Sec. 6, 7, 17, 18, 20, 29, 30, 31

T. 14 N., R. 11 W.,
Sec. 26

T. 14 N., R. 12 W.,
Sec. 6, 7, 8, 17, 20, 21, 27, 28, 34, 35

T. 13 N., R. 12 W.,
Sec. 1, 2, 12

T. 13 N., R. 11 W.,
Sec. 7, 17, 18, 20, 21, 22, 26, 27, 35, 36

T. 12 N., R. 11 W.,
Sec. 1

T. 12 N., R. 10 W.,
Sec. 6
Sec. 7, those portions above the
Ordinary High Water ("OHW")
line on the north bank of the
Yukon River

T. 5 N., R. 3 W.,
Sec. 27, 34
Sec. 36 SE $\frac{1}{4}$, those portions within
the White Mountains National
Recreation Area

T. 2 N., R. 1 W.,
Sec. 3 and 10, those portions within federal
mining claims F-52189, F-52176,
F-52172 and F-52185

T. 1 S., R. 2 E.,
Sec. 22
Sec. 26, 27

T. 2 S., R. 2 E.,
Sec. 13 and 24, those portions
within the Chena River Lakes
Flood Control Project

T. 2 S., R. 3 E.,
Sec. 19 excluding USS 9074,
Lots 2 & 3
USS 9074, Lots 2 & 3 (in Section 19)
Sec. 20
Sec. 21, those portions
within the Chena River Lakes
Flood Control Project
Sec. 26, 27 E $\frac{1}{2}$, 35, 36

T. 3 S., R. 3 E.,
Sec. 1, 12

T. 3 S., R. 4 E.,
Sec. 7, 18, 17, 20, 21, 28, 33, 34

T. 4 S., R. 4 E.,
Sec. 2 NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$
Sec. 3 NE $\frac{1}{4}$

T. 10 S., R. 10 E.,
Sec. 2 NE $\frac{1}{4}$ SW $\frac{1}{4}$
Sec. 11 SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$
USS 3293 A and B, Streets and Block 18
(Federal Reserve) (in Section 24)
USS 2626, Lot 2 (in Sec. 25, 26, 35)

T. 11 S., R. 10 E.,
USS 2626 (in Sec. 2, 11)
Sec. 10, 11, 15, 22
Sec. 27 N $\frac{1}{2}$ N $\frac{1}{2}$ N $\frac{1}{2}$ N $\frac{1}{2}$
Sec. 34 NE $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$

APPENDIX B

T. 12 S., R. 10 E.,

Sec. 3, those portions east of the
Richardson Highway, excluding
Lots 30, 32 and 38
Sec. 10, those portions east of the
Richardson Highway
Sec. 15 SW $\frac{1}{4}$ NW $\frac{1}{4}$, excluding Lot 20,
NW $\frac{1}{4}$ SW $\frac{1}{4}$
Sec. 16
Sec. 21, 28, 32, 33

T. 13 S., R. 10 E.,

Sec. 4, 9, 16, 21
Sec. 28 and 29, those portions lying
north of a line $\frac{1}{2}$ mile north
of the Richardson Highway

T. 14 S., R. 10 E.,

Sec. 5, 8, 17, 20, 29, 32

T. 15 S., R. 9 E.,

Sec. 27

T. 15 S., R. 10 E.,

Sec. 6 S $\frac{1}{2}$
Sec. 7, 18, 19, 29, 30, 32

T. 16 S., R. 10 E.,

Sec. 5, 8, 17, 20, 29, 32

T. 17 S., R. 10 E.,

Sec. 4, 9, 10, 14, 15, 23, 24, 25, 36

T. 18 S., R. 10 E.,

Sec. 1, 12, 13, 24, 25, 36

T. 19 S., R. 10 E.,

Sec. 1, 12, 13

T. 19 S., R. 11 E.,

Sec. 18, 19, 20, 21, 29, 32

T. 22 S., R. 12 E.,

Sec. 4, 9, 16, 21, 28, 29, 32

COPPER RIVER MERIDIAN

T. 14 N., R. 1 W.,

Sec. 31

T. 13 N., R. 1 W.,

Sec. 5, 6, 8, 17, 18, 20

T. 12 N., R. 1 W.,

Sec. 5, 8, 17, 20, 29, 32, 33

T. 11 N., R. 1 W.,

Sec. 4, 9, 16, 21, 28, 32, 33

T. 10 N., R. 1 W.,

Sec. 5, 8, 7, 18, 17, 20, 29, 32, 31

T. 9 N., R. 1 W.,

Sec. 6, 7

T. 9 N., R. 2 W.,

Sec. 12, 13
Sec. 23, Lot 6
Sec. 24 NW $\frac{1}{4}$, W $\frac{1}{2}$ SW $\frac{1}{4}$
Sec. 25 NW $\frac{1}{4}$ NW $\frac{1}{4}$
Sec. 26, S $\frac{1}{2}$, Lots 1, 4, 5
Sec. 35

T. 8 N., R. 2 W.,

Sec. 2, 11, 14, 23, 24, 25, 36

T. 7 N., R. 2 W.,

Sec. 1, 12, 13, 24, 25, 36

T. 7 N., R. 1 W.,

Sec. 6
Sec. 35 NW $\frac{1}{4}$, those portions east of
the Richardson Highway

T. 6 N., R. 2 W.,

Sec. 1, 12, 13, 24, 25, 36

T. 5 N., R. 2 W.,

Sec. 1, 12, 13, 24, 25
USS 10679, Lot 2 (in Sec. 25, 36)
Sec. 36

T. 4 N., R. 2 W.,

Sec. 1, 12, 13
Sec. 24 N $\frac{1}{2}$ S $\frac{1}{2}$ and Lots 43 and 44
Sec. 25

T. 4 N., R. 1 W.,

Sec. 30 W $\frac{1}{2}$
Sec. 31

T. 2 N., R. 1 W.,

Sec. 3, 10, 11, 24, 25

T. 2 N., R. 1 E.,

Sec. 30, 31

T. 1 N., R. 1 E.,

Sec. 6 Lot 3, SE $\frac{1}{4}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$

T. 1 S., R. 1 E.,

Sec. 4 Lot 1

Sec. 3 Lot 4 and S $\frac{1}{2}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$,
SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$

Sec. 8 SE $\frac{1}{4}$

Sec. 10, 14, 15

Sec. 23 excluding E $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$
and S $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$

Sec. 25 SW $\frac{1}{4}$ NW $\frac{1}{4}$

Sec. 26 E $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ E $\frac{1}{2}$ SE $\frac{1}{4}$

Sec. 35 NE $\frac{1}{4}$

T. 2 S., R. 1 E.,

Sec. 2 Lot 2, SW $\frac{1}{4}$ NE $\frac{1}{4}$, Lot 6,
Lot 7, E $\frac{1}{2}$ SW $\frac{1}{4}$

Sec. 11 W $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$, Lot 2,
Lot 4, W $\frac{1}{2}$ SW $\frac{1}{4}$

Sec. 14 W $\frac{1}{2}$ NW $\frac{1}{4}$

Sec. 15

Sec. 22, 27, 34

T. 3 S., R. 1 E.,

Sec. 3

Sec. 4 SE $\frac{1}{4}$

Sec. 9, 16, 21, 28

Sec. 29 SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$

Sec. 32, 33 NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$

T. 4 S., R. 1 E.,

Sec. 5, 8, 17, 16, 21, 22

Sec. 27 N $\frac{1}{2}$, N $\frac{1}{2}$ S $\frac{1}{2}$

Sec. 26, 25, 36

T. 4 S., R. 2 E.,

Tract A

T. 5 S., R. 1 E.,

Sec. 1, 12, 13, 23, 24, 26, 27, 32, 33, 34

T. 5 S., R. 2 E.,

Sec. 6, 7

T. 6 S., R. 1 E.,

Sec. 5, 8, 7, 17, 18, 29, 30, 32

T. 6 S., R. 1 W.,

Sec. 13, 24, 25

T. 7 S., R. 1 E.,

Sec. 5, 8, 17, 18

T. 7 S., R. 1 W.,

Sec. 13, 23, 24, 26, 27, 34

Sec. 35 NE $\frac{1}{4}$

T. 8 S., R. 1 W.,

Sec. 3, 4, 5, 6

T. 8 S., R. 2 W.,

Tract A (those portions comprising

Sec. 1, 2, 3, 4, 7, 8, 9)

Exhibit B

**Requirements of the Department of Defense
Relating to Military Installations**

APPENDIX B

EXHIBIT B

Requirements of the Department of Defense Relating to Military Installations

A. General Requirements

1. Entry upon military land for construction and routine operations and maintenance shall be fully coordinated ten (10) days in advance of entry with the appropriate installation commander having immediate jurisdiction over the property. Entry under emergency conditions shall be coordinated expeditiously with the installation commander.

2. Entry for all activities conducted by Permittees upon all military installations shall be in strict compliance with post/base regulations, both existing or hereafter promulgated. Permittees shall obtain copies of such regulations from the affected installation commanders.

3. Ingress and egress to military installation shall be confined to routes designated by the installation commander. Such commander shall have the right to modify or change the designated routes without advance notice to Permittees. Use of existing military roads or other access routes across subject lands shall be non-exclusive.

4. Permittees shall reimburse the United States, through the Army or Air Force installation affected, for any increased maintenance costs of existing military roads resulting from or attributable to usage by Permittees. These costs shall be in addition to those contemplated by Section 12 of this Agreement.

5. Permittees may construct permanent access and maintenance roads within the Right-of-Way, provided such roads do not interfere with the surface use of the area by the military, except during the construction phase.

6. Roads designated by the installation commander to require intermittent military usage may be closed. The installation commander shall approve in advance all such closures. Any extended closure shall cause the road to be

treated as stated in Section 3 of these General Requirements.

7. Any overhead construction relating to the Pipeline shall provide for a minimum of eighteen (18) feet of clearance above the existing road surface.

8. Crossover road ramp construction relative to ramp grades, pipeline cover, sleeves, bridging, signs and the like will conform to the extent practical to the standards of the Alaska State Highway Department.

9. Final route selection, as mapped, and any subsequent changes thereto across military lands will be approved by the affected installation commander prior to construction. The route of the Pipeline shall be located so as to avoid military improvements and the Pipeline shall be constructed a minimum distance of three hundred and twenty-five (325) feet from perimeter fences surrounding ammunition and fuel storage areas.

10. No surface projection of the Pipeline shall be permitted within the drop zone area west of the main development at Fort Greely.

11. Crossing of Army Petroleum Oil and Lubricant (POL) line will be coordinated with the affected installation commander and the Petroleum Distribution Office (PDO), Support Command, U.S. Army, Alaska (USARAL), Fort Richardson, Alaska.

12. The Pipeline traversing subject lands shall be buried from stations 8400+00 and to 8511+51 and from Stations 8554+70 to 8562+46 as shown on Alyeska Pipeline Service Company Trans Alaska Pipeline System Drawing AL-00-G2, Sheet 45 of 138, Prudhoe Bay to Valdez. Burial depth and technique shall be sufficient to permit surface crossing of the Right-of-Way by heavy tracked and wheeled vehicles at designated locations of existing roads and runways. In the event that subsurface

construction cannot be accomplished to the satisfaction of the installation commander, the Pipeline shall be relocated to an area or areas where burial is permissible, or where surface construction can be authorized without interruption of the military mission. Mode of construction between the aforementioned stations shall require the prior consent of the installation commander.

13. Disruption of, or interference with the operation and maintenance of any military pipelines, utility and communication lines is prohibited except by authorization by the installation commander. The Pipeline shall cross all existing intersecting pipelines, conduits, and cables with a minimum clearance of twelve (12) inches.

14. Maximum length of open trench or trenches during construction of the Pipeline over and across the subject land shall not exceed one (1) mile at any given time without the prior approval of the installation commander.

15. Suitable bridged crossings over open trenches shall be provided and maintained where necessary to permit passage of military personnel and vehicles; timely notice of requirements to be furnished by installation commander.

16. In connection with Permittees' duties to repair, replace, and rehabilitate as provided for in Section 13 of this Agreement, where borrowed soil material is necessary to perform such duties, the location and method of obtaining the borrowed material shall be approved by the installation commander. All surplus material not required for fill, backfill or grading shall be spread and leveled in an area designated by said commander.

17. Permittees shall submit legal descriptions of the centerline of the Right-of-Way and permanent access and maintenance roads as constructed in, upon, over and across military-controlled lands to the installation commander within ninety (90) days of the completion of construction within a given military installation. Separate legal descriptions shall be written for each noncontiguous tract of military-controlled land. Said legal descriptions shall be accompanied by preliminary "as built" drawings

(and final "as built" drawings shall be furnished within three hundred and sixty (360) days) of said completion of the Pipeline and all permanent access and maintenance roads, together with separate real estate maps in the event sufficient survey information necessary to verify legal descriptions is not contained on the "as built" drawings.

18. Permittees shall install mainline valves sufficient to control Oil flow in the vicinity of populated area, ammunition/explosive and fuel storage areas.

19. Electrically operated devices installed as part of the Pipeline System which are capable of producing radiations, electromagnetic or other interference, shall be screened, filtered or otherwise suppressed to the extent that such devices will not adversely affect the function of existing communication systems. In the event that physical obstructions, such as towers or buildings are to be erected as part of the Pipeline System, their positioning shall be such that they will not obstruct radiation patterns of line-of-site communication, navigation aids or other communications, electronic or meteorological services.

20. Entry for construction and routine maintenance upon installations or crossings of utility facilities under the control of or utilized by Air Force Communications System/White Alice will be coordinated at least ten (10) days prior to entry with Alaska Communications Region through Headquarters, Alaskan Air Command, Elmendorf Air Force Base. Entry under emergency conditions will be coordinated expeditiously with the Region.

21. Should the Pipeline cross high voltage power transmission lines on Eielson Air Force Base, adequate precaution to the satisfaction of the installation commander will be taken to insure that excessive sag or accidental power line breakage does not create a safety hazard.

22. In the event unexploded munitions are discovered by Permittees during construction activities, the construction activities shall immediately cease in that area. Permittees shall notify the installation commander who will immediately proceed to dispose of the

munitions. Construction shall not proceed until authorized by the installation commander.

23. The United States reserves to itself the right to construct, use and maintain across, over and/or under the Right-of-Way, oil and sewer lines, and other facilities, in such manner as not to create an unreasonable interference with the use of the Right-of-Way.

24. Any authorized use or occupation of the subject military lands in connection with the construction, operation, maintenance or termination of the Pipeline System shall be subject to such rules and regulations as the installation commanders may from time to time prescribe. The military departments reserve the right to modify or change conditions to protect military interests as circumstances may from time to time warrant.

25. Transportation, storage and use of explosives during construction of the Pipeline System shall be permitted only in conformance with the applicable installation regulations. Permittees shall secure copies of these regulations from the installation commanders. Use of all explosives on military reservations shall be in strict conformance with U.S. Army Corps of Engineers Safety Manual, and Permittees shall secure copies of this manual from the installation commander. At least thirty (30) days in advance of any underwater blasting, Permittees shall submit to the installation commander a plan for such blasting. The plan shall set forth blasting locations, types and amounts of explosives, date or dates of blasting, and the reason for blasting.

26. The use of pesticides and herbicides shall be in accordance with applicable military regulations. An approved list of pesticides and

herbicides, together with application constraints shall be obtained from the installation commander.

27. Permittees shall locate and/or install the Pipeline System in such manner so as to preclude the creation of ground fog and/or ice fog conditions which will in any way decrease the operational capability of the air fields located on Eielson Air Force Base, Fort Wainwright and Fort Greely. Studies or other data supporting the location or construction techniques utilized by Permittees to accomplish the requirements of this condition shall be submitted to the installation commander for review and approval thirty (30) days prior to commencement of construction on the lands herein described.

28. Prior to commencement of construction, Permittees shall submit a schedule of their construction activities on the military installation involved. This schedule shall be in such detail as may be required by the installation commander and during the course of construction this schedule shall be updated and resubmitted as may be required by the installation commander.

B. Definitions

As used above, the following items have the meanings indicated:

1. "Installation Commander": The Commanding Officer of a military installation, E.g., Fort Wainwright, Fort Greely, Eielson Air Force Base.
2. "District Engineer": The District Engineer, U.S. Army Engineer District, Alaska, Anchorage, Alaska

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C., November 23, 1973

Mr. DAVID E. LINDGREEN
Deputy Solicitor
Department of the Interior,
Washington, D.C.

DEAR MR. LINDGREEN: By letter dated 14 November 1973 we furnished you certain provisions to be included in the right-of-way permit for the construction of the Trans-Alaska Pipeline. These provisions protect military interests where the pipeline right-of-way crosses or otherwise affects military installations.

In this letter we reserved the right to make reasonable modifications or changes from time to time. We are furnishing herewith a revision of Exhibit E which clarifies the intent of various paragraphs and eliminates certain paragraphs in which the provision is already adequately covered in the stipulations of the Final Environmental Impact Statement.

It is the intention of the Department of the Army and the Department of the Air Force to permit the construction, operation, maintenance, and termination of the Trans-Alaska Pipeline in a way that is compatible with both military operations and the Pipeline System, and that the necessary approvals requested by the Pipeline System will not be unreasonably withheld.

Sincerely,

WOODROW BERGE
Director of Real Estate.

Note--The "revision" referred to above in this letter was modified in certain respects before being incorporated into this Agreement and the Director of Real Estate, D.O.A., Office of Chief of Engineers, has been apprised of the modifications in all material respects.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D.C., November 14, 1973

MR. DAVID E. LINDGREEN
Deputy Solicitor
Department of the Interior
Washington, D.C.

DEAR MR. LINDGREEN: This refers to our DAEN-CWZ-W letter dated 9 November 1973 concerning review of your 20 July 1973 draft permit on the construction of the Trans-Alaska Pipeline. We indicated then that the permit should contain conditions to protect military interests where the pipeline right-of-way crosses or otherwise affects military installations.

We have prepared and are inclosing a set of such provisions to be incorporated in the draft permit as Exhibit E.

While these conditions are as accurate as we can foresee at this time, military exigencies and local circumstances may require that reasonable modifications or changes be made from time to time and the discretion to make such changes has been reserved in our proposed Exhibit E.

Sincerely,

WOODROW BERGE
Director of Real Estate.

EXHIBIT C

Requirements of the Federal Power Commission Relating to Power Sites

(Exhibit is proposed for deletion because there no longer are lands in the TAPS ROW classified, withdrawn, or reserved for power purposes. Deletion is pending confirmatory discussions.)

APPENDIX B

EXHIBIT C

Requirements of the Federal Power Commission Relating to Power Sites

A. With respect to any Federal Lands that are classified, withdrawn or reserved for power purposes, the grant of the Right-of-Way is, in accordance with the findings of the Federal Power Commission (Docket No. DA-112-Alaska, U.S. Department of the Interior, issued on December 6, 1973), made subject to:

* * * the retention of prior rights for reservoir or power development, and subject to the condition that in the event the said land is

required for such purposes, any improvements or structures placed thereon which shall be found to interfere with such development shall be removed or relocated as may be necessary to eliminate interference with reservoir or power development at no cost to the United States, its permittees or licensees.

B. The Permittees herein shall not be deemed to be "permittees or licensees" within the meaning of the aforesaid findings of the Federal Power Commission.

EXHIBIT D

Stipulations for the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline

APPENDIX B

EXHIBIT D

Stipulations for the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline

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1. GENERAL**1.1. Definitions**

1.1.1. As used in these Stipulations and elsewhere in this "Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline", the following terms have the following meanings:

1.1.1.1. "Access Roads" means the roads constructed or used by Permittees within, or for ingress to and egress from, the Pipeline System. It does not include the proposed State highway from the Yukon River to Prudhoe Bay, Alaska, or any other State highway.

1.1.1.2. "Affiliate" means (a) a Subsidiary of a Parent, or (b) the Parent of the Subsidiary, or (c) in the case of a corporate Subsidiary, one or more corporations that share the Parent with the Subsidiary by reason of the fact that all of the outstanding capital stock of each of the corporations that share the Parent is owned directly or indirectly by the Parent, or (d) in the case of Sohio Pipe Line Company, any corporation of which all of the outstanding capital stock is owned directly or indirectly by The Standard Oil Company, an Ohio corporation, or The British Petroleum Company, Limited, a United Kingdom corporation, or both.

1.1.1.3. "Authorized Officer" means the employee of the Department, designated by the Secretary, to whom the Secretary delegates the authority to act on behalf of the Secretary pursuant to this Agreement or such other Person to whom the Authorized Officer redelegates his authority pursuant to the delegation of authority to the Authorized Officer from the Secretary.

1.1.1.4. "Business Entity" means an artificial legal entity, formed to conduct one or more ventures for profit, or not for profit, that is duly authorized and empowered to sue and be sued, and to hold the title to property, in its own name.

1.1.1.5. "Category 1(c) Lands" means lands selected by the State and not tentatively approved and not withdrawn under section 11(a)(2) of the Alaska Native Claims Settlement Act.

1.1.1.6. "Category 1(d) Lands" means lands selected by the State and not tentatively approved and which were withdrawn under section 11(a) (2) of the Alaska Native Claims Settlement Act but which are not available for village or regional selection under section 22(1) of the Alaska Native Claims Settlement Act, 85 Stat. 713, 43 U.S.C. § 1621 (1970).

1.1.1.7. "Commissioning" means the acceptance and custody by Permittees of the first Oil tendered for shipment through the Pipeline after provision for line fill and tank bottoms. Permittees shall, by written notice, promptly advise the Authorized Officer of the date upon which such acceptance and custody takes place.

1.1.1.8. "Construction Mode" means the type of construction to be employed generally with regard to the Pipeline (E.g., whether the pipe will be buried or elevated).

1.1.1.9. "Construction Segment" means a portion of the Pipeline System that constitutes a complete physical entity or stage, in and of itself, which can be constructed, independently of any other portion or stage of the Pipeline System, in a designated area or between two given geographical points reasonably proximate to one another. It is not to be construed as referring to the entirety of the Pipeline or of the Pipeline System.

1.1.1.10. "Construction Subdivision" means any one of approximately six (6) large, lineal sections of the route of the Pipeline as determined by the Authorized Officer after consulting with Permittees.

1.1.1.11. "Department" means the Department of the Interior of the United States, or any successor department or agency.

1.1.1.12. "Final Design" comprises completed design documents. It shall include contract plans and specifications; proposed Construction Modes; operational requirements necessary to justify designs; schedules; design analysis (including sample calculations for each particular design feature); all functional and engineering criteria; summaries of tests conducted and their results; and other

considerations pertinent to design and project life expectancy.

1.1.1.13. "Involuntary Passage of Title" means a Transfer that is made by the exercise of a power of sale primarily for the benefit of creditors, or in accordance with the judgment, order or decree of a court in bankruptcy, eminent domain or other similar proceedings, or pursuant to any act or resolution of a sovereign legislative body directing a lawful taking of property.

1.1.1.14. "Mapping Segment" means a Construction Subdivision, or any part thereof, as determined by the Authorized Officer; *provided, however,* that with respect to a pump station, basic communication site, remote control valve site, mechanical refrigeration equipment site and any other like Related Facility, a Mapping Segment means the entire site.

1.1.1.15. "Notice to Proceed" means a permission to initiate Pipeline System construction that is issued in accordance with Stipulation 1.7.

1.1.1.16. "Oil" means unrefined liquid hydrocarbons, including gas liquids.

1.1.1.17. "Parent" means a Person or Business Entity whose direct or indirect legal or beneficial ownership interest in, or with respect to, a Transferee or Permittee enables that Person or Business Entity to control the Transferee's or the Permittee's management or policies.

1.1.1.18. "Permittee" means any one of the Permittees.

1.1.1.19. "Permittees" means the Original Permittees, or their respective successors or assigns holding an undivided ownership interest in the Right-of-Way to the extent sanctioned by the Secretary in accordance with the provisions of this Agreement.

1.1.1.20. "Person" means a natural person.

1.1.1.21. "Persons" means more than one Person.

1.1.1.22. "Pipeline System" means all facilities located in Alaska used by Permittees in

connection with the construction, operation, maintenance or termination of the Pipeline. This includes, but is not limited to, the Pipeline, storage tanks, Access Roads, communications sites, airfields, construction camps, materials sites, bridges, construction equipment and facilities at the origin station and at the Valdez terminal. This does not include facilities used in connection with production of oil or gathering systems, nor does it include such things as urban administrative offices and similar facilities, which are only indirectly involved.

1.1.1.23. "Preliminary Design" means the establishment of project criteria (i.e., construction, including design, and operational concepts) necessary to delineate the project to be constructed. As a minimum it includes the following: design criteria and project concepts; evaluation of field data used to establish the design criteria; drawings showing functional and technical requirements; reports of all test data compiled during the data collection and preliminary design evaluation; standard drawings (if applicable) or drawings to support structural design concepts of each typical facility or structure; proposed Construction Modes; outline project specifications; sample computations to support the design concepts and bases for project siting.

1.1.1.24. A. "Related Facilities" means those structures, devices, improvements, and sites, the substantially continuous use of which is necessary for the operation or maintenance of the Oil transportation pipeline, including:

- (1) line pipe and supporting structures;
- (2) pump stations, including associated buildings, heliports, structures, yards and fences;
- (3) valves and other control devices, and structures housing them;
- (4) monitoring and communication devices, and structures housing them;
- (5) surge and storage tanks, and related containment structures;
- (6) bridges;

- (7) terminals, including associated buildings, heliports, structures, yards, docks, and fences;
- (8) a gas fuel line and electrical power lines necessary to serve the Pipeline;
- (9) retaining walls, berms, dikes, ditches, cuts and fills, including hydraulic control structures;
- (10) storage buildings and structures, and areas for storage of supplies and equipment;
- (11) administrative buildings;
- (12) cathodic protection devices;
- (13) mechanical refrigeration equipment; and
- (14) such other facilities as the Authorized Officer shall determine to be Related Facilities

B. "Related Facilities" not authorized by this Agreement include roads and airports. Authorizations for such Related Facilities shall be given by other instruments.

C. "Related Facilities" does not mean those structures, devices, improvements, sites, facilities or areas, the use of which is temporary in nature such as those used only for construction purposes. Among such are: temporary camps; temporary landing strips; temporary bridges; temporary Access Roads; temporary communications sites; temporary storage sites; disposal sites; and construction use areas.

1.1.1.25. "Secretary" means the Secretary of the Interior of the United States, his delegate or lawful successor.

1.1.1.26. "Secretary of Labor" means the Secretary of Labor of the United States, his delegate or lawful successor.

1.1.1.27. "Subsidiary" means a Business Entity, that may or may not be a Permittee; the management and policies of which are controlled by a Parent directly or indirectly through one or more intermediaries.

1.1.1.28. "Transfer" means the passage of any right, title or interest in property (real, personal or mixed) by sale, grant, assignment, operation of law or otherwise, and whether voluntary or not.

1.1.1.29. "Transferee" means any Person, Business Entity or governmental or quasi-governmental body or authority in which there is, or there is proposed to be, vested any right, title, or interest of a Permittee in the Agreement or the Right-of-Way pursuant to a Transfer.

1.1.1.30. "Transferor" means any Permittee that makes, or that seeks to make, a Transfer of any right, title or interest in this Agreement or the Right-of-Way.

1.1.2. Terms Defined Elsewhere in This Agreement:

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1.2. Responsibilities

1.2.1. Except where the approval of the Authorized Officer is required before Permittees may commence a particular operation, neither the United States nor any of its agents or employees agrees, or is in any way obligated, to examine or review any plan, design,

specification, or other document which may be filed with the Authorized Officer by Permittees pursuant to these Stipulations.

1.2.2. The absence of any comment by the Authorized Officer or any other agent or employee or contractor of the United States with respect to any plan, design, specification, or other document which may be filed by Permittees with the Authorized Officer shall not be deemed to represent in any way whatever any assent to, approval of, or concurrence in such plan, design, specification, or other document or of any action proposed therein.

1.2.3. With regard to the construction, operation, maintenance and termination of the Pipeline System: (1) Permittees shall ensure full compliance with the provisions of this Agreement, including these Stipulations, by their agents, employees and contractors (including subcontractors of any tier), and the employees of each of them. (2) Unless clearly inapplicable, the requirements and prohibitions imposed upon Permittees by these Stipulations are also imposed upon each Permittee's agents, employees, contractors, and subcontractors, and the employees of each of them. (3) Failure or refusal of a Permittee's agents, employees, contractors, subcontractors, or their employees to comply with these Stipulations shall be deemed to be the failure or refusal of the Permittee. (4) Each Permittee shall require its agents, contractors and subcontractors to include these Stipulations in all contracts and subcontracts which are entered into by any of them, together with a provision that the other contracting party, together with its agents, employees, contractors and subcontractors, and the employees of each of them, shall likewise be bound to comply with these Stipulations.

1.2.4. Permittees shall make separate application, under applicable statutes and regulations, for authorization to use or occupy Federal Lands in connection with the Pipeline System where the lands are not within the Right-of-Way granted by this Agreement.

1.3 Authorized Officer

1.3.1. For purposes of information and review, the Authorized Officer may call upon Permittees at any time to furnish any or all data

related to construction, operation, maintenance and termination activities undertaken in connection with the Pipeline System.

1.3.2. The Authorized Officer may require Permittees to make such modification of the Pipeline System, without liability or expense to the United States, as he deems necessary to: protect or maintain stability of geologic materials; protect or maintain integrity of the Pipeline System; prevent serious and irreparable harm to the environment (including but not limited to fish or wildlife populations, or their habitats); or remove hazards to public health and safety.

1.4. Common Agent of Permittees

1.4.1. Permittees, and each of them, have appointed Alyeska Pipeline Service Company as their common agent to design and construct the Pipeline System under and pursuant to an agreement entitled "Agreement for the Design and Construction of the Trans Alaska Pipeline System," dated August 27, 1970, and intend to appoint Alyeska Pipeline Service Company as their common agent to operate, maintain and terminate the Pipeline System under and generally pursuant to an Operating Agreement referred to in Section 5.1 of the "Trans Alaska Pipeline System Agreement," dated August 27, 1970. A Power of Attorney has been filed with the Department of the Interior by each Permittee appointing Alyeska Pipeline Service Company the true and lawful agent and attorney-in-fact on behalf of each Permittee with full power and authority to execute and deliver any and all instruments in connection with the design, construction, or operation of the Pipeline System. Within the scope of such contractual authority, such agent shall represent Permittees, and each of them, with respect to this Agreement. Such agent is and shall be empowered on behalf of Permittees, and each of them, to accept service of any process, pleadings or other documents in connection with any court or administrative proceeding relating in whole or in part to this Agreement or to all or any part of the Pipeline System and to which the United States shall be a party.

1.4.2. Permittees shall maintain a common agent for the construction, operation, maintenance and termination of the Pipeline

System at all times during this Agreement. Such agent shall be a citizen of the United States, or if a corporation, a domestic corporation. Such agent shall be a resident of Alaska, or if a corporation, shall be duly authorized to conduct business in Alaska. Permittees shall cause such agent to maintain in the City of Anchorage, Alaska, at all times during this Agreement an office for the delivery of all documents, orders, notices and other written communications, as provided for in Stipulations 1.4.1. and 1.6.

1.4.3. In the event Permittees substitute a new common agent at any time, Permittees shall give prompt written notice to the Authorized Officer of such substitution, the name and office address in Anchorage, Alaska, of the new agent, and a copy of Permittees' agreement with the new agent. The United States shall be entitled to rely on each appointment until such time as a notice of the substitution of a new common agent takes effect. Each such notice shall not take effect until two (2) full working days after (and not including) the date that it was received by the Authorized Officer.

1.4.4. Upon the Transfer by any Permittee of any right, title or interest of Permittee in the Right-of-Way or this Agreement, the Transferee shall promptly execute and deliver to the Authorized Officer such documents as may be required to evidence the Transferee's appointment and ratification of the then-acting common agent.

1.5. Authority of Representatives of Authorized Officer and Common Agent; Orders of Authorized Officer

1.5.1. No order or notice given to Permittees on behalf of the Secretary by the Authorized Officer or any other Person shall be effective as to Permittees unless prior written notice of the delegation of authority to issue such order or notice has been given to Permittees in the manner provided in Stipulation 1.6.

1.5.2. Permittees shall comply with each and every lawful order directed to them and that is issued by the Secretary, the Authorized Officer or by any duly authorized representative of the Authorized Officer.

1.5.3. Permittees shall cause the common agent of Permittees to maintain a sufficient number of its duly authorized representatives to allow for the prompt delivery to Permittees, or any of them, of all notices, orders and other communications, written or oral, of the Secretary or Authorized Officer. Each of the said representatives shall be registered with the Authorized Officer, and shall be appropriately identified in such manner and on such terms as the Authorized Officer shall prescribe. Permittees shall cause the common agent of Permittees to consult with the Authorized Officer at any time regarding the number and location of such representatives of the common agent.

1.6. Orders and Notices

1.6.1. All decisions, determinations, authorizations, approvals, consents, demands or directions that shall be made or given by the Secretary or the Authorized Officer to any one or more of Permittees in connection with the enforcement or administration of this Agreement, any applicable law or regulation, or any other agreement, permit or authorization relating in whole or in part to all or any part of the Pipeline System shall, except as otherwise provided in Stipulation 1.6.2. of this Stipulation, be in the form of a written order or notice.

1.6.2. If, in the judgment of the Secretary or the Authorized Officer, there is an emergency that necessitates the immediate issuance to any one or more of Permittees of an order or notice, such order or notice may be given orally, *provided, however,* that subsequent confirmation of the order or notice shall be given in writing as rapidly as is practicable under the circumstances.

1.6.3. All written orders, notices or other written communications, including telegrams, relating to any subject (and regardless of whether they do or do not relate to the design or construction of the Pipeline System) that are addressed to any one or more of Permittees shall be deemed to have been delivered to and received by the addressee or addressees when the order, notice or other communication has been delivered: (1) either by messenger during normal business hours or by means of registered or certified United States mail, postage prepaid, return receipt requested, to the office of the

common agent of Permittees at 1815 South Bragaw Street, Anchorage, Alaska 99504, or (2) personally to any authorized representative of the common agent.

1.6.4. All written notices and communications, including telegrams, of any one or more of Permittees that are addressed to the Secretary shall be deemed to have been delivered to and received by the Secretary when the notice or communication has been delivered, either by messenger during normal business hours or by means of registered or certified United States mail, postage prepaid, return receipt requested, to the Secretary personally or to Office Room No. 6151 in the Department of the Interior Building, 18th & C Streets, Northwest, Washington, D.C. 20240.

1.6.5. All written notices and communications of any one or more of Permittees that are addressed to the Authorized Officer shall be deemed to have been delivered and received by the addressee when the notice or communication has been delivered, either by messenger during normal business hours or by means of registered or certified United States mail, postage prepaid, return receipt requested, to the Authorized Officer personally or to Office Room No. 405, 555 Cordova Street, Anchorage, Alaska 99504.

1.6.6. The United States or Permittees, by written notice to the other, may change the office address to which written notices, orders, or other written communications may be addressed and delivered thereafter, subject, however, to the provisions of Stipulation 1.4.

1.6.7. The regulations of the Department relating to notices or other communications by mail (43 CFR 1810.2) shall not be applicable to this Agreement.

1.7. Notices To Proceed

1.7.1. Permission to Construct

1.7.1.1. Permittees shall not initiate any construction of the Pipeline System without prior written permission of the Authorized Officer. Such permission shall be given solely by means of a written Notice to Proceed issued by the Authorized Officer. Each Notice to Proceed shall

authorize construction only as therein expressly stated and only for the particular Construction Segment therein described.

1.7.1.2. The Authorized Officer shall issue a Notice to Proceed only when in his judgment the construction (including design) and operation proposals are in conformity with the provisions of these Stipulations.

1.7.1.3. By written notice, the Authorized Officer may revoke in whole or in part any Notice to Proceed which has been issued when in his judgment unforeseen conditions later arising require alterations in the Notice to Proceed in order to: protect or maintain stability of geologic materials; protect or maintain integrity of the Pipeline System; prevent serious and irreparable harm to the environment (including but not limited to fish or wildlife populations, or their habitats); or remove hazards to public health and safety.

1.7.1.4. Prior to submission of any Preliminary Designs or applications for any Notice to Proceed, Permittees and the Authorized Officer shall agree to a schedule for the time, scope and quantity of such submissions and applications. The purpose of such schedule is to assure that Permittees' submissions and applications shall be reasonable in scope, and filed in a reasonable time frame, insofar as the workload thereby imposed on the Authorized Officer is concerned. Submittals and applications shall be filed in accordance with said schedule, and the Authorized Officer may refuse to consider any that are not so filed. The schedule may be reviewed and revised from time to time as may be agreed upon by Permittees and Authorized Officer.

1.7.2. Preliminary Design Submissions

1.7.2.1. Prior to applying for a Notice to Proceed for any Construction Segment, Permittees shall submit the Preliminary Design for that Segment to the Authorized Officer for approval. Where appropriate, each submission shall include the criteria which justify the selection of the Construction Modes. The Authorized Officer shall expeditiously review each submission and shall do so within thirty

(30) days from the date of his receipt of the submission. The Authorized Officer may request additional information if he deems it necessary.

1.7.2.2. In appropriate cases, the Authorized Officer may waive the requirement that a Preliminary Design be submitted. In this circumstance, Permittees may proceed to apply for a Notice to Proceed in accordance with Stipulation 1.7.4.

1.7.3. Summary Network Analysis Diagram

1.7.3.1. Prior to Final Design submissions, Permittees shall submit a summary network analysis diagram for the entire project to the Authorized Officer. The summary network analysis diagram shall be time-scaled and shall include all activities and contingencies which may reasonably be anticipated in connection with the project. The summary network analysis diagram shall include:

- (1) Data collection activities;
- (2) Submittal and approval activities;
- (3) Pre-construction, construction and post-construction activities; and
- (4) Other pertinent data.

1.7.3.2. The summary network analysis diagram shall be updated at thirty (30) day intervals, as significant changes occur, or as otherwise approved in writing by the Authorized Officer.

1.7.4. Application for Notice to Proceed

1.7.4.1. Permittees may apply for a Notice to Proceed for only those Construction Segments for which the Preliminary Design has been approved in writing by the Authorized Officer or a waiver pursuant to Stipulation 1.7.2.2 has been issued in writing by the Authorized Officer.

1.7.4.2. Before applying for a Notice to Proceed for a Construction Segment, Permittees shall, in such manner as shall be acceptable to the Authorized Officer, by survey, locate and clearly mark on the ground the proposed

centerline of the line pipe to be located in the Mapping Segment within which the Construction Segment is to be constructed and the location of all Related Facilities proposed to be constructed in the Mapping Segment.

1.7.4.3. Each application for a Notice to Proceed shall be supported by:

- (1) A Final Design.
- (2) All reports and results of environmental studies conducted or considered by Permittees.
- (3) All data necessary to demonstrate compliance with the terms and conditions of these Stipulations with respect to that particular Construction Segment.
- (4) A detailed network analysis diagram for the Construction Segment, including: Permittees' work schedules; consents, permits or authorizations required by State and Federal agencies and their interrelationships; design and review periods; data collection activities; and construction sequencing. The detailed network analysis diagram shall be updated as required to reflect current status of the project.
- (5) A map or maps, prepared in such manner as shall be acceptable to the Authorized Officer, depicting the proposed location in the Mapping Segment within which the Construction Segment is to be constructed of: (1) the boundaries of all contiguous temporary use areas, and (2) all improvements, buried or aboveground, that are to be constructed within the Mapping Segment. The Authorized Officer shall not issue a Notice to Proceed with construction until he has approved all relevant locations on the ground and temporary boundary markers have been set by Permittees to the satisfaction of the Authorized Officer.
- (6) Such other data as may be requested by the Authorized Officer either before submission of the application for a

Notice to Proceed or at any time during the review period.

1.7.4.4. During review of an application for a Notice to Proceed, the relevant portion of the route of the Pipeline may be modified by the Authorized Officer, if, in his judgment, environmental conditions or new technological developments warrant the modifications. If, during construction, adverse physical conditions are encountered that were not known to exist, or that were known to exist but their significance was not fully appreciated when the Authorized Officer issued a Notice to Proceed for the portion of the Mapping Segment in which the physical conditions are encountered, the Authorized Officer may authorize deviations from the initially approved location of the Pipeline to another location along the same general route of the Pipeline at the point or points where the physical conditions are encountered, including adequate room for structurally sound transition. A deviation shall not be constructed without the prior written approval of the Authorized Officer and, if so approved, shall conform in all respects to the provisions of the approval.

1.7.4.5. The Authorized Officer shall review each application for a Notice to Proceed and all data submitted in connection therewith within ninety (90) days. Said ninety (90) day period shall begin from the later of the following dates:

- (1) Date of receipt by the Authorized Officer of an application for a Notice to Proceed.
- (2) Date of receipt by the Authorized Officer of the last submittal of additional data pursuant to this Stipulation.

1.7.4.6. If the Authorized Officer requires Permittees to submit additional data on one or more occasions, the review period shall begin from the date of receipt by the Authorized Officer of the last submittal.

1.8. Changes in Conditions

1.8.1. Unforeseen conditions arising during construction, operation, maintenance or termination of the Pipeline System may make it necessary to revise or amend these Stipulations to control or prevent damage to the environment

or hazards to public health and safety. In that event, Permittees and the Authorized Officer shall agree as to what revisions or amendments shall be made. If they are unable to agree, the Secretary shall have final authority to determine the matter.

1.9. Antiquities and Historical Sites

1.9.1. Permittees shall engage an archeologist approved by the Authorized Officer to provide surveillance and inspection of the Pipeline System for archeological values.

1.9.2. If, in connection with any operation under this Agreement, or any other Agreement issued in connection with the Pipeline System, Permittees encounter known or previously unknown paleontological, archeological, or historical sites, Permittees shall immediately notify the Authorized Officer and said archeologist. Permittees' archeologist shall investigate and provide an on-the-ground opinion regarding the protection measures to be undertaken by Permittees. The Authorized Officer may suspend that portion of Permittees' operations necessary to preserve evidence pending investigation of the site.

1.9.3. Six copies of all survey and excavation reports shall be filed with the Authorized Officer.

1.10. Completion of Use

1.10.1. Upon completion of the use of all, or a very substantial part, of the Right-of-Way or other portion of the Pipeline System, Permittees shall promptly remove all improvements and equipment, except as otherwise approved in writing by the Authorized Officer, and shall restore the land to a condition that is satisfactory to the Authorized Officer or at the option of Permittees pay the cost of such removal and restoration. The satisfaction of the Authorized Officer shall be stated in writing. Where approved in writing by the Authorized Officer, buried pipe may be left in place, provided all oil and residue are removed from the pipe and the ends are suitably capped.

1.10.2. All areas that do not constitute all, or a very substantial part of the Right-of-Way or

other portion of the Pipeline System, utilized pursuant to authorizations issued in connection with the Pipeline System, shall be Put-to-Bed by Permittees upon completion of their use unless otherwise directed by the Authorized Officer. Put-to-Bed is used herein to mean that Access Roads, material sites and other areas shall be left in such stabilized condition that erosion will be minimized through the use of adequately designed and constructed waterbars, revegetation and chemical surface control; that culverts and bridges shall be removed by Permittees in a manner satisfactory to the Authorized Officer, and that such roads, sites and areas shall be closed to use. Permittees' rehabilitation plans shall be approved in writing by the Authorized Officer prior to termination of use of any such road, or any part thereof, in accordance with Stipulation 2.12.

1.11. Public Improvements

1.11.1. Permittees shall protect existing telephone, telegraph and transmission lines, roads, trails, fences, ditches and like improvements during construction, operation, maintenance and termination of the Pipeline System. Permittees shall not obstruct any road or trail with logs, slash, or debris. Damage caused by Permittees to public utilities and improvements shall be promptly repaired by Permittees to a condition which is satisfactory to the Authorized Officer.

1.12. Regulation of Public Access

1.12.1. During construction or termination activities, Permittees may regulate or prohibit public access to or upon any Access Road being used for such activity. At all other times, Permittees shall permit free and unrestricted public access to and upon Access Roads, except that with the written consent of the Authorized Officer, Permittees may regulate or prohibit public access and vehicular traffic on Access Roads as required to facilitate operations or to protect the public, wildlife and livestock from hazards associated with operation and maintenance of the Pipeline System. Permittees shall provide appropriate warnings, flagmen, barricades, and other safety measures when Permittees are using Access Roads, or regulating or prohibiting public access to or upon Access Roads.

1.12.2. During construction of the Pipeline System, Permittees shall provide alternative routes for existing roads and trails as determined by the Authorized Officer whether or not these roads or trails are recorded.

1.12.3. Permittees shall make provisions for suitable permanent crossings for the public where the Right-of-Way or Access Roads cross existing roads, foot-trails, winter trails, or other rights-of-way.

1.12.4. After completion of construction of the Pipeline System, and with the concurrence of Permittee, the Authorized Officer may designate areas of the Right-of-Way to which the public shall have free and unrestricted access. Certain areas of the Right-of-Way and conditions for access were published in a notice in the *Federal Register* on May 16, 1983, p. 22001, and are still in effect.

1.13. Electronically Operated Devices

1.13.1. Permittee shall screen, filter, or otherwise suppress any electronically operated devices that are installed as part of the Pipeline System which are capable of producing electromagnetic interference radiations so that such devices will not adversely affect the functioning of existing communications systems or navigational aids. In the event that structures such as towers or buildings are to be erected as a part of the Pipeline System, their positioning shall be such that they will not obstruct radiation patterns of line-of-sight communications systems, navigational aids, or similar systems.

1.14. Camping, Hunting, Fishing and Trapping

1.14.1. Permittees shall post the Right-of-Way against camping, hunting, fishing, trapping and shooting within the Right-of-Way. Permittees shall prohibit their employees, agents, contractors, subcontractors, and their employees, from engaging in such activities.

1.14.2. Permittees shall inform their employees, agents, contractors, subcontractors, and their employees, of applicable laws and regulations relating to hunting, fishing, and trapping.

1.15. Small Craft Passage

1.15.1. The creation of any permanent obstruction to the passage of small craft in streams is prohibited.

1.16. Protection of Survey Monuments

1.16.1. Permittees shall mark and protect all geodetic survey monuments encountered during the construction, operation, maintenance and termination of the Pipeline System. These monuments are not to be disturbed; however, if such a disturbance occurs, the Authorized Officer shall be immediately notified thereof in writing.

1.16.2. If any land survey monuments, corners, or accessories (excluding geodetic survey monuments) are destroyed, obliterated or damaged, Permittees shall employ a qualified land surveyor to reestablish or restore same in accordance with the "Manual of Instruction for the Survey of Public Lands" and shall record such survey in the appropriate records. Additional requirements for the protection of monuments, corners, and bearing trees may be prescribed by the Authorized Officer.

1.17. Fire Prevention and Suppression

1.17.1. Permittees shall promptly notify the Authorized Officer and take all measures necessary or appropriate for the prevention and suppression of fires in accordance with 43 CFR 2801.1-5(d). Permittees shall comply with the instructions and directions of the Authorized Officer concerning the use, prevention and suppression of fires. Use of open fires in connection with construction of the Pipeline System is prohibited unless authorized in writing by the Authorized Officer.

1.18. Surveillance and Maintenance

1.18.1 During the construction, operation, maintenance and termination of the Pipeline System, Permittees shall conduct a surveillance and maintenance program applicable to the subarctic and arctic environment. This program shall be designed to: (1) provide for public health

and safety; (2) prevent damage to natural resources; (3) prevent erosion; and (4) maintain Pipeline System integrity.

1.18.2. Permittees shall have a communication system that ensures the transmission of information required for the safe operation of the Pipeline System.

1.18.3. Permittees shall maintain complete and up-to-date records on construction, operation, maintenance and termination activities performed in connection with the Pipeline System. Such records shall include surveillance data, leak and break records, necessary operational data, modification records and such other data as the Authorized Officer may require.

1.18.4. Permittees shall provide and maintain Access Roads and airstrips, the number and location of which shall be approved by the Authorized Officer, to ensure that Permittees' maintenance crews and Federal and State representatives shall have continuing access to the Pipeline System.

1.19. Housing and Quarters

1.19.1. Permittees shall furnish, on a reimbursable basis, such representatives of the United States as may be designated by the Authorized Officer with adequate meals, living quarters and office space, reasonable use of Permittees' communications systems, and reasonable surface and air transportation during the construction, operation, maintenance and termination of the Pipeline System. Whenever possible, Permittees shall be notified in writing by the Authorized Officer in advance regarding the number of persons for whom such services and facilities will be required.

1.20. Health and Safety

1.20.1. Permittees shall take all measures necessary to protect the health and safety of all persons affected by their activities performed in connection with the construction, operation, maintenance or termination of the Pipeline System, and shall immediately abate any health or safety hazards. Permittees shall immediately notify the Authorized Officer of all serious

accidents which occur in connection with such activities.

1.21. Conduct of Operations

1.21.1. Permittees shall perform all Pipeline System operations in a safe and workmanlike manner so as to ensure the safety and integrity of the Pipeline System, and shall at all times employ and maintain personnel and equipment sufficient for that purpose. Permittees shall immediately notify the Authorized Officer of any condition, problem, malfunction, or other occurrence which in any way threatens the integrity of the Pipeline System.

1.22. Applicability of Stipulations

1.22.1. Nothing in these Stipulations shall be construed as applying to activities of Permittees that have no relation to the Pipeline System.

1.22.2. Nothing in these Stipulations shall be construed to affect any right or cause of action that otherwise would be available to Permittees against any person other than the United States.

2. ENVIRONMENTAL

2.1. Environmental Briefing

2.1.1. Prior to, and during, construction of the Pipeline System, Permittees shall provide for environmental and other pertinent briefings for construction and other personnel by such Federal employees as may be designated by the Authorized Officer. Permittees shall arrange the time, place and attendance for such briefings upon request by the Authorized Officer. Permittees shall bear all costs of such briefings other than salary, per diem, subsistence, and travel costs of Federal employees. In addition, Permittees shall separately arrange with the State of Alaska for such similar briefings as the State may desire.

2.2. Pollution Control

2.2.1. General

2.2.1.1. Permittees shall conduct all activities associated with the Pipeline System in

a manner that will avoid or minimize degradation of air, land and water quality. In the construction, operation, maintenance and termination of the Pipeline System, Permittees shall perform their activities in accordance with applicable air and water quality standards, related facility siting standards, and related plans of implementation, including but not limited to standards adopted pursuant to the Clean Air Act, as amended, 42 U.S.C. § 1857 *et seq.*, and the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1321 *et seq.*

2.2.2. Water and Land Pollution

2.2.2.1. Permittees shall comply with applicable "Water Quality Standards" of the State of Alaska as approved by the Environmental Protection Agency.

2.2.2.2. Mobile ground equipment shall not be operated in lakes, streams or rivers unless such operation is approved in writing by the Authorized Officer.

2.2.3. Thermal Pollution

2.2.3.1. Permittees shall comply with the standards set for thermal pollution in the State of Alaska "Water Quality Standards," as approved by the Environmental Protection Agency.

2.2.4. Air Pollution and Ice Fog

2.2.4.1. Permittees shall utilize and operate all facilities and devices used in connection with the Pipeline System so as to avoid or minimize air pollution and ice fog. Facilities and devices which cannot be prevented from producing ice fog shall be located so as not to interfere with airfields, communities or roads.

2.2.4.2. Emissions from equipment, installations and burning materials shall meet applicable Federal and State air quality standards.

2.2.5. Pesticides, Herbicides and other Chemicals

2.2.5.1. Permittees shall use only non-persistent and immobile types of pesticides, herbicides and other chemicals. Each chemical to be used and its application constraint shall be

approved in writing by the Authorized Officer prior to use.

2.2.6. Sanitation and Waste Disposal

2.2.6.1. "Waste" means all discarded matter, including but not limited to human waste, trash, garbage, refuse, oil drums, petroleum products, ashes and equipment.

2.2.6.2. All waste generated in construction, operation, maintenance and termination of the Pipeline System shall be removed or otherwise disposed of in a manner acceptable to the Authorized Officer. All applicable standards and guidelines of the Alaska State Department of Environmental Conservation, the United States Public Health Service, the Environmental Protection Agency, and other Federal and State agencies shall be adhered to by Permittees. All incinerators shall meet the requirements of applicable Federal and State laws and regulations and shall be used with maximum precautions to prevent forest and tundra fires. After incineration, material not consumed in the incinerator shall be disposed of in a manner approved in writing by the Authorized Officer. Portable or permanent waste disposal systems to be used shall be approved in writing by the Authorized Officer.

2.3. Buffer Strips

2.3.1. Public Interest Areas

2.3.1.1. No construction activity in connection with the Pipeline System shall be conducted within one-half (½) mile of any officially designated Federal, State or municipal park, wildlife refuge, research natural area, recreation area, recreation site, or any registered National Historic Site or National Landmark, unless such activity is approved in writing by the Authorized Officer.

2.3.2. Vegetative Screen

2.3.2.1. Permittees shall not cut or remove any vegetative cover within a minimum five hundred (500) foot strip between State highways and material sites unless such cutting or removal is approved in writing by the Authorized Officer.

2.3.2.2. Where the Right-of-way crosses State highways, a screen of vegetation native to the specific setting shall be established over disturbed areas unless otherwise approved in writing by the Authorized Officer.

2.3.3. Streams

2.3.3.1. The Pipeline System shall be located so as to provide three hundred (300) foot minimum buffer strips of undisturbed land along streams unless otherwise approved in writing by the Authorized Officer.

2.4. Erosion Control

2.4.1. General

2.4.1.1. Permittees shall perform all Pipeline System construction, operation, maintenance and termination activities so as to avoid or minimize disturbance to vegetation.

2.4.1.2. The design of the Pipeline System shall provide for the construction of control facilities that will avoid or minimize erosion.

2.4.1.3. The erosion control facilities shall be constructed to avoid induced and accelerated erosion and to lessen the possibility of forming new drainage channels resulting from Pipeline System activities. The facilities shall be designed and operations conducted in such a way as to avoid or minimize disturbance to the thermal regime.

2.4.2. Stabilization

2.4.2.1. Surface materials taken from disturbed areas shall be stockpiled and utilized during restoration unless otherwise approved in writing by the Authorized Officer. Stabilization practices, as determined by the needs for specific sites, shall include but shall not be limited to seeding, planting, mulching, and the placement of mat binders, soil binders, rock or gravel blankets, or structures.

2.4.2.2. All disturbed areas shall be left in a stabilized condition satisfactory to the Authorized Officer. Such satisfaction shall be stated in writing by the Authorized Officer.

2.4.3. Crossing of Streams, Rivers or Flood Plains

2.4.3.1. Permittees shall prevent or minimize erosion at stream and river crossings and those parts of the Pipeline System within flood plains, as defined in Stipulation 3.6.

2.4.3.2. Temporary access over stream banks shall be made through use of fill ramps rather than by cutting through stream banks, unless otherwise approved in writing by the Authorized Officer. Permittees shall remove such ramps upon termination of seasonal or final use. Ramp materials shall be disposed of in a manner approved in writing by the Authorized Officer.

2.4.4. Seeding and Planting

2.4.4.1. Seeding and planting of disturbed areas shall be conducted as soon as practicable and, if necessary, shall be repeated until vegetation is successful, unless otherwise approved in writing by the Authorized Officer. All other restoration shall be completed as soon as possible.

2.4.5. Excavated Material

2.4.5.1. Excavated material in excess of that required to backfill around any structure, including the pipe, shall be disposed of in a manner approved in writing by the Authorized Officer.

2.5. Fish and Wildlife Protection**2.5.1. Passage of Fish**

2.5.1.1. Permittees shall provide for uninterrupted movement and safe passage of fish. Any artificial structure or any stream channel change that would cause a blockage to fish shall be provided with a fish passage structure or facility that meets all Federal and State requirements. The proposed design shall be submitted to the Authorized Officer in accordance with Stipulation 1.7.

2.5.1.2. Pump intakes shall be screened to prevent harm to fish.

2.5.1.3. Abandoned water diversion structures shall be plugged and stabilized to prevent trapping or stranding of fish.

2.5.1.4. If material sites are approved adjacent to or in certain lakes, rivers, or streams, the Authorized Officer may require Permittees to construct levees, berms or other suitable means to protect fish and fish passage and to prevent siltation of streams or lakes.

2.5.2. Fish Spawning Beds

2.5.2.1. "Fish Spawning Beds" means the areas where anadromous and resident fish deposit their eggs.

2.5.2.2. Permittees shall avoid channel changes in Fish Spawning Beds designated by the Authorized Officer; however, where channel changes cannot be avoided in such beds, new channels shall be constructed according to written standards supplied by the Authorized Officer.

2.5.2.3. Fish Spawning Beds shall be protected from sediment where soil material is expected to be suspended in water as a result of construction activities. Settling basins shall be constructed to intercept silt before it reaches streams or lakes.

2.5.2.4. Permittees shall comply with any special requirements made by the Authorized Officer for a stream system in order to protect Fish Spawning Beds. Permittees shall repair all damage to Fish Spawning Beds caused by construction, operation, maintenance or termination of the Pipeline System.

2.5.3. Zones of Restricted Activities

2.5.3.1. Permittees' activities in connection with the Pipeline System in key fish and wildlife areas may be restricted by the Authorized Officer during periods of fish and wildlife breeding, nesting, spawning, lambing or calving activity and during major migrations of fish and wildlife. The Authorized Officer shall give Permittees written notice of such restrictive action. From time to time, the Authorized Officer shall furnish Permittees a list of areas where

such actions may be required, together with anticipated dates of restriction.

2.5.4. Big Game Movements

2.5.4.1. Permittees shall construct and maintain the Pipeline, both buried and above ground sections, so as to assure free passage and movement of big game animals.

2.6. Materials Sites

2.6.1. Purchase of Materials

2.6.1.1. If Permittees require materials from the public lands, Permittees shall make application to purchase such materials in accordance with 43 CFR, Part 3610. Permittees shall submit a mining plan in accordance with 43 CFR, Part 23. No materials may be removed by Permittees without the written approval of the Authorized Officer.

2.6.1.2. Insofar as possible, use of existing materials sites will be authorized in preference to new sites.

2.6.1.3. Gravel and other construction material shall not be taken from stream beds, river beds, lake shores or other outlets of lakes, unless the taking is approved in writing by the Authorized Officer.

2.6.2. Layout of Materials Sites

2.6.2.1. Materials site boundaries shall be shaped in such a manner as to blend with surrounding natural land patterns. Regardless of the layout of materials sites, primary emphasis shall be placed on prevention of soil erosion and damage to vegetation.

2.7. Clearing

2.7.1. Boundaries

2.7.1.1. Permittees shall identify approved clearing boundaries on the ground for each Construction Segment prior to beginning clearing operations. All timber and other vegetative material outside clearing boundaries and all blazed, painted or posted trees which are on or mark clearing boundaries are reserved from cutting and removal with the exception of

danger trees or snags designated as such by the Authorized Officer.

2.7.2. Timber

2.7.2.1. Prior to initiating clearing operations, Permittees shall notify the Authorized Officer of the amount of merchantable timber, if any, which will be, cut, removed or destroyed in the construction and maintenance of the Pipeline System, and shall pay the United States in advance of such construction or maintenance activity, such sum of money as the Authorized Officer determines to be the full stumpage value of the timber to be cut, removed or destroyed.

2.7.2.2. All trees, snags, and other woody material cut in connection with clearing operations shall be cut so that the resulting stumps shall not be higher than six (6) inches measured from the ground on the uphill side.

2.7.2.3. All trees, snags and other woody material cut in connection with clearing operations shall be felled into the area within the clearing boundaries and away from water courses.

2.7.2.4. Hand clearing shall be used in areas where the Authorized Officer determines that use of heavy equipment would be detrimental to existing conditions.

2.7.2.5. All debris resulting from clearing operations and construction that may block stream flow, delay fish passage, contribute to flood damage, or result in stream bed scour or erosion shall be removed.

2.7.2.6. Logs shall not be skidded or yarded across any stream without the written approval of the Authorized Officer.

2.7.2.7. No log landing shall be located within three-hundred (300) feet of any water course.

2.7.2.8. All slash shall be disposed of in construction pads or Access Roads unless otherwise directed in writing by the Authorized Officer.

2.8. Disturbance of Natural Water

2.8.1. All activities of Permittees in connection with the Pipeline System that may create new lakes, drain existing lakes, significantly divert natural drainage, permanently alter stream hydraulics, or disturb significant areas of stream beds are prohibited unless such activities along with necessary mitigation measures are approved in writing by the Authorized Officer.

2.9. Off Right-of-Way Traffic

2.9.1. Permittees shall not operate mobile ground equipment off the Right-of-Way, Access Roads, State highways, or authorized areas, unless approved in writing by the Authorized Officer or when necessary to prevent harm to any Person.

2.10. Aesthetics

2.10.1. Permittees shall consider aesthetic values in planning, construction and operation of the Pipeline System. Where the Right-of-Way crosses a State highway in forested terrain, the straight length of the Pipeline Right-of-Way visible from the highway shall not exceed six hundred (600) feet in length, unless otherwise approved in writing by the Authorized Officer. The Authorized Officer may impose such other requirements as he deems necessary to protect aesthetic values.

2.11. Use of Explosives

2.11.1. Permittees shall submit a plan for use of explosives, including but not limited to blasting techniques, to the Authorized Officer in accordance with Stipulation 1.7.

2.11.2. No blasting shall be done under water or within one quarter (1/4) mile of streams or lakes without a permit from the Alaska Department of Fish and Game, when such a permit is required by State law or regulation.

2.12. Restoration

2.12.1. Areas disturbed by Permittees shall be restored by Permittees to the satisfaction of the Authorized Officer as stated in writing.

2.12.2. All cut and fill slopes shall be left in a stable condition.

2.12.3. Materials from Access Roads, haul ramps, berms, dikes, and other earthen structures shall be disposed of as directed in writing by the Authorized Officer.

2.12.4. Vegetation, overburden and other materials removed during clearing operations shall be disposed of by Permittees in a manner approved in writing by the Authorized Officer.

2.12.5. Upon completion of restoration, Permittees shall immediately remove all equipment and supplies from the site.

2.13. Reporting of Oil Discharges

2.13.1. A discharge of Oil by Permittees into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone in violation of the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1321 *et seq.* and the regulations issued thereunder, or in violation of applicable laws of the State of Alaska and regulations issued thereunder, is prohibited. Permittees shall give immediate notice of any such discharge to: (1) the Authorized Officer, and (2) such other Federal and State officials as are required by law to be given such notice.

2.13.2. Permittees shall give immediate notice of any spill or leakage of Oil or other pollutant from the Pipeline, the Valdez terminal facility, or any storage facility to: (1) the Authorized Officer; and (2) such other Federal and State officials as are required by law to be given such notice. Any oral notice shall be confirmed in writing as soon as possible.

2.14. Contingency Plans

2.14.1. It is the policy of the Department of the Interior that there should be no discharge of Oil or other pollutant into or upon lands or waters. Permittees must therefore recognize their prime responsibility for the protection of the public and environment from the effects of spillage.

2.14.2. Permittees shall submit their contingency plans to the Authorized Officer at least one-hundred and eighty (180) days prior to

scheduled start-up. The plans shall conform to this Stipulation and the National Oil Hazardous Substances Pollution Contingency Plan, 36 F.R. 16215, August 20, 1971, and shall:

- (1) include provisions for Oil Spill Control¹;
- (2) specify that the action agencies responsible for contingency plans in Alaska shall be among the first to be notified in the event of any Pipeline System failure resulting in an Oil spill;
- (3) provide for immediate corrective action including Oil Spill Control and restoration of the affected resource;
- (4) provide that the Authorized Officer shall approve any materials or devices used for Oil Spill Control and shall approve any disposal sites or techniques selected to handle oily matter; and
- (5) include separate and specific techniques and schedules for cleanup of Oil spills on land, lakes, rivers and streams, sea, and estuaries.

2.14.3. Prior to Pipeline start-up, such plans shall be approved in writing by the Authorized Officer, and Permittees shall demonstrate their capability and readiness to execute the plans. Permittees shall update as appropriate the plans and methods of implementation thereof, which shall be submitted annually to the Authorized Officer for his written approval.

2.14.4. If during any phase of the construction, operation, maintenance or termination of the Pipeline, any Oil or other pollutant should be discharged from the Pipeline System, the control and total removal, disposal and cleaning up of such Oil or other pollutant, wherever found, shall be the responsibility of Permittees, regardless of fault. Upon failure of Permittees to control, dispose of, or clean up such discharge, the Authorized Officer may take such measures as he deems necessary to control and clean up the discharge at the full expense of Permittees. Such action by the Authorized Officer shall not relieve Permittees of any responsibility as provided herein.

¹ As used in this Stipulation 2.14.2, Oil Spill Control is defined as: (1) detection of the spill; (2) location of the spill; (3) confinement of the spill; and (4) cleanup of the spill.

3. TECHNICAL

3.1. General

3.1.1. The following standards shall be complied with in design, construction, operation and termination of the Pipeline System.

3.2. Pipeline System Standards

3.2.1. General Standards

3.2.1.1. All design, material and construction, operation, maintenance and termination practices employed in the Pipeline System shall be in accordance with safe and proven engineering practice and shall meet or exceed the following standards:

- (1) U.S.A. Standard Code for Pressure Piping, ANSI B 31.4, "Liquid Petroleum Transportation Piping System."
- (2) Department of Transportation Regulations, 49 CFR, Part 195, "Transportation of Liquids by Pipeline."
- (3) ASME Gas Piping Standard Committee, 15 Dec. 1970: "Guide for Gas Transmission and Distribution Piping System."
- (4) Department of Transportation Regulations, 49 CFR, Part 192, "Transportation of Natural and Other Gas by Pipelines: Minimum Federal Safety Standards."

3.2.1.2. Requirements in addition to those set forth in the above minimum standards may be imposed by the Authorized Officer as necessary to reflect the impact of subarctic and arctic, environments. If any standard contains a provision which is inconsistent with a provision in another standard, the more stringent shall apply.

3.2.2. Special Standards

3.2.2.1. The design shall also provide for remotely controlled shutoff valves at each pump station; remotely controlled mainline block valves (intended to control spills); and additional valves located with the best judgment regarding

wildlife habitat, fish habitat, and potentially hazardous areas.

3.2.2.2. All practicable means shall be utilized to minimize injury to the ground organic layer.

3.2.2.3. Radiographic inspection of all main line girth welds and pressure testing of the Pipeline shall be conducted by Permittees prior to placing the system in operation.

3.2.2.4. Permittees shall provide for continuous inspection of Pipeline System construction to ensure compliance with the design specifications and these Stipulations.

3.2.2.5. Welder qualification tests shall be by destructive means, except that operators of automatic welding equipment for girth welding of tank seams shall be tested by radiography in accordance with ASME Boiler and Pressure Vessel Code, Section 9, Subsection Q-21 (b).

3.2.2.6. Lightning protection shall conform to the requirements of ANSI C5.1-1969, "Lightning Protection Code-1968."

3.2.3. Standards for Access Roads

3.2.3.1. Design, materials and construction practices employed for Access Roads shall be in accordance with safe and proven engineering practice and in accordance with the principles of construction for secondary roads for the subarctic and arctic environments.

3.2.3.2. Permittees shall submit a layout of each proposed Access Road for approval by the Authorized Officer in accordance with Stipulation 1.7.

3.2.3.3. Access Roads shall be constructed to widths suitable for safe operation of equipment at the travel speeds proposed by Permittees.

3.2.3.4. The maximum allowable grade shall be 12 percent unless otherwise approved in writing by the Authorized Officer.

3.3. Construction Mode Requirements

3.3.1. The selection of the Construction Mode (elevated or buried) shall be governed by the following criteria: (1) There shall be an unobstructed air space of at least two feet between the pipe and ground surface; or (2) There shall be no greater heat transfer from the pipe to the ground than results from the use of an unobstructed air space of at least two (2) feet between the pipe and ground surface; or (3) Below the level of the pipe axis the ground shall consist of competent bedrock, soil naturally devoid of permafrost, or if frozen, of Thaw-Stable Sand and Gravel.² Above the level of the pipe axis other materials may be present but it must be shown that they will remain stable under all credible conditions; or (4) Results of a detailed field exploration program and analysis indicate that pipe rupture and major terrain disruption will not occur at any place from soil instability. Effects and their interaction, which are to be analyzed on a mile by mile basis to justify the proposed Construction Mode, shall include but not be limited to, thaw plug stability, differential settlement, seismic loading and weakening, and possible movement resulting from slope instability.³

As a prerequisite for the use of this criterion, an acceptable comprehensive monitoring system of the Pipeline shall be developed which will include but not be limited to making deformation measurements sufficiently sensitive and prompt to detect the approach to operational

² Thaw-Stable Sand and Gravel is defined as material meeting the following requirements: (a) Material lies within the classes GW, GP, SW, and SP, (Unified Soil Classification) but with up to 6% by weight passing the #200 U.S. standard sieve; if an inorganic granular soil contains more than 6% fines than the #200 sieve, its thaw-stability must be justified. (b) There is no excess (segregated or massive) ice. (c) Thawing of the material *in situ* will not result in excess pore-pressure.

³ Because of soil variability and/or unique hydrologic conditions in active flood plains, some of the requirements of Stipulation 3.3.1 may not be met in those locations. In such cases proposed designs including special design and/or construction procedures where required by these conditions must be submitted with justification to the Authorized Officer for approval in accordance with Stipulations 1.7.

tolerance limits (which shall be clearly specified) of the Pipeline; design specifications, operational requirements, and feasibility analysis of such monitoring system shall be submitted in accordance with Stipulation 1.7. Such system shall be operational prior to transmission of Oil through the Pipeline.

3.4. Earthquakes and Fault Displacements

3.4.1. Earthquakes

3.4.1.1. The Pipeline System shall be designed, where technically feasible, by appropriate application of modern, state-of-the-art seismic design procedures to prevent any Oil leakage from the effects (including seismic shaking, ground deformation and earthquake-induced mass movements) of earthquakes distributed along the route as follows:

Zone:	Richter magnitude
Valdez to Willow Lake	8.5
Willow Lake to Paxson	7.0
Paxson to Donnelly Dome	8.0
Donnelly Dome to 67 deg. N	7.5
67 deg. N. to Prudhoe Bay	5.5

3.4.1.2. Where such design is not technically feasible, the potential damage from an Oil spill shall be minimized by special design provisions that shall include, but shall not be limited to: (1) a network of ground-motion detectors that continuously monitor, record and instantaneously signal the occurrence of ground motion in the vicinity of the Pipeline reaching the Operational Design Level⁴ (the critical levels of ground motions shall be approved in writing by the Authorized Officer); (2) rapid programmed shutdown and prompt close inspection of system integrity in the event of ground motion reaching the Operational Design Level; and (3) a special contingency plan for Oil Spill Control for each such seismically hazardous area which shall be filed in accordance with Stipulation 2.14. This plan shall specifically consider expected field conditions in the particular area in the aftermath of a destructive earthquake.

⁴ Highest level that would not produce general pipe deformation sufficient to limit operations.

3.4.2. Fault Displacements

3.4.2.1. Prior to applying for a Notice to Proceed for any Construction Segment, Permittees shall satisfy the Authorized Officer that all recognizable or reasonably inferred faults or fault zones along the alignment within that segment have been identified and delineated, and that the risk of Oil leakage resulting from fault movement and ground deformation has been adequately assessed and provide for in the design of the Pipeline for that segment. Evaluation of said risk shall be based on geologic, geomorphic, geodetic, seismic, and other appropriate scientific evidence of past or present fault behavior and shall be compatible with the design earthquakes tabulated above and with observed relationships between earthquake magnitude and extent and amount of deformation and fault slip within the fault zone.

3.4.2.2. Minimum design criteria for a segment of the Pipeline traversing a fault zone that is reasonably interpreted as active, shall be: (1) that the Pipeline resist failure resulting in leakage from two feet of horizontal and/or vertical displacement in the foundation material anywhere within the fault zone; and (2) that no storage tank or pump station be located within the fault zone.

3.4.2.3. Where the Pipeline crosses a fault or lies within a fault zone that is reasonably interpreted as active, Permittees shall monitor crustal deformation in the vicinity of the Pipeline. Such monitoring shall include annual geodetic observation of permanent reference marks established on stable ground. Said reference marks shall be positioned so as to form closed figures and to provide for detection of relative horizontal and vertical displacements as small as 0.10 ft. across principal individual faults within the fault zone and to provide for monitoring of crustal strain with an absolute error of two parts per million within the fault zone. Further, where annual slip on a fault exceeds 0.10 ft. for two successive years, Permittees shall install recording or telemetering slip-meters. Data obtained from the monitoring shall be provided to the Authorized Officer at specified regular intervals throughout the operational life of the Pipeline. Said data shall be used by the Permittees to aid in the initiation of corrective measures to protect the Pipeline from failure

caused by tectonic deformation that would result in leakage.

3.5. Slope Stability

3.5.1. Areas subject to mudflows, landslides, avalanches, rock falls and other types of mass movements shall be avoided where practicable in locating the Pipeline. Where such avoidance is not practicable, the Pipeline design, based upon detailed field investigations and analysis, shall provide measures to prevent the occurrence of, or protect the Pipeline against, the effects of mass movements.

3.6. Stream and Flood Plain Crossings and Erosion

3.6.1. General

3.6.1.1. For each region through which the Pipeline passes, the Pipeline shall be designed to withstand or accommodate the effects (including runoff, stream and flood plain erosion, meander cutoffs, lateral migration, ice-jams, and icings) of those meteorologic, hydrologic (including surface and subsurface) and hydraulic conditions considered reasonably possible for the region. The following standards shall apply to such Pipeline design:

3.6.1.1.1. For stream crossings and portions of the Pipeline within the flood plain.

3.6.1.1.1.1. The Pipeline shall cross streams underground unless a different means of crossing is approved in writing by the Authorized Officer.

3.6.1.1.1.2. The design flood shall be based on the concept of the "Standard Project Flood" as defined in Corps of Engineers Bulletin 52-8, Part 1.

3.6.1.1.1.3. The depth of channel scour shall be established by appropriate field investigations and theoretical calculations using those combinations of water velocity and depth that yield the maximum value. At the point of maximum scour, the cover over the pipe shall be at least twenty (20) percent of the computed scour, but not less than four (4) feet.

3.6.1.1.1.4. For overhead crossings comparable analysis shall be made to ensure that support structures are adequately protected from the effects of scour, channel migration, undercutting, ice forces and degradation of permafrost.

3.6.1.1.1.5. In flood plains, appropriate construction procedures shall be used wherever there is potential channelization along the pipe.

3.6.1.1.1.6. The pipe trench excavation shall stop an adequate distance from the water crossing to leave a protective plug (unexcavated material) at each bank. These plugs shall be left in place until the stream bed excavation is complete and the pipe laying operation is begun. The plugs shall not be completely removed until absolutely necessary. The trench shall be backfilled with stable material as soon as the pipe is laid.

3.6.1.2. Culverts and Bridges

3.6.1.2.1. Culverts and bridges necessary for maintenance of the Pipeline shall be designed to accommodate a fifty (50) -year flood in accordance with criteria established by the American Association of State Highway Officials and the Federal Highway Administration and endorsed by the State of Alaska Department of Highways.

3.6.2. Erosion

3.6.2.1. Where necessary because of outfall erosion, stilling basins shall be constructed at the outflow end of culverts. To prevent erosion the pool sides shall be stabilized by appropriate methods; eg., by the use of riprap.

3.6.2.2. Slopes of cuts through stream banks shall be designed and constructed to minimize erosion and prevent slides.

3.6.2.3. Erosion control procedures shall accommodate and be based on the runoff produced by the maximum rainfall rate and snow melt rate combination reasonably characteristic of the region. The procedures shall also accommodate effects that result from thawing produced by flowing or pond water on permafrost terrain.

3.7. Sea Waves

3.7.1. Oil transfer facilities at the Valdez terminal shall be protected by cut-off devices designed and located to prevent major Oil leakage from breaking of pipes by destructive sea waves comparable to those generated in Port Valdez by the March 27, 1964 earthquake. Design for such protective features shall be submitted in accordance with Stipulation 1.7.

3.8. Glacier Surges

3.8.1. Surveillance systems sufficient to give adequate warning of impending surges on any glacier that could damage the Pipeline shall be instituted prior to transmission of Oil through the pipe. Procedures for initiation and operation of such surveillance systems and protective procedures in the event of such surges shall be submitted in accordance with Stipulation 1.7.

3.9. Construction and Operation

3.9.1. All construction, operation, maintenance, and termination activities in connection with the Pipeline System shall be conducted so as to avoid or minimize thermal and other environmental changes and to provide maximum protection to fish and wildlife and their habitat, and people. All working platforms, pads, fills and other surface modifications shall be planned and executed in such a way that any resulting degradation of permafrost will not jeopardize the Pipeline foundations.

3.9.2. Acceptable plans, procedures and quality controls that ensure compliance with Stipulation 3.9.1 shall be submitted in accordance with Stipulation 1.7.

3.10. Pipeline Corrosion

3.10.1. Permittees shall provide detailed plans for corrosion resistant design and methods for early detection of corrosion. These shall include: (1) pipe material and welding techniques to be used and information on their

particular suitability for the environment involved; (2) details on the external pipe protection to be provided (coating, wrapping, etc.), including information on variation of the coating process to cope with variations in environmental factors along the Pipeline route; (3) plans for cathodic protection including details of impressed ground sources and controls to ensure continuous maintenance of adequate protection over the entire surface of the pipe; (4) details of plans for monitoring cathodic protection current including spacing of current monitors; (5) provision for periodic intensive surveys of trouble spots, regular preventive maintenance surveys and special provisions for abnormal potential patterns resulting from the crossing of the Pipeline by other pipelines or cables; and (6) information on precautions to be taken to prevent internal corrosion of the Pipeline. Permittees shall also provide for periodic internal pitting surveys by electro-magnetic or other means.

3.11. Containment of Oil Spills

3.11.1. Permittees shall provide Oil spill containment dikes or other structures around storage tanks at pump stations and at the Valdez terminal. The volume of the containment structures shall be at least: (1) one-hundred ten (110) percent of the total storage volume of the storage tanks in the relevant area, plus (2) a volume sufficient for maximum trapped precipitation and runoff which might be impounded at the time of the spill. Such structures shall be constructed to withstand failure from earthquakes in accordance with Stipulation 3.4 and shall be impervious so as to provide seepage-free storage until disposal of their contents can be effected safely without contamination of the surrounding area.

3.11.2. Permittees shall provide containment dikes or other structures to minimize effects of Oil spills at critical locations along the Pipeline in accordance with Stipulation 2.14.

EXHIBIT E
COOPERATIVE AGREEMENT
between
UNITED STATES DEPARTMENT OF THE
INTERIOR
and
STATE OF ALASKA
regarding the
PROPOSED TRANS-ALASKA PIPELINE

(Exhibit is proposed for deletion because construction of the Trans-Alaska pipeline is completed.
Deletion is pending confirmatory discussions.)

APPENDIX B

EXHIBIT E
COOPERATIVE AGREEMENT
between
UNITED STATES DEPARTMENT OF THE INTERIOR
and
STATE OF ALASKA
regarding the
PROPOSED TRANS-ALASKA PIPELINE

THIS AGREEMENT, effective this 8th day of January, 1974, by and between the United States Department of the Interior (hereinafter referred to as the "Department") and the State of Alaska (hereinafter referred to as the "State"), which together are hereinafter referred to jointly as "Parties,"

WITNESSETH

WHEREAS, the State has the authority pursuant to AS 38.05.020 to enter into this agreement with the Department in order to protect the lands, waters and natural environment of Alaska;

WHEREAS, the Secretary of the Interior (hereinafter referred to as the "Secretary") has the authority to enter into agreements involving the improvement, management, use and protection of the public lands and their resources pursuant to Section 102 of the Public Land Administration Act, 74 Stat. 506 (1960), 43 U.S.C. § 1363 (1970);

WHEREAS, the Parties have been requested to issue rights-of-way and other authorizations for the construction of an oil pipeline system from Prudhoe Bay to Valdez, Alaska;

WHEREAS, the Congress of the United States has determined that early construction of such an oil pipeline system is in the national interest and has authorized and directed the Secretary and other appropriate Federal officers and agencies to issue and take all necessary

action to administer and enforce rights-of-way and other authorizations that are necessary for or related to the construction of the Trans-Alaska oil pipeline system;

WHEREAS, the Legislature of Alaska, in special session, has enacted legislation to establish authority and guidelines for a right-of-way lease for that system;

WHEREAS, the Secretary will designate a Federal Authorized Officer and the Governor of Alaska will appoint a State Pipeline Coordinator who will, respectively, have general supervision and control over the functions in Alaska of the Department and the State with respect to the construction of the pipeline system;

WHEREAS, it is anticipated that detailed technical and environmental stipulations relating to construction of the pipeline system will be incorporated in the right-of-way and other authorizations of each of the Parties, and that the State and Federal stipulations will be similar in all major respects;

WHEREAS, it is necessary to provide for review and approval of designs and surveillance of construction activities in order to assure compliance with the aforesaid stipulations; and

WHEREAS, it is the purpose of this agreement to promote an effective working relationship between the Parties in order to provide maximum protection for the environment without unnecessary delays in construction of the pipeline system;

NOW, THEREFORE, the Parties agree as follows:

I. LANDS-LEASE AND PERMIT

1. The State and Department recognize the following categories of land to be made subject to the rights-of-way and other authorizations of the State or the Department and that such lands constitute all of the land along the proposed pipeline right-of-way that is not owned by private parties and therefore is subject to the authority of either the Department or the State to authorize rights-of-way.

- (a) Lands patented to the State.
- (b) Lands selected by and tentatively approved to the State and not withdrawn under section 11(a)(2) of the Alaska Native Claims Settlement Act, 85 Stat. 696, 43 U.S.C. § 1610 (1970).
- (c) Lands selected by the State and not tentatively approved and not withdrawn under section 11(a)(2) of the Alaska Native Claims Settlement Act.
- (d) Lands selected by the State and not tentatively approved and which were withdrawn under section 11(a)(2) of the Alaska Native Claims Settlement Act but which are not available for village or regional selection under section 22(l) of the Alaska Native Claims Settlement Act, 85 Stat. 713, 43 U.S.C. § 1621 (1970).
- (e) Lands selected by the State, both tentatively approved and not tentatively approved, and withdrawn under section 11(a)(2) of the Alaska Native Claims Settlement Act.
- (f) Lands beneath navigable waters as defined in Section 2 of the Submerged Lands Act, 67 Stat. 29, 43 U.S.C. § 1301 (1970).
- (g) Lands in Federal ownership that have not been selected by the State.

2. The State will issue its right-of-way and other authorizations for lands in categories 1(a), 1(b), and 1(f). The Department will issue its

rights-of-way and other authorizations for lands in categories 1(e) and 1(g).

3. Both the State right-of-way lease or other grant and the Federal right-of-way authorization will include the lands in categories 1(c) and 1(d) and each will be effective in accordance with the following terms:

- (a) Lands in category 1(c) will be tentatively approved or patented to the State no later than fifteen (15) days after compliance by the Parties with all applicable regulations. The Parties will immediately initiate and expeditiously complete such compliance. The State will thereupon immediately proceed to issue a right-of-way lease or other grant and such authorizations as are necessary for construction and operation of the pipeline system on said lands.
- (b) The Department will take all necessary action preparatory to tentatively approving or patenting the lands in category 1 (d) to the State within twenty-five (25) days from the effective date of this agreement and will tentatively approve or patent those lands promptly upon receipt of notice from the Commissioner of Natural Resources that the State is prepared to issue a right-of-way lease or other grant and such other authorizations as are necessary for construction and operation of the pipeline system on said lands.
- (c) The Federal right-of-way in and to lands in categories 1(c) or 1(d), or both, will vest in the Parties receiving it on the date it is issued by the Department but only upon the occurrence of one of the following events, whichever occurs first:
 - (i) The Commissioner of Natural Resources notifies the Secretary in writing that it is essential for the expeditious construction of the pipeline system that the Federal right-of-way in and to some or all of the lands in categories 1(c) or 1(d), or both, vest in the Parties receiving it; or

- (ii) The lands in category 1(d) have not been tentatively approved to the State and a valid State right-of-way lease or other grant in and to those lands has not been issued for the construction and operation of the pipeline system by March 10, 1974; or
- (iii) The lands in category 1(c) have not been tentatively approved to the State and a valid State right-of-way lease or other grant in and to those lands has not been issued for the construction and operation of the pipeline system by June 1, 1974;

Provided as conditions: First, that the Federal right-of-way is made subject to the State's valid pre-existing rights, if any, in and to those lands; Second, that upon either valid tentative approval or valid patent of any of those lands to the State, the existence or subsequent issuance of a valid State right-of-way lease or other grant in and to those lands terminates the Federal right-of-way and other authorizations, and the State right-of-way lease or other grant thereupon applies in all respects to those lands; Third, that the parties who receive the Federal right-of-way and other authorizations agree in writing to the first and second conditions herein and that they will not challenge the validity of the State's right-of-way lease or other grant on the basis of the existence of the Federal right-of-way and other authorizations or their interest therein, and the Federal right-of-way recites these three conditions; and, Fourth, that the Department will make every reasonable effort to tentatively approve and patent the lands to the State expeditiously.

II. SURVEILLANCE

1. While the Parties will establish and maintain separate organizations to assure compliance with the terms and stipulations of their respective right-of-way authorizations and with their respective statutes and regulations, they will seek to coordinate the activities of these organizations as fully as possible. In the execution of their respective responsibilities the Parties will seek to provide maximum protection for the environment without unnecessary delays

in construction of the pipeline. Pursuant to this general agreement, it is further agreed that:

- (a) The Parties will endeavor, both in central offices and in the field, to locate all personnel in the surveillance effort, including agents and third party contractors, in common locations and to utilize, insofar as possible, common logistical support, with the objective of maximizing communication between the two organizations.
- (b) Except as prohibited by law or by the Department's pipeline right-of-way agreement with the owners of the Trans-Alaska pipeline, (but the owners will be required by the State right-of-way lease to make the same available to the State), the Parties will share fully all information concerning the construction of the pipeline system and the surveillance thereof. The State and the Federal organizations will have complete and immediate access to the information of the other, on request, and there will be regular exchange of information regarding design reviews, application for and issuances of notices to proceed, temporary suspension orders, modification orders, reports on compliance in the field, construction change recommendations, all submissions by the holders of the rights-of-way, all third party contractor reports, applications for and issuance of permission to resume activity, and all other similar information. The timing, location, method and type of information exchanged shall be governed by the objective of the fullest possible access to information practical in order to maximize the decision-making capability of the Parties.
- (c) The Parties will have full and free access to the lands of each other for all purposes relating to the surveillance of the pipeline system and the enforcement of all State and Federal statutes and regulations.

2. All applications for notices to proceed, together with supporting documents, will be

reviewed by both the State Pipeline Coordinator and the Federal Authorized Officer.

The State right-of-way lease will contain provisions regarding notices to proceed that assure review by the Pipeline Coordinator within the same time period as provided in the Department's right-of-way authorizations. The Authorized Officer or his designee, on behalf of the Department, may issue notices to proceed involving construction of any portion of the pipeline system. The Pipeline Coordinator or his designee, on behalf of the State, may issue notices to proceed with respect to any construction of the pipeline system on State lands, and no notice to proceed on lands subject to the State right-of-way lease will be effective unless signed by the State Pipeline Coordinator.

3. On lands subject to the Federal right-of-way authorizations, the Department will determine compliance with the terms and stipulations regulating the construction of the pipeline system. On lands subject to the Federal right-of-way authorization, where applicable statutes and regulations of the State providing for the protection of resources, the environment, or public health, safety or general welfare, impose additional requirements to, or more stringent standards than, those required by the Federal terms and stipulations for pipeline construction, operation or maintenance, the State law will control.

4. On lands subject to the State right-of-way lease, the determination of compliance with those terms and stipulations regulating the construction of the pipeline system which do not directly affect the physical integrity of the pipeline, but which are necessary for the protection of State lands and resources shall be made exclusively by the State. On such lands the State or the Department may issue any orders necessary to assure compliance with those terms and stipulations regulating the construction of the pipeline system that are necessary to protect the physical integrity of the pipeline.

5. The Parties recognize that the unique characteristics of the arctic and subarctic environment require special efforts to provide it with optimum protection. The Parties will make every reasonable effort to ensure that

construction and operation methods and activities will be planned and executed so as to minimize environmental degradation.

6. Fish and wildlife protection is regarded by the Parties as a special responsibility of the surveillance effort which extends with common concern over the length of the pipeline. The Parties will encourage the formation, to the extent practicable, of a cooperative effort for such protection, sharing the fish and game personnel and information resources of both the State and Federal Governments, and the application of this cooperative effort over both State and Federal lands.

7. The Department shall have full and free access at all times to the Valdez terminal site for the purpose of enforcing the Department's stipulations at that facility. The State will assure such access to the Department by making appropriate provisions therefor in any lease or conveyance it may issue or grant with respect to the lands embraced in the Valdez terminal site.

III. STATE HIGHWAY AND STATE AIRPORTS

1. The Department agrees to take such action pursuant to the Trans-Alaska Pipeline Authorization Act of November 16, 1973, P.L. 93-153, as are necessary for the State to construct a public highway from the Yukon River to Prudhoe Bay. The State agrees to construct the highway according to the Highway and Airport Stipulations attached hereto as Exhibit "A" and, if the State contracts to build the highway, to include said stipulations as a part of any agreement with its contractors.

2. The State has furnished the Department a map of the intended location of the highway, and upon completion of construction of the highway will file with the Department a map of definite location of the highway of similar scale.

3. The Department agrees to lease three sites for public airports pursuant to the Trans-Alaska Pipeline Authorization Act (*supra*). The State agrees to build the airports according to those provisions of the Highway and Airport Stipulations that are pertinent to airport construction, and if the State contracts to build

the airports, to include said stipulations as a part of any agreement with such contractors.

4. The Department agrees to take all actions necessary to provide to the State, under nonexclusive permits, the free use of gravel or other materials necessary for construction of the State highway and the State airports pursuant to the Trans-Alaska Pipeline Authorization Act (*supra*). All free use permits issued by the Department for such material sites shall include provisions of the Highway and Airport Stipulations applicable to material sites.

5. The State shall have the right and responsibility to enforce the applicable provisions of the Highway and Airport Stipulations referring to the construction of the State highway and State airports.

IV. MISCELLANEOUS

1. The Federal Authorized Officer and the State Pipeline Coordinator will develop procedures to implement the provisions of this agreement.

2. In the implementation of this agreement, each Party will avoid unnecessary employment of personnel and needless expenditure of funds.

3. This agreement shall remain in effect until construction of the Trans-Alaska pipeline is completed. However, in the event that either Party deems it necessary or desirable to terminate this agreement at an earlier time, it may do so after giving the other Party sixty (60) days advance written notice thereof.

.....
IN WITNESS WHEREOF, the Parties hereto have executed this agreement as of the date shown below:

STATE OF ALASKA
/s/ William A. Egan
Title: Governor
State of Alaska
January 8, 1974

United States of America
Department of the Interior
/s/ Rogers C.B. Morton
Title: Secretary of the
Interior

EXHIBIT A

Highway and Airport Stipulations

1. DEFINITIONS

1.1. "Highway" means the State highway from the Yukon River to Prudhoe Bay, Alaska; and includes all permanent roads, bridges, tunnels, drainage structures, signs, guardrails, protective structures, and appurtenances related thereto or used in connection therewith.

1.2. "Airports" means the three public airports for which the State of Alaska made application on March 20, 1970, under 49 U.S.C. §§ 211-214 (1970).

1.3. "State Pipeline Coordinator" means that individual designated by the State of Alaska with authority over and responsibility for the supervision of design review and construction of the Pipeline System or his designee.

1.4. "Federal Authorized Officer" means the Secretary of the Interior, or a person delegated to exercise his authority with respect to the Pipeline System.

1.5. "Contractor" means the individual, corporation, or other entity, or the subcontractor or agent of such individual, corporation or other entity, with which the State of Alaska contracts to build the Highway or Airports. In the event that the State undertakes to build the Highway or Airports itself, "Contractor" shall mean the State of Alaska.

1.6. "Notice to Proceed" means a document signed by the State Pipeline Coordinator authorizing some aspect of the construction of the Highway or Airports.

2. PROCEDURES

2.1. Regulation of Public Access

2.1.1. During construction of the Highway, the State shall provide alternative routes for existing roads and trails across public lands.

2.1.2. The State shall make provisions for suitable permanent crossings for the public where the Highway right-of-way crosses existing

roads, foot trails, winter trails, or other rights-of-way.

2.2. Applicability of Stipulations

2.2.1. Nothing in these Stipulations shall be construed as applying to activities of the State that have no relation to the Highway or Airports.

2.2.2. Nothing in these Stipulations shall be construed to affect any right or cause of action that otherwise would be available to the State against any person other than the United States.

2.3. Responsibilities

2.3.1. With regard to the construction of the Highway and Airports: (1) The State shall ensure full compliance with the terms and conditions of these Stipulations by its agents, employees and contractors (including subcontractors of any tier), and the employees of each of them. (2) Unless clearly inapplicable, the requirements and prohibitions imposed upon the State by these Stipulations are also imposed upon the State's agents, employees, contractors, and subcontractors, and the employees of each of them. (3) Failure or refusal of the State's agents, employees, contractors, subcontractors, or their employees to comply with these Stipulations shall be deemed to be the failure or refusal of the State. (4) The State shall require its agents, contractors, and subcontractors to include these Stipulations in all contracts and subcontracts which are entered into by any of them, together with a provision that the other contracting party, together with its agents, employees, contractors, subcontractors, and the employees of each of them, shall likewise be bound to comply with these Stipulations.

2.3.2. The State shall make separate application, under applicable statutes and regulations, for authorization to use or occupy Federal lands in connection with the Highway or Airports where the lands are not within the Highway right-of-way or Airport leases. This

shall include material sites, camp sites, waste areas, storage areas, access roads, etc.

2.3.3. The Federal Authorized Officer may require modification of the Highway or Airports, without liability or expense to the United States, as necessary to protect the integrity of the Trans-Alaska Pipeline.

2.4. Highway Design Approval

2.4.1. The State shall require detailed design submittals from Contractor for all river and stream crossings.

2.4.2. All such submittals shall be reviewed by the State Pipeline Coordinator for conformity with the Stipulations set forth herein.

2.4.3. Upon approval of such design, a Notice to Proceed shall be executed and transmitted to the Contractor. Such document shall authorize the commencement of construction on the element of the Highway for which design is approved.

2.5. Suspension of Construction

2.5.1. In the event the State Pipeline Coordinator determines that the Contractor is in violation of these Stipulations, he may order suspension of that portion of the work in violation.

2.5.2. In the event that the Federal Authorized Officer determines that the Contractor is in violation of these Stipulations, he may recommend that the State Pipeline Coordinator order suspension of that portion of the work he deems to be in violation.

2.6 Changes in Conditions

Unforeseen conditions arising during design or construction of the Highway or Airports may make it necessary to revise or amend these Stipulations to protect the environment and the public interest. In that event, the Federal Authorized Officer and the State Pipeline Coordinator, shall agree as to what revisions or amendments shall be made. If they are unable to agree, the Federal Authorized Officer shall have final authority to determine the matter if the Airports are involved, and the State Pipeline

Coordinator shall have final authority to determine the matter if the Highway is involved.

3. CONTRACTOR STIPULATIONS-GENERAL

3.1. Equal Employment Opportunity

By accepting this contract, Contractor agrees that, during the period of construction of the Highway and Airports, or for so long as this permit shall be in effect, whichever is the longer, he shall comply with this Stipulation.

3.1.1. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are equally treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be approved by the Authorized Officer setting forth the provision of this equal opportunity clause.

3.1.2. Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, sex, color or national origin.

3.1.3. Contractor will send to each labor union or representative of workers with which Contractor has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Authorized Officer, advising the labor union or worker's representatives of Contractor commitments under this equal opportunity clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

3.1.4. Contractor will comply with Executive Order No. 11246 of September 24, 1965, as amended, and rules and regulations and relevant orders of the Secretary of Labor.

3.1.5. Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to Contractor's books, records, and accounts by the State Pipeline Coordinator and the Federal Authorized Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

3.1.6. In the event of Contractor's noncompliance with this equal opportunity clause or with any of said rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and Contractor may be declared ineligible for further government contracts or permits in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

3.1.7. Contractor will include the provisions of this equal opportunity clause in every contract, subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended, so that such provisions will be binding upon each contractor, subcontractor or vendor. Contractor will take such action with respect to any contract, subcontract, or purchase order as the Authorized Officer may direct as a means of enforcing such provisions including sanctions for noncompliance; provided, however, that in the event Contractor becomes involved in, or is threatened with, litigation with a contractor, subcontractor or vendor as a result of such direction by the State Pipeline Coordinator, Contractor may request the United States to enter into such litigation to protect the interests of the United States.

3.1.8. Contractor further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work.

3.1.9. Contractor agrees that it will assist and cooperate actively with the State Pipeline Coordinator and the Federal Authorized Officer and the Secretary of Labor in obtaining the compliance of Contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the State Pipeline Coordinator and the Federal Authorized Officer and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the State Pipeline Coordinator in securing compliance.

3.1.10. Contractor further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order No. 11246 of September 24, 1965, as amended, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon Contractors and subcontractors by the Federal Authorized Officer or the Secretary of Labor, pursuant to Part II, Subpart D, of the Executive Order. In addition, Contractor agrees that if it fails or refuses to comply with these undertakings, the State Pipeline Coordinator may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this contract; refrain from extending any further assistance to Contractor under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received from the Contractor; and refer the case to the Department of Justice for legal proceedings.

**3.1.11. Certification of
Nonsegregated Facilities**

By accepting this contract, Contractor certifies that Contractor does not and will not maintain or provide for Contractor's employees

any segregated facilities at any of Contractor's establishments, and that Contractor does not and will not permit Contractor's employees to perform their services at any location, under Contractor's control, where segregated facilities are maintained. Contractor agrees that a breach of this certification is a violation of the equal opportunity clause of this permit. As used in this certification, the term "segregated facilities" means, but is not limited to, any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom or otherwise. Contractor further agrees that (except where Contractor has obtained identical certifications from proposed Contractors and subcontractors for specific time periods) Contractor will obtain identical certifications from proposed Contractors and subcontractors prior to the award of contracts or subcontracts exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause; the Contractor will retain such certifications in Contractor's files; and the Contractor will forward the following notice to such proposed Contractors and subcontractors (except where the proposed Contractors or subcontractors have submitted identical certifications for specific time periods): "NOTICE TO PROSPECTIVE CONTRACTORS AND SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NON-SEGREGATED FACILITIES." A Certification of Nonsegregated Facilities, as required by the order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a contract or subcontract exceeding \$10,000 which is not exempt from the provisions of the equal opportunity clause. The certification may be submitted either for each contract and subcontract or for all contracts and subcontracts during a period (i.e., quarterly, semiannually, or annually).

3.2. Liabilities and Responsibilities of Contractor

Contractor shall abate any condition existing with respect to the construction of the Highway or Airports that causes or threatens to cause serious and irreparable harm or damage to any person, structure, property, land, fish and wildlife and their habitats, or other resource. Any State or Federal property and fish and wildlife habitat harmed or damaged by the Contractor in connection with the construction of the Highway or Airports, regardless of fault, shall be reconstructed, repaired and rehabilitated by the Contractor to the written satisfaction of the State Pipeline Coordinator. Contractor shall be liable in accordance with applicable laws for loss or damage to property of others or for bodily injuries to or the death of any person arising from or connected with the construction of the Highway or Airports.

3.3. Federal, State and Local Laws and Regulations

Contractor shall comply with applicable Federal and State laws and all regulations issued thereunder, existing or hereafter enacted or promulgated, affecting in any manner construction of the Highway or Airports.

3.4. Antiquities and Historical Sites

Contractor shall engage an archeologist approved by the Federal Authorized Officer to provide surveillance and inspection of the Highway and Airport sites for archeological values. If, in connection with any operation under this contract, or any other contract entered in connection with the Highway or Airports, Contractor encounters known or previously unknown paleontological, archeological, or historical sites, Contractor shall immediately notify the Federal Authorized Officer and the State Pipeline Coordinator and said archeologist. Contractor's archeologist shall investigate and provide an on-the-ground opinion regarding the protective measures to be undertaken by Contractor. The Federal Authorized Officer may suspend that portion of Contractor's operations necessary to preserve evidence pending investigation of the site.

Six (6) copies of all survey and excavation reports shall be filed with the Federal Authorized Officer and the State Pipeline Coordinator.

3.5. Termination of Use

Upon termination of use of any part of the Highway or Airports, Contractor shall remove all improvements and equipment, except as otherwise approved in writing by the State Pipeline Coordinator as to the Highway, and the Federal Authorized Officer as to the Airports, and shall restore the land to a condition that is satisfactory to them. The satisfaction of the State Pipeline Coordinator and Federal Authorized Officer shall be stated in writing.

All Access Roads shall be "put-to-bed" by Contractor upon completion of their use unless otherwise directed by the Federal Authorized Officer. "Put-to-bed" is used herein to mean that such roads shall be left in such stabilized condition that erosion will be minimized through the use of adequately designed and constructed waterbars, revegetation, and chemical surface control; that culverts and bridges shall be removed by Contractor in a manner satisfactory to the Federal Authorized Officer; and that such roads shall be closed to use. Contractor's rehabilitation plan shall be approved in writing by the State Pipeline Coordinator and the Federal Authorized Officer prior to termination of use of any such road or any part thereof.

3.6. Public Improvements

Contractor shall protect existing improvements on Federal and State lands during construction of the Highway or Airports. Except as authorized for temporary purposes by the State Pipeline Coordinator and Federal Authorized Officer, the Contractor shall not obstruct any road or trail with logs, slash, or debris.

3.7. Camping, Hunting, Fishing, and Trapping

Contractor shall satisfy the State Pipeline Coordinator that it has and will adequately inform its employees, agents, contractors, subcontractors, and their employees, of applicable laws and regulations relating to hunting, fishing, and trapping.

3.8. Small Craft Passage

The creation of any permanent obstruction to the navigation of small craft in streams is prohibited.

3.9. Survey Monuments

Contractor shall mark and protect all geodetic survey monuments encountered during the construction of the Highway or Airports. These monuments are not to be disturbed; however, if such a disturbance occurs, the Federal Authorized Officer shall be immediately notified thereof in writing.

If any land survey monuments, corners, or accessories (excluding geodetic survey monuments) are destroyed, obliterated or damaged, Contractor shall employ a qualified land surveyor to reestablish or restore same in accordance with the "Manual of Instructions for the Survey of Public Lands" and shall record such survey in the appropriate records. Additional requirements for the protection of monuments, corners, and bearing trees may be prescribed by the Federal Authorized Officer.

3.10. Fire Prevention and Suppression

Contractor shall promptly notify the State Pipeline Coordinator and the Federal Authorized Officer and take all measures necessary and appropriate for the prevention and suppression of fires in accordance with 43 CFR 2801.1-5 (d). Contractor shall comply with their instructions and directions concerning the use, prevention and suppression of fires. Use of open fires in connection with construction of the Highway or Airports is prohibited unless authorized in writing by the State Pipeline Coordinator as to the Highway or the Federal Authorized Officer as to the Airports.

3.11. Health and Safety

Contractor shall take all measures necessary to protect the health and safety of all persons affected by its activities performed in connection with the construction of the Highway or Airports and shall immediately abate any health or safety hazards. Contractor shall immediately notify the State Pipeline Coordinator

of all serious accidents which occur in connection with such activities.

4. CONTRACTOR STIPULATIONS-ENVIRONMENTAL

4.1. Environmental Briefing

Prior to and during construction of the Highway and Airports, Contractor shall provide for environmental and other pertinent briefings of construction and other personnel by such Federal and State employees as may be designated by the Federal Authorized Officer and the State Pipeline Coordinator. Contractor shall arrange the time, place and attendance for such briefings upon their request.

4.2. Pollution Control

4.2.1. General

Contractor shall conduct all activities associated with the Highway and Airports in a manner that will avoid or minimize degradation of air, land and water quality. In the construction of the Highway and Airports, Contractor shall perform its activities in accordance with applicable air and water quality standards and related plans of implementation, including emission standards, adopted pursuant to the Clean Air Act, as amended (42 U.S.C., sec. 1857, et seq.), and the Federal Water Pollution Control Act, as amended (33 U.S.C., sec. 1160).

4.2.2. Water and Land Pollution

4.2.2.1. Contractor shall comply with applicable "Water Quality Standards" of the State of Alaska as approved by the Environmental Protection Agency.

4.2.2.2. Mobile ground equipment shall not be operated in lakes, streams, or rivers unless such operation is approved in writing by the State Pipeline Coordinator.

4.2.3. Air Pollution and Ice Fog

4.2.3.1. Contractor shall utilize and operate all facilities and devices used in connection with the construction of the Highway and Airports in such a way so as to avoid or minimize air pollution and ice fog.

4.2.3.2. Emissions from equipment, installations, and burning materials shall meet applicable Federal and State air quality standards.

4.2.4. Pesticides, Herbicides, and other Chemicals

Contractor shall use only non-persistent and immobile types of pesticides, herbicides and other chemicals. Each chemical to be used and its application constraint shall be approved in writing by the State Pipeline Coordinator prior to use.

4.2.5. Sanitation and Waste Disposal

4.2.5.1. "Waste" means all discarded matter, including but not limited to human waste, trash, garbage, refuse, oil drums, petroleum products, ashes and equipment.

4.2.5.2. All waste generated in construction of the Highway and Airports shall be removed or otherwise disposed of in a manner acceptable to the State Pipeline Coordinator. All applicable standards and guidelines of the Alaska State Department of Environmental Conservation, the United States Public Health Service, the Environmental Protection Agency, and other Federal and State agencies shall be adhered to by Contractor. All incinerators shall meet the requirements of applicable Federal and State laws and regulations and shall be used with maximum precautions to prevent forest and tundra fires. After incineration, material not consumed in the incinerator shall be disposed of in a manner approved in writing by the State Pipeline Coordinator. Portable or permanent waste disposal systems to be used shall be approved in writing by the State Pipeline Coordinator.

4.3. Buffer Strips

4.3.1. Public Interest Areas

No construction activity in connection with the Highway or Airports shall be conducted within one-half (1/2) mile of any officially designated Federal, State or municipal park, wildlife refuge, research natural area, recreation area, recreation site, or any registered National

Historic Site or National Landmark, unless such activity is approved in writing by the Federal Authorized Officer as to Federal areas or the State Pipeline Coordinator as to State areas.

4.3.2. Streams

The Highway clearing limits shall be limited so as to provide three hundred (300) foot minimum buffer strips of undisturbed land along streams unless otherwise approved under 2.4 herein.

4.4. Erosion Control

4.4.1. Contractor shall conduct all Highway and Airport construction activities so as to avoid or minimize disturbance to vegetation.

4.4.2. The design of the Highway and Airports shall provide for the construction of erosion control facilities that will avoid or minimize erosion.

4.4.3. The erosion control facilities shall be constructed to avoid erosion and to lessen the possibility of forming new drainage channels resulting from Highway or Airport construction activities. The facilities shall be designed and constructed in such a way as to avoid or minimize disturbance to the thermal regime.

4.4.4. Stabilization

4.4.4.1. Surface materials taken from disturbed areas shall be stockpiled and utilized during restoration unless otherwise approved in writing by the State Pipeline Coordinator as to the Highway and by the Federal Authorized Officer as to the Airports. Stabilization practices, as determined by the needs for specific sites, shall include but shall not be limited to seeding, planting, mulching, and the placement of mat binders, soil binders, rock or gravel blankets, or structures.

4.4.4.2. All disturbed areas shall be left in a stabilized condition satisfactory to the State Pipeline Coordinator as to the Highway and the Federal Authorized Officer as to the Airports. Such satisfaction shall be stated in writing.

4.4.5. Crossings of Streams, Rivers or Flood Plains

4.4.5.1. Contractor shall prevent or minimize erosion at streams and river crossings and those parts of the Highway or Airports within flood plains.

4.4.5.2. Temporary access over stream banks shall be made through use of fill ramps rather than by cutting through stream banks, unless otherwise approved in writing by the State Pipeline Coordinator.

4.4.5.3. Timing and methods of crossings shall be subject to control and alteration by the State Pipeline Coordinator to protect fish passage and spawning and aquatic resources generally.

4.4.6. Seeding and Planting

Seeding and planting of disturbed areas shall be conducted as soon as practicable and, if necessary, shall be repeated until vegetation is successful, unless otherwise approved in writing by the State Pipeline Coordinator. All other restoration shall be completed as soon as possible.

4.4.7. Excavated Material

Excavated material not utilized for Highway or Airport construction shall be disposed of in a manner approved in writing by the Federal Authorized Officer, if wasted outside of the facility right-of-way.

4.5. Fish and Wildlife Protection

4.5.1. Passage of Fish

4.5.1.1. Contractor shall provide for uninterrupted movement and safe passage of fish. Any artificial structure or any stream channel change that would cause a blockage of fish shall be provided with a fish passage structure or facility that meets all Federal and State requirements. The proposed design shall be submitted to the State Pipeline Coordinator in accordance with Stipulation 2.4.1.

4.5.1.2. Pump intakes shall be screened to prevent harm to fish.

4.5.1.3. Abandoned water diversion structures shall be removed or filled to prevent trapping or stranding of fish.

4.5.1.4. If material sites are approved adjacent to or in certain lakes, rivers, or streams, the State Pipeline Coordinator, either on his own initiative or at the request of the Federal Authorized Officer, may require the Contractor to construct levees, berms, or other suitable means to protect fish and fish passage and to prevent siltation of streams or lakes.

4.5.2. Fish Spawning Beds

4.5.2.1. "Fish Spawning Beds" means the areas where anadromous and resident fish deposit their eggs.

4.5.2.2. Contractor shall avoid channel changes in Fish Spawning Beds designated by the State Pipeline Coordinator; however, where channel changes cannot be avoided in such beds, new channels shall be constructed according to written standards supplied by the State Pipeline Coordinator.

4.5.2.3. Fish Spawning Beds shall be protected from sediment where soil material is expected to be suspended in water as a result of construction activities. Settling basins shall be constructed to intercept silt before it reaches streams or lakes.

Contractor shall comply with any special requirements made by the State Pipeline Coordinator for a stream system in order to protect Fish Spawning Beds. Contractor shall repair all damage to Fish Spawning Beds caused by construction of the Highway or Airports.

4.5.3. Zones of Restricted Activities

Contractor's activities in connection with the construction of the Highway or Airports in key fish and wildlife areas may be restricted by the State Pipeline Coordinator during periods of fish and wildlife breeding, nesting, spawning, lambing or calving activity and during major migrations of fish and wildlife. The State Pipeline Coordinator shall provide Contractor written notice of such restrictive action. From

time to time, the State Pipeline Coordinator shall furnish Contractor a list of areas where such actions may be required, together with anticipated dates of restriction.

4.6. Material Sites

4.6.1. Acquisition of Materials

4.6.1.1. If Contractor requires materials from the public lands, Contractor shall request the State of Alaska to make application, in accordance with 43 CFR, Part 3621, "Free Use of Mineral Materials." Contractor shall submit a mining plan in accordance with 43 CFR, Part 23. No materials may be removed by Contractor without the written approval of the Federal Authorized Officer.

4.6.1.2. Insofar as possible, use of existing material sites will be authorized in preference to new sites.

4.6.2. Layout of Material Sites

Material site boundaries should be shaped in such a manner as to blend with surrounding natural land patterns. Regardless of the layout of material sites, primary emphasis shall be placed on prevention of soil erosion and damage to vegetation.

4.7. Clearing

4.7.1. Boundaries

Contractor shall identify approved clearing boundaries on the ground prior to beginning clearing operations. All timber and other vegetative material outside clearing boundaries and all blazed, painted or posted trees which are on or mark clearing boundaries are reserved from cutting and removal with the exception of danger trees or snags designated as such by the State Pipeline Coordinator.

4.7.2. Timber

4.7.2.1. Prior to initiating clearing operations, Contractor shall notify the Federal Authorized Officer of the amount of merchantable timber, if any, which will be cut, removed, or destroyed in the construction of the Highway or Airports, and shall request that the State make separate application for the free use

of such timber in accordance with 43 CFR, Part 5510.

4.7.2.2. All trees, snags, or other woody material cut in connection with clearing operations shall be cut so the resulting stumps shall not be higher than six (6) inches measured from the ground on the uphill side.

4.7.2.3. All trees, snags, and other woody material cut in connection with clearing operations shall be felled into the area within the clearing boundaries and away from water courses.

4.7.2.4. Hand clearing shall be used in areas where the State Pipeline Coordinator as to the Highway and the Federal Authorized Officer as to the Airports, determine that use of heavy equipment would be detrimental to existing conditions.

4.7.2.5. All debris resulting from clearing operations and construction that may block stream flow, delay fish passage, contribute to flood damage, or result in stream bed scour or erosion shall be removed.

4.7.2.6. Logs shall not be skidded or yarded across any stream without the written approval of the State Pipeline Contractor.

4.7.2.7. No log landing shall be located within three hundred (300) feet of any water course, except where impractical, then only with the written approval of the State Pipeline Coordinator.

4.7.2.8. All slash shall be disposed of within the Highway right-of-way or Airport lease unless otherwise directed in writing by the Federal Authorized Officer as to the Airports or the State Pipeline Coordinator as to the Highway.

4.8. Disturbance of Natural Waters

All activities of Contractor in connection with the construction of the Highway or Airports that may create new lakes, drain existing lakes, significantly divert natural drainages, permanently alter stream hydraulics, or disturb

significant areas of stream beds are prohibited unless such activities along with necessary mitigation measures are approved in writing by the Federal Authorized Officer as to the Airports and the State Pipeline Coordinator as to the Highway.

4.9. Off Right-of-Way Traffic

Contractor shall not operate mobile ground equipment off the Highway or Airport constructions limits or authorized areas unless approved in writing by the Federal Authorized Officer as to the Airports and the State Pipeline Coordinator as to the Highway, or when necessary to prevent harm to any person.

4.10. Aesthetics

The Federal Authorized Officer or State Pipeline Coordinator may impose such requirements as he deems necessary to protect aesthetic values.

4.11. Restoration

4.11.1. Areas disturbed by Contractor shall be restored by Contractor to the satisfaction of the State Pipeline Coordinator as to the Highway, and the Federal Authorized Officer as to the Airports as stated in writing.

4.11.2. All cut and fill slopes shall be left in a stable condition.

4.11.3. Materials from the Highway and Airports, haul ramps, berms, dikes, and other earthen structures shall be disposed of as directed by the State Pipeline Coordinator as to the Highway and the Federal Authorized Officer as to the Airport.

4.11.4. Vegetation, overburden, and other materials removed during clearing operations shall be disposed of by Contractor in a manner approved in writing by the State Pipeline Coordinator as to the Highway and the Federal Authorized Officer as to the Airports.

4.11.5. Upon completion of restoration, Contractor immediately shall remove all equipment and supplies from the site.

5. CONTRACTOR STIPULATIONS - TECHNICAL

The following requirements shall be complied with in design and construction of Highways and Airports.

5.1. Special Standards

5.1.1. All pre-construction, construction, and post-construction operations shall be conducted to minimize permafrost degradation and damage to the environment, and to provide maximum protection to wildlife and human beings.

5.1.2. Temporary bridges shall be located so as to reserve the superior site and alignment for future permanent bridges.

5.1.3. Embankment sections shall be used in preference to excavated sections wherever practicable and, in general, the Highway shall follow terrain features.

5.1.4. Unless otherwise approved by the State Pipeline Coordinator, organic material resulting from clearing operations shall not be incorporated in the road prism, but may be used as a mat overlay below the road prism.

5.2. Permanent Culverts and Bridges

Culverts and bridges shall be designed to accommodate a 50-year flood in accordance with criteria established by the American Association of State Highway Officials and the Federal Highway Administration.

5.3. Erosion

5.3.1. Erosion control procedures shall accommodate and be based on the runoff produced by storm and snow melt conditions

having a 50-year occurrence interval. The procedure shall also accommodate effects that result from thawing produced by flowing or ponded water on permafrost terrain.

5.3.2. Slopes of cuts through stream banks shall be designed and constructed to minimize erosion and prevent slides.

5.3.3. Where necessary because of outfall erosion, stilling basins shall be constructed at the outflow end of culverts. To prevent erosion the pool sides shall be established by appropriate methods; E.g., by the use of riprap.

5.4. Slope Stability

Areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movements shall be avoided where practicable in locating the Highway and Airports. Where such avoidance is not practical, the Highway or Airport design, based upon detailed field investigations and analysis, shall provide measures to prevent the occurrence of, or protect the Highway or Airports against the effects of mass movements.

5.5. Construction Operations

5.1.1. All pre-construction and construction activities shall be conducted so as to avoid or minimize thermal and other environmental changes and to provide maximum protection to fish and wildlife and their habitat, and people. All surface modifications shall be planned and executed in such a way that any resulting degradation of permafrost will not jeopardize adjoining structure foundations.

5.5.2. Acceptable plans, procedures and quality controls that ensure compliance with these Stipulations shall be submitted in accordance with Stipulation 2.4.1.

Appendix C:

Hazardous Materials and Waste Management

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Hazardous Materials and Waste Management

C.1 Introduction

Affected environments are defined for each of the major waste types associated with Trans-Alaska Pipeline System (TAPS) operations. For each waste category, the respective Alyeska Pipeline Service Company (APSC) Environmental Management System program, relevant implementing procedures, and information obtained through interviews of APSC and Joint Pipeline Office (JPO) representatives are used to describe the general nature of the wastes being generated and the external and internal controls that govern APSC extant management strategies. The most recently available disposal records are used to provide quantification where possible. Information provided in the Hazardous Materials Management Business Model and its related implementation procedures is used to define the affected environment with respect to hazardous materials. Quantities of some hazardous materials are reflected in the APSC Emergency Planning and Community Right-To-Know (EPCRA) Tier II report for 2000.

C.2 Hazardous Materials Management

Hazardous materials are used throughout the TAPS system to support operations and maintenance. The APSC Hazardous Materials Management Business Model provides for both administrative tracking and physical control of hazardous materials (APSC 2000a). Chapter 8 of the TAPS *Environmental Protection Manual*, EN-43-1 (APSC 2000b), contains implementing procedures for hazardous materials management. The more salient elements of the program include the following:

- *Review and authorization for use:* Before a chemical can be used within the TAPS (including at contractor facilities), approvals must be obtained from both APSC environmental and safety authorities. The

safety review identifies the prominent chemical and physical hazards of the chemical and specifies unique storage and handling requirements as well as the necessary hazard communication training for workers who will handle, or potentially be exposed to, the chemical. The environmental review identifies the compliance obligations that result from using the chemical and specifies the appropriate disposal scheme for resulting wastes. Appropriate elements of spill contingency planning are also identified.

- *Inventory management:* A systemwide Hazardous Materials Consolidation and Redistribution (HAZCORE) Program is in place. Databases are maintained on a commercially available computer software program to provide for systemwide comprehensive hazardous materials procurement and inventory management, as well as the electronic management and distribution of Material Safety Data Sheets (MSDS). Initiatives such as redistributing hazardous materials throughout the system, limiting excess hazardous materials purchases, and tracking material shelf lives are all facilitated by the HAZCORE databases. The HAZCORE databases also interface with programs for employee training to ensure that training is consistent with Occupational Safety and Health Administration (OSHA) and State of Alaska requirements and APSC corporate policies.
- *Hazardous material transportation:* Separate training on U.S. Department of Transportation (DOT) requirements is provided to APSC employees and contractor employees who repackage and transport hazardous materials throughout the TAPS.
- *Hazardous materials management plans:* Hazardous materials brought into TAPS

facilities by contractors or to support a specific project require an approved Hazardous Materials Management Plan. Such plans provide details on the materials, their packaging and storage circumstances, appropriate contingency plans, and an identification of all wastes anticipated from the use of the materials in question.

- *Emergency planning:* Emergency planning includes the development of site-specific contingency plans for hazardous material storage or usage locations. This program element also supports APSC's responsibility to notify local emergency response authorities of all hazardous materials present in quantities above their respective threshold planning quantities (TPQs) as required by EPCRA (also known as Superfund Amendments and Reauthorization Act [SARA] Title III). In addition to initial notifications, the program is also capable of generating an annual report to the state (known as a Tier II Report) of amounts and types of hazardous materials present at TAPS facilities above TPQs, as also required by EPCRA.

A wide variety of hazardous materials are necessary to support the TAPS. Materials used include equipment and vehicle fuels, heat transfer fluids, organic solvents, petroleum-based cleaners and detergents, lubricating oils, adhesives and sealants, refrigerants, photographic materials, fire suppressants, fire fighting agents, corrosion inhibitors, corrosive agents, explosives, and pesticides. In addition, hazardous materials are also used for infrastructure repair and maintenance. These include paints and solvents as well as various adhesives and protective coatings.

In addition to hazardous commodities, hazardous materials are also present in some equipment or products in widespread use throughout the TAPS. Such products include batteries of the following types: lead-acid, alkaline, lead calcium, lithium, mercury, nickel-cadmium, and zinc chloride. Other commodities containing hazardous materials include various items of air emission monitoring equipment that may contain corrosive solutions or toxic heavy metals; thermometers, thermostats, or electrical switches that contain mercury; vapor or

fluorescent lightbulbs that contain mercury; and incandescent lightbulbs containing lead.

Hazardous materials are delivered to the central APSC warehouse in Anchorage, the Anchorage Distribution Center, or directly to the appropriate maintenance facility or pump station by commercial carriers. APSC employees and operating contractors also engage in some repackaging (into smaller containers) and redistribution of hazardous materials throughout the TAPS. With few exceptions, hazardous materials shipments are by truck (either commercial carrier or APSC vehicle). Contractors conducting specific tasks may also bring hazardous materials obtained from outside the APSC inventory directly to the job site. Fuels are delivered by bulk load by commercial carriers. With the exception of fuels in portable tanks brought to maintenance or repair work sites along the pipeline and fuels brought to remote gate valve (RGV) control buildings, APSC employees and contractors do not redistribute or otherwise transport fuels. Notwithstanding fuels, hazardous materials are stored in 55-gal or smaller containers.

Although the potential exists for hazardous materials to be used anywhere throughout the pipeline or within the Valdez Marine Terminal, the majority of hazardous material usage occurs at the marine terminal, the operating pump stations, and maintenance and equipment yards off the TAPS ROW. These locations include the Doyon Industrial Facility (Fairbanks), Nordale Storage Yard (Fairbanks), North Pole Metering Station, and the Van Horn Facility (Fairbanks). Hazardous materials are also used along the pipeline to support maintenance or repair activities and special projects. Very small amounts of hazardous materials are used at the APSC "Bragaw Facility" administrative headquarters in Anchorage. With the exception of fuels that are stored in aboveground tanks at pump stations and maintenance yards and in one belowground storage tank at the Bragaw Facility, hazardous materials are stored in dedicated storage areas within buildings at the Valdez Marine Terminal, the maintenance facilities, and the pump stations. For some line maintenance activities or special projects (e.g., vaulting of check valves), limited quantities of hazardous materials and fuels are stored in

temporary facilities or portable tanks at the job site through the duration of the job.

In March 2001, the APSC submitted an EPCRA Tier II Report to the ADEC reporting on the amounts of hazardous materials present at APSC facilities in amounts above their respective TPQs (Ferrell 2001). Table C-1 provides a summary of that report.

C.3 Hazardous Waste

Section 3 of the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c), describes procedures by which any waste generated within the TAPS will be evaluated and characterized. Section 4 establishes systemwide programmatic controls for managing those TAPS wastes that are determined to be hazardous waste by federal or state regulations. Section 4 of the TAPS *Environmental Protection Manual*, EN-43-2, establishes APSC standards for containerization and labeling of hazardous waste; storage of hazardous waste at satellite locations and designated storage facilities; inspections and record keeping for storage areas; and pickup and transportation of hazardous waste to designated permitted treatment, storage, and disposal facilities (TSDFs). Section 4 also establishes training requirements for personnel responsible for management of hazardous waste and requires the development of contingency plans for all hazardous waste accumulation and storage areas.

The APSC has determined where hazardous wastes are generated and accumulated and has given notification to the U.S. Environmental Protection Agency (EPA) Region 10 of the status of these locations (Seward 2001a). These APSC-operated hazardous waste generation/accumulation sites include Pump Station (PS) 1 through PS 12 (excluding those now on standby); Mainline Refrigeration Units 1, 2, and 7; the Ship Escort Response Annex; Ship Escort Response Base; Valdez Marine Terminal; North Pole Metering Station; Nordale Yard Facility; Northstar Terminal; Van Horn Facility; North Pole Laboratory; and Bragaw Facility. Only the hazardous waste management areas at Mainline

Refrigeration Unit 2, Northstar Terminal, and the Marine Terminal are large-quantity generators (i.e., generate more than 2,200 lb hazardous waste per month). The other sites are conditionally exempt small-quantity generators that generate less than 220 lb of hazardous waste or 2.2 lb of acute hazardous waste in any month.

Some APCS-generated wastes, such as spent fluorescent bulbs and batteries, are managed as Resource Conservation and Recovery Act (RCRA) Universal Wastes and are ultimately delivered to a disposal facility by the APSC hazardous waste contractor. Spent lead acid batteries are recycled and therefore are not considered RCRA wastes.

Hazardous waste is generated from the use of hazardous materials (e.g., methyl ethyl ketone [MEK]) or the disposal of off-specification or excess chemicals (e.g., 1,1,1-trichloroethane [TCA]), which the EPA designates as "listed hazardous waste" when they are discarded. Wastes generated from the maintenance of various items of pipeline and Valdez Marine Terminal equipment that display any of the EPA-designated hazardous characteristics (i.e., ignitability, corrosivity, toxicity, or reactivity) are also considered hazardous wastes. Only large-quantity generators are required to file a biennial report with the EPA showing the type of waste generated, source of the waste, quantity of waste generated, identity of the hazardous waste contractor taking the waste, and the type of disposal facility to which it was shipped. Thus, the biennial report filed in 1999 reflects only the hazardous waste generated and shipped from Mainline Refrigeration Unit 2, Northstar Terminal, and the Valdez Marine Terminal. The hazardous wastes reflected in the 1999 biennial report are shown in Table C-2. Other facilities along the pipeline generate similar hazardous wastes, but in smaller quantities.

As shown in Table C.2, a systemwide total of 142,118.9 lb of hazardous waste was shipped off site in 1999. A major reduction in the generation of hazardous waste has occurred over the years, principally because of better hazardous materials management and other pollution prevention initiatives. For example, 712,000 and 310,000 lb of hazardous waste were disposed

TABLE C-1 Summary of EPCRA Tier II Report for Calendar Year 2000^a

TAPS Facility	Hazardous Material	Maximum Daily Amount Present ^b	Average Daily Amount Present ^b	Principal Hazard ^c
Bragaw Office Complex	Diesel fuel	24,000 gal	18,000 gal	F, I
Doyon Industrial Facility	Antifreeze	1,000 gal	1,000 gal	I, D
	Therminol 44 [®] (heat transfer fluid)	11,500 gal	6,500 gal	I
	Therminol 55 [®] (heat transfer fluid)	13,000 gal	13,000 gal	I
	Oakite [®]	13,125 lb	13,125 lb	I
	Diesel fuel	2,000 gal	2,000 gal	F, I
	Therminol FF [®] (heat transfer fluid)	11,500 gal	6,500 gal	I
	Therminol 44 [®] (heat transfer fluid)	99,999 gal	9,999 gal	I
	Diesel fuel	2,000 gal	2,000 gal	F, I
	Jet oil II	500 gal	500 gal	D
	Lubricating oils	99,999 gal	9,999 gal	F, I
Drag Reducing Agent Injection Facility	Drag reducing agent (Conoco)	10,000 gal	5,000 gal	F, I, D
	Drag reducing agent (Baker)	39,000 gal	20,000 gal	F, I, D
	Liquid nitrogen	5,200 gal	2,600 gal	P
	Diesel fuel	3,150 gal	2,000 gal	F, I
Nordale Storage Yard	Halon 1301 [®]	99,999 lb	99,999 lb	I
	Lubricating oil	99,999 lb	99,999 lb	F, I
	Gasoline	9,999 lb	9,999 lb	F, I, D
	Diesel fuel	99,999 lb	99,999 lb	F, I
	Antifreeze	9,999 lb	9,999 lb	I, D
	Methanol	9,999 lb	9,999 lb	F, I, D
	Methyl ethyl ketone (MEK)	9,999 lb	9,999 lb	F, I
	Petroleum solvent, Varsol 18 [®]	9,999 lb	9,999 lb	F, P
	Transmission fluid	9,999 lb	9,999 lb	F, I
	Used oil	5,000 gal	3,000 gal	F, I
North Pole Metering Station	Diesel fuel	5,821 gal	2,500 gal	F, I
Anchorage Operations Support Facility	Citrikleen [®] (new and waste)	900 lb	450 lb	NA ^d
	1,1,1-trichloroethane	500 lb	200 lb	I, D
	Stoddard solvent (Naphtha-based)	600 lb	500 lb	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present ^b	Average Daily Amount Present ^b	Principal Hazard ^c
PS 1	Therminol 44 [®] (heat transfer fluid)	18,800 lb	18,800 lb	I
	Therminol 55 [®] (heat transfer fluid)	18,800 lb	18,800 lb	I
	Drag reducing agent (Baker)	267,000 lb	267,000 lb	F, I, D
	Diesel fuel	2,931,000 lb	2,931,000 lb	F, I
PS 2	JP-4 aviation fuel	64,000 lb	64,000 lb	F, I
	Diesel fuel	40,000 lb	40,000 lb	F, I
PS 3	Therminol 44 [®] (heat transfer fluid)	9,300 lb	9,300 lb	I
	Diesel fuel	5,938,000 lb	5,938,000 lb	F, I
	Lubricating oils and used oil	24,700 lb	24,700 lb	F, I
PS 4	Therminol 55 [®] (heat transfer fluid)	9,300 lb	9,300 lb	I
	Lubricating oils and used oil	13,500 lb	13,500 lb	F, I
	JP-4 aviation fuel	64,000 lb	64,000 lb	F, I
	Therminol 44 [®] (heat transfer fluid)	9,300 lb	9,300 lb	I
	Gasoline	23,300 lb	12,000 lb	F, I, D
	Diesel fuel	5,937,000 lb	5,937,000 lb	F, I
	Propane	12,000 gal	12,000 gal	F, P, I
PS 5	Therminol 44 [®] (heat transfer fluid)	6,000 gal	6,000 gal	I
	Sulfuric acid (battery electrolyte)	600 gal	500 gal	R, I
	Lubricating oils and used oil	3,250 gal	1,500 gal	F, I
	JP-4 aviation fuel	8,000 gal	4,000 gal	F, I
	Halon 1301 [®] (including weight of storage cylinders)	260,000 lb	260,000 lb	P
	Therminol 55 [®] (heat transfer fluid)	6,000 gal	6,000 gal	I
	Corrosion inhibitor	700 gal	350 gal	F, I
	AFFF (aqueous film-forming foam) (3M)	2,310 gal	2,310 gal	
	Diesel fuel	812,000 gal	400,000 gal	F, I
	Antifreeze	165 gal	100 gal	I, D
PS 6	Corrosion inhibitor	700 gal	350 gal	F, I
	Therminol 44 [®] (heat transfer fluid)	7,500 gal	7,500 gal	I
	Sulfuric acid (battery electrolyte)	600 lb	600 lb	R, I
	JP-4 aviation fuel	8,000 gal	4,000 gal	F, I
	Halon 1301 [®] (including weight of storage cylinders)	260,000 lb	2,600,000 lb	P
	Gasoline	300 gal	150 gal	F, I, D
	Diesel fuel	35,000 gal	17,500 gal	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present ^b	Average Daily Amount Present ^b	Principal Hazard ^c
PS 7	AFFF (3M)	1,695 gal	1,695 gal	NA
	Corrosion inhibitor	700 gal	350 gal	F, I
	Diesel fuel	1,780,000 gal	1,300,000 gal	F, I
	Drag reducing agent (Baker)	43,200 gal	21,600 gal	F, I, D
	Sulfuric acid (battery electrolyte)	4,000 gal	4,000 gal	R, I
	Halon 1301 [®] (including weight of storage cylinders)	164,000 lb	164,000 lb	P
	Liquid nitrogen	3,000 gal	1,500 gal	P
	Therminol 55 [®] (heat transfer fluid)	5,000 gal	4,700 gal	I
PS 8	Diesel fuel	3,000 gal	2,000 gal	F, I
	Halon 1301 [®] (including weight of storage cylinders)	99,999 lb	99,999 lb	P
	Sulfuric acid (battery electrolyte)	36 gal	36 gal	R, I
PS 9	Drag reducing agent (Conoco)	10,000 gal	5,000 gal	F, I, D
	Therminol 44 [®] (heat transfer fluid)	6,500 gal	6,500 gal	I
	Sulfuric acid (battery electrolyte)	4,000 gal	4,000 gal	R, I
	Liquid nitrogen	2,800 gal	1,000 gal	P
	Lubricating oil	605 gal	605 gal	F, I
	Halon 1301 [®] (including weight of storage cylinders)	32,200 lb	32,200 lb	P
	Drag reducing agent (Baker)	22,000 gal	18,000 gal	F, I, D
	Diesel fuel	1,680,000 gal	1,400,000 gal	F, I
	Corrosion inhibitor	750 gal	250 gal	F, I
	AFFF (3M)	1,450 gal	1,450 gal	NA
PS 10	Diesel fuel	12,800 gal	12,800 gal	F, I
	Halon 1301 [®] (including weight of storage cylinders)	48,000 lb	48,000 lb	P
PS 12	Lubricating oil	99,999 lb	99,999 lb	F, I
	Halon 1301 [®] (including weight of storage cylinders)	99,999 lb	99,999 lb	P
	Gasoline	99,999 lb	99,999 lb	F, I, D
	Diesel fuel	9,999,999 lb	9,999,999 lb	F, I
	Corrosion inhibitor	99,999 lb	99,999 lb	F, I
	AFFF (3M)	99,999 lb	99,999 lb	
	Sulfuric acid (battery electrolyte)	500 lb	500 lb	R, I
RGVs 26–37 at PS 4 ^e	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present ^b	Average Daily Amount Present ^b	Principal Hazard ^c
RGVs 39–62 at PS 5 ^e	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2500 gal	F, I
RGVs 65–77A at PS 7 ^e	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
RGVs 80–96 at PS 9 ^e	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
RGVs 97–125 at PS 12 ^e	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
SERVS (Downtown)	Diesel fuel	99,999 lb	9,999 lb	F, I
SERVS (Mineral Creek Rd.)	Corexit™ dispersant	100,800 lb	100,800 lb ^f	F, I, D ^f
	Diesel fuel	58,000 lb	58,000 lb	F, I
	Motor oil	4,470 lb	4,470 lb	F, I
	Corrosion inhibitor	9,800 lb	4,900 lb	F, I
Valdez Marine Terminal	Diesel fuel	23,869,366 lb	23,869,366 lb	F, I
	Ethylene glycol	280,000 lb ^f	280,000 lb ^f	I, D
	Gasoline	7,000 lb	7,000 lb ^f	F, I, D
	Hydraulic lubricating oil	80,000 lb	50,000 lb	F, I
	Cleartron ZB-258 [®]	108,000 lb	108,000 lb	I
	Sodium hydroxide	159,000 lb ^f	159,000 lb ^f	R, I
	Sulfuric acid (both pure and battery electrolyte)	53,000 lb ^f	53,000 lb ^f	R, I
	Aer-o-lite [®] (3% Green foam) (fire fighting foam) (National foam)	312,200 lb	312,200 lb	I
	AFFF (3M)	999,999 lb	999,999 lb	NA
	Fluoroprotein foam (National)	496,000 lb	465,000 lb	NA
	BioNutrient 2170	280,000 lb ^f	280,000 lb ^f	I
	Crude oil	1.056 billion lb ^f	1.056 billion lb ^{f,g}	F
Van Horn Facility	Gasoline	1,000 gal	500 gal	F, I, D
	Transmission fluid	700 gal	470 gal	F, I
	Propane	300 lbs	30 lbs	F, P, I
	PF 32 degreaser	200 gal	165 gal	F
	Motor oil	700 gal	690 gal	F, I
	Methanol	55 gal	55 gal	F, I, D

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present ^b	Average Daily Amount Present ^b	Principal Hazard ^c
Van Horn Facility (Cont.)	Hydraulic oil	500 gal	455 gal	F, I
	Diesel fuel	26,000 gal	15,850 gal	F, I
	Antifreeze	500 gal	315 gal	I, D
	Sulfuric acid (battery electrolyte)	12 gal	12 gal	R, I

- ^a Except as noted in footnote f, data in this table were derived from the State of Alaska Tier II forms submitted by APSC to the Alaska Department of Environmental Conservation (ADEC) on March 1, 2001, covering the period January 1, 2000, through December 31, 2000. No attempts were made to independently verify any of the quantities reported. Storage of hazardous materials in calendar year 2000 is believed to be generally representative of ongoing TAPS operations.
- ^b Under the federal regulations governing completion of the Tier II report, the facility may choose to report the maximum amount possible rather than provide quantities based on actual throughput (e.g., entries such as 99,999 lb).
- ^c Federal regulations provide for three physical hazard categories: Fire (F), Sudden Release of Pressure (P), and Reactive (R). Two health hazard categories are defined: Immediate (Acute) Health Hazard (I) and Delayed (Chronic) Health Hazard (D). These hazard categories are defined in the *Code of Federal Regulations*, Title 40, Part 370 (40 CFR 370.2).
- ^d NA = not applicable; although they do not meet any hazard categories defined in 40 CFR 370.2, these chemicals were nonetheless included in the APSC's EPCRA report for completeness.
- ^e A small building at each gate valve houses controls. The buildings are heated by a propane heater. Each gate valve building also has a diesel-fired electric generator. The amounts of propane and diesel fuel present at each gate valve are very limited. Maintenance crews stationed at pump stations are responsible for maintaining the gate valves, including supplying propane and diesel fuel to the control buildings on an as-needed basis. Supplies of propane and diesel fuel to support gate valves are stored at the pump stations, as indicated in the table.
- ^f Recent changes in operating circumstances have resulted in different types and amounts being present at certain facilities. On April 17, 2002, APSC submitted a revised EPCRA Tier II report to ADEC. The data in this table are from this amended report (Willson 2002).
- ^g This total does not represent crude oil in Tanks 1 and 3. That oil is considered to be in the transportation mode and not subject to EPCRA reporting.

of off-site in 1993 and 1996, respectively (APSC undated).

According to the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c), wastes are containerized and accumulated within designated waste accumulation areas located within buildings. APSC policies require that all hazardous waste accumulation areas have secondary containment features; this requirement is satisfied by the secondary containment features of the buildings or by the installation of secondary containment features at the accumulation areas. Small amounts of

hazardous wastes are also occasionally generated along the pipeline ROW as the result of remote maintenance or repair projects. All such wastes are containerized and brought back to the closest pump station or maintenance facility hazardous waste accumulation area. APSC contractors are obligated to properly containerize, label, and store wastes that they generate. Such contractor hazardous wastes are ultimately transported to APSC hazardous waste accumulation areas for management under APSC hazardous waste procedures. Hazardous waste accumulation generally occurs in

TABLE C-2 Hazardous Wastes Generated at the Mainline Refrigeration Unit 2, Northstar Terminal, and VALDEZ Marine Terminal in 1998–1999

Waste Description	Disposal Facility or Technology	Quantity (lb)
<i>Mainline Refrigeration Unit 2</i>		
Brine solution from refrigeration units (contaminated with chromium)	Off-site POTW ^a /sewer	5,000.00
Absorbent pad contaminated with brine solution (chromium)	Incinerator	2,009.00
Brine (chromium) contaminated pipe	Stabilization	2,500.00
Total hazardous waste generated		9,509.00
<i>Northstar Terminal</i>		
Spent carbon filters from aerosol can puncturing unit contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-trichloroethane	Energy recovery	46.7
Flammable cleaning compound	Energy recovery	200.0
Thinners and rags contaminated with solvents	Incinerator	420.0
Flammable petroleum residues (gelblok) containing benzene	Energy recovery	2,000.0
Flammable used paint, epoxy, and thinners	Energy recovery	1,188.0
Petroleum-based product with 1,1,1-trichloroethane (valve cleaner)	Incinerator	350.0
Mercury debris (bulb crusher filter)	Retorting	10.0
Crushed fluorescent bulbs contaminated with mercury	Landfill	2,800.00
Hydrochloric acid	POTW/sewer	5.0
Freon™ gas cylinders	Incinerator	100.0
Flammable aerosol can residue, sorbents, and plastic contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-trichloroethane	Energy recovery	144.0
Total hazardous waste generated		7,263.7

TABLE C-2 (Cont.)

Waste Description	Disposal Facility or Technology	Quantity (lb)
<i>Valdez Marine Terminal</i>		
Freon 113™, oil and water	Incinerator	75.0
Silver-contaminated spent photographic chemicals (fixer/developer)	POTW/sewer	1,300.0
Flammable adhesives	Incinerator	150.0
Used oil with chlorinated compounds	Energy recovery	5.0
Oxidizer	Incinerator	8.0
Petroleum residues (strainer and filter wastes) contaminated with benzene	Incinerator	18,260.0
Petroleum residues (steam rack sludge) contaminated with benzene	Energy recovery	81,151.2
Used paint, epoxy, and thinners	Energy recovery	6,600.00
Spent carbon filters from aerosol can puncturing unit contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-trichloroethane	Energy recovery	5.0
Flammable lab pack	Energy recovery	225.0
Mercury thermometers	Retorting	10.0
Mercury debris	Retorting	40.0
Crushed fluorescent bulbs contaminated with mercury	Landfill	2,960.0
Crude oil and gravel contaminated with benzene	Incinerator	11,000.00
Corrosive spent film fixative contaminated with silver and chromium	Landfill	1,250.0
Flammable, reactive zinc dust	Incinerator	40.0
Filters contaminated with benzene (used gas filters)	Incinerator	95.0
Coolant filters contaminated with lead	Landfill	147.0
Labpack contaminated with lead	Incinerator	5.0

TABLE C-2 (Cont.)

Waste Description	Disposal Facility or Technology	Quantity (lb)
Valdez Marine Terminal (Cont.)		
Toxic labpack contaminated with methylene chloride and 1,1,1-trichloroethane	Incinerator	150.0
Flammable, corrosive, vapor recovery system scale contaminated with benzene	Incinerator	120.0
Mercury contaminated sediment	Landfill	715.0
Caustic lab pack (alkali)	Neutralization	15.0
Acid lab pack	Neutralization	165.0
Xylene, methanol, and crude oil solution	Energy recovery	90.0
Aerosol can residue, sorbents, plastic contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-trichloroethane	Energy recovery	120.0
Lead contaminated incandescent lightbulbs	Landfill	645.0
Total hazardous waste generated		125,346.2

^a Publicly owned treatment works such as a municipal wastewater treatment plant.

Source: Seward (1999).

containers with a 55-gal capacity or less. There is no accumulation or storage of hazardous waste in tanks.

Under the current scheme, the APSC contractor collects hazardous waste from the accumulation areas on a regular schedule, weather permitting. Trucks begin the collection at PS 1 and continue down the pipeline, collecting waste containers from each designated accumulation area along the way. The waste is then consolidated at the hazardous waste contractor's transfer facility. No permitted RCRA TSDFs exist within the state of Alaska. Therefore, the APSC hazardous waste contractor transports all APSC hazardous waste to out-of-state RCRA-permitted TSDFs. Under a

proper hazardous waste manifest, trucks deliver the waste to a rail terminal in Anchorage (Burlington 2001). Wastes proceed by rail to a ship terminal in Anchorage, where they are transported by ship or barge to a rail yard in the State of Washington. The wastes are then transferred by rail to the hazardous waste contractor's transfer facility in Washington. Wastes are then sent, via truck, to various TSDFs in Washington or elsewhere in the contiguous 48 states, depending on the treatment, storage, or disposal designated by the APSC. All wastes are transported in containers meeting DOT specifications.

Likewise, routinely generated wastes from the Valdez Marine Terminal are transported via

truck by the hazardous waste contractor to Anchorage, where they follow the same general path to out of state TSDFs. Special projects may generate substantial quantities of hazardous waste over short periods of time (e.g., recovery of tank bottoms) and may require specially scheduled pickup and transportation. However, the management of hazardous waste from such special projects is essentially the same as that described above. In 2001, approximately 4,000 55-gallon drums of waste tank bottom sludge were removed from the Valdez Marine Terminal during a one-time cleanout project. Because of prior years of transferring the tank bottoms from one tank to another to accommodate the tank inspection schedules, this cleanout project effectively represents 10 years of tank bottoms buildup. This buildup was characterized as hazardous and is being shipped out via the APSC hazardous waste contractor under proper manifests to appropriate, permitted out-of-state TSDFs.

During early years of operation of the pipeline, three "Topping Plants" were operational at PS 6, 8 and 10. These Topping Plants were initially operated to provide refined petroleum product for use as fuel for APSC equipment and vehicles. Thus, the Topping Plants met the RCRA definition of a petroleum refinery, and various EPA-designated listed hazardous waste can be expected from their operation. However, once commercial fuel outlets became available in areas along the pipeline route, the APSC determined that continuation of the Topping Plants was no longer cost-effective. The plants have been "mothballed" and are not expected to go back into service in the foreseeable future. Therefore, no additional impact analyses are provided for wastes related to Topping Plant operations.

Spill debris (e.g., contaminated environmental media, spent absorbent pads, and other items used in spill response) may be hazardous waste. When unplanned releases of crude oil, refined petroleum product, or hazardous material occur along the main line, circumstantial factors of such releases may dictate temporary storage of contaminated debris at the spill site. When logistics permit, such contaminated debris will be containerized or otherwise impeded from further environmental impact until adequate

characterization of the debris is completed. Temporary storage plans may also need to be developed and approved by the ADEC. Such plans may allow for storage at the spill site or at pump stations nearest the spill site for a period of up to two years, or at the Valdez Marine Terminal for periods of up to four years.

Ultimate disposition of contaminated media and spill debris is addressed on a case-by-case basis in remediation and restoration plans that have been approved by the appropriate JPO member agencies. Ultimately, nonhazardous contaminated media are trucked to a commercial facility where they undergo thermal treatment. All spill debris that has been determined by analysis to be hazardous waste is containerized and handled in accordance with extant hazardous waste management procedures. (See Section 3.16.5 for additional discussion on the management of nonhazardous spill debris and related remediation wastes.)

C.4 Solid Waste

The APSC has established administrative controls for the management of all solid wastes generated throughout the TAPS. Guidelines are provided in Section 5, *Waste Management*, of the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c). Various arrangements are in place for the management and disposition of solid wastes. These include incineration, followed by landfilling of resulting ash in permitted landfills, direct landfilling of some solid waste in APSC- or municipally owned permitted landfills and recycling. Explicit guidelines are provided for all anticipated solid waste streams.

Both domestic and industrial solid wastes are generated at various locations throughout the TAPS. Domestic solid waste results primarily from the operation and maintenance of personnel living quarters and support facilities, such as kitchens and cafeterias located at the pump stations and maintenance and administrative facilities. Common office wastes also fall into the category of domestic solid wastes. Industrial solid wastes are generated at pump stations, mainline refrigeration units, and off ROW maintenance facilities as well as at the Valdez Marine Terminal.

Solid waste incinerators are located at PS 1 through 7 and PS 10 and at the Valdez Marine Terminal. However, incinerators located at pump stations that are now on standby (PS 2, 6, and 10) are not operational. Solid waste incinerators operate under the auspices of ADEC-issued air quality operating permits (ADEC 1996). In all instances, one operating permit addresses all stationary air emission sources at the pump station and the Valdez Marine Terminal. Solid wastes that are incinerated include oily waste materials (but not used oil), shredded documents, kitchen wastes, untreated wood, empty containers, and non-hazardous paint waste as well as domestic solid waste. Hazardous wastes are not incinerated in APSC incinerators. Operating records indicate that the cumulative amounts of solid wastes incinerated at the APSC incinerators have steadily declined since 1994. Estimated amounts of solid waste incinerated during calendar years (CYs) 1994 through 2000 are 1.65, 1.23, 1.17, 0.94, 0.93, 0.87, and 0.74 million pounds, respectively (APSC undated; Seward 2001b). Although operating permits issued by the ADEC do not specify a limit to the amount of solid waste that can be incinerated, they do require that APSC base its waste management decisions on a hierarchy consistent with that established in the Pollution Prevention Act of 1990: "1) minimize pollution entering the air, land, and water; and 2) promote waste management practices in the following order of priority: source reductions, recycling/reuse, treatment, and disposal" (ADEC 1996).

Statistically relevant sampling over time of incinerator ash has shown the ash to be nonhazardous, provided waste segregation controls remain in effect (APSC 2000c). However, the City of Valdez and the Boroughs of North Star and North Slope require laboratory analyses verifying nonhazardous character for each delivery of ash to their facilities. Consequently, each shipment of ash from incinerators at PS 1 and 2 and the Valdez Marine Terminal is sampled for hazardous

characteristics before delivery to designated landfills. Ash from all other incinerators is sampled annually. Sampling and analysis of ash follow the prescriptions of approved EPA test methodologies (EPA 1986). Ash that demonstrates hazardous waste characteristics is managed within APSC as hazardous waste and is collected by APSC's hazardous waste transporter for delivery to out of state TSDFs.

The APSC maintains three solid waste disposal sites (SWDSs), SWDS 117-1B, 100-1, and 38-1. Each disposal site is permitted by ADEC as a Class III Municipal Landfill (Seward 2001b,c).¹ All three permits were renewed in September 2001 and have expiration dates of July 31, 2006.

SWDS 117-1B is located approximately 1 mi south of Dalton Highway MP 285, Sections 28 and 33, T.9S, R.12E, Unimat Meridian. SWDS 100-1 is located approximately 1.5 mi south of Wiseman, Alaska, in Sections 25 and 36, T.30N, R.12W, Fairbanks Meridian. SWDS 38-1 is located approximately 1 mi south of PS 10 in Section 25, T.17S, R.10E, Fairbanks Meridian. (Seward 2001c) The APSC landfills are permitted to receive ash from the solid waste incinerators at PS 3, 4, 5, 6, 7, and 10 and the Valdez Marine Terminal, as well as inert construction wastes, including nonsalvageable metals and other miscellaneous nonhazardous solid industrial wastes from APSC facilities.

Wastes prohibited from disposal in the APSC-operated landfills include any hazardous waste as defined by 40 CFR 261.3, oily waste, waste oil, greases, paints, sludge, chemical wastes, putrescible waste that has not been incinerated, and medical waste that has not been sterilized. Certain restrictions are also placed on the receipt of contaminated soil. Disposal options for contaminated soils and other remediation wastes resulting from responses to accidental releases of crude oil, refined petroleum products or hazardous materials are addressed in Section 3.16.5. In

¹ Class III Municipal Landfills are defined in ADEC regulation 18 AAC 60.300(c). Class III landfills are those that are not connected by road to Class I landfills or are at least 50 mi distant from Class I landfills. By rule, Class III landfills are limited to no more than 1 ton per day of ash from incinerated solid waste and less than 5 tons per day of municipal solid waste. However, the operating permits impose additional restrictions on the wastes that can be disposed of in APSC landfills.

accordance with conditions in the operating permits for the three APSC-operated landfills, APSC personnel maintain a solid waste operating log at each of the facilities that deliver wastes to any of the APSC landfills. The APSC also develops and submits quarterly reports of landfill operations to the ADEC. These reports include amounts and types of waste disposed of and completed APSC-developed inspection checklists that incorporate all performance standards contained in the ADEC-issued operating permits as well as amended "As-built" landfill plans. For landfill 117-1B only, the permit renewal issued in September 2001 by the ADEC calls for the APSC to annually sample surface water ponded in the disposal cell, analyze for parameters contained in the landfill's Enhanced Management Plan, and submit the results to the ADEC. The first such sampling event under the renewed permit has yet to occur.

The APSC also utilizes eight municipally owned and operated landfills for disposal of solid wastes generated throughout the TAPS. Information on these landfills and the APSC landfills and the manner in which all are currently utilized is provided in Table C-3.

At most locations, the APSC maintains service contracts with local commercial waste haulers for the collection of solid wastes from its facilities and delivery to the specified landfill. Municipal employees provide this collection and hauling service in Valdez as part of the municipality's solid waste disposal service. Valdez Marine Terminal personnel, however, can also deliver solid wastes directly to either the Valdez sanitary landfill or the Valdez construction debris landfill. APSC employees collect and deliver wastes from APSC facilities to any of the three APSC-operated landfills. Details on the management of asbestos waste are provided in Section 3.16.5.

The APSC also maintains a number of recycling programs for some solid waste streams. The solid wastes for which recycling options have been identified are precious metals, scrap metals, aluminum beverage cans, copy machine toner cartridges, thermostats and thermometers (mercury containing), asphalt, nonhazardous spent sandblasting sand and grit, wood, office furniture, waste office paper, and

newspaper. However, the extent to which each recycling program is active at any given time is dependent on the viability of recycled product markets as well as other circumstantial factors. Some solid wastes (e.g., office paper, spent heat transfer fluids) are also burned as supplemental fuel. Table C-4 provides the latest available data on APSC recycling activities.

C.5 Wastewater

The Ballast Water Treatment Facility (BWTF) treats ballast water and other wastewater from Valdez Marine Terminal operations. Its general components are described in the *Best Management Practices Plan for Ballast Water Treatment* (APSC 2001b). The BWTF includes ballast water storage tanks (90s tanks), dissolved air flotation (DAF) cells, biological treatment tanks (BTTs), air strippers, a chemical storage/injection system, control room, laboratory, and oil recovery tanks (80s tanks). The 90s tanks provide primary gravity separation of separable solids and free-phase oil, and allow containment of spills or equalization of flow variations. The DAF cells further reduce free-phase separable and dissolved hydrocarbons by enhancing phase separation through release of water supersaturated with air. The BTTs continue the treatment process by biologically degrading most residual levels of dissolved hydrocarbons and other organic wastes still in the waste stream. Finally, air strippers may be used to prevent exceeding the BWTF's permit limit for BTEX (benzene, toluene, ethylbenzene, xylene) if biological treatment is insufficient.

The BWTF also includes an "oil recovery system." The 90s tanks, DAF cells, and BTTs recover oil in the wastewater through skimming, which in turn is hardpiped to the 80s tanks. In the 80s tanks, the recovered oil is separated from the wastewater through gravity separation. Recovered oil from the 80s tanks is hardpiped to the Valdez Marine Terminal oil transfer system and becomes a part of the crude oil loaded onboard tankers or stored with the crude oil in the marine terminal crude oil storage tanks until it is loaded onboard tankers. Wastewater from the 80s tanks is routed by hardpiping to the 90s tanks for treatment by the BWTF.

TABLE C-3 Solid Waste Disposal Sites Currently Used by APSC

Owner/Operator	Disposal Site Name	Permit Number	APSC Facilities Using This Site	Amount Delivered ^{a,b}
APSC	SWDS 117-1B	0131-BA006	PS 3 and 4	0 73 (first two quarters of 2001)
APSC	SWDS 100-1	0131-BA005	PS 5, 6, and 7	208.8 11.1 (first two quarters of 2001)
APSC	SWDS 38-1	0132-BA003	PS 10, VMT	72 520 (first two quarters of 2001)
North Slope Borough	Oxbow Landfill	9536-BA006	PS 1, 2, 3, and 4	NA ^c
North Star Borough	South Cushman Landfill	9131-BA005	PS 7 and 8, Van Horn, Nordale Yard, Doyon Industrial Facility, North Pole Metering	1,608
City of Delta Junction	Delta Landfill	8833-BA002	PS 9	NA
Copper Basin Sanitation Services Company	Glennallen Landfill	9022-BA001	PS 12	1,950
City of Valdez	Valdez City Landfill	8224-BA001	VMT, SERVS ^d	1,450 ^e
City of Valdez	Valdez Construction Debris Landfill	9322-BA001	VMT, SERVS	40 ^{e,f}
Municipality of Anchorage Regional Landfill	Municipal Landfill	8721-BA018	Bragaw Administrative Center, other Anchorage facilities, other facilities outside Anchorage with special permission	880 waste ^{f,g} 208 cardboard ^h (Over the period Nov. 12, 2000, to Nov. 12, 2001)
City of Palmer "Matinuska-Susitria" or Mat-Su	Palmer Landfill		Asbestos wastes from all APSC facilities (with prior approval)	Data not available ^g

TABLE C-3 (Cont.)

- ^a Amount delivered is reported in uncompacted cubic yards. Latest available data are displayed and are considered to be representative of annual waste volumes routinely generated. Reporting period is CY 2000 unless otherwise specified.
- ^b Volumes of solid waste delivered to APSC-operated landfills were compiled from quarterly reports submitted to the ADEC in accordance with operating permit provisions. Landfill operators provided data on waste volumes delivered to municipal landfills to the APSC (Seward 2000a–c, 2001d–g, 2002a).
- ^c NA = data not available
- ^d VMT = Valdez Marine Terminal; SERVS = Ship Escort/Response Vessel System.
- ^e Volumes of solid waste delivered to City of Valdez landfills were compiled from billing statements issued by the City of Valdez (APSC 2000d). All volumes are reported in cubic yards and are approximate.
- ^f Volumes of construction and demolition waste delivered to the City of Valdez Construction Debris landfill by APSC personnel are not represented in this total. However, these volumes are considered to be inconsequential to the total amount delivered.
- ^g Normally, solid waste is collected at the Bragaw facility in a compactor. However, temporarily staged roll-off containers were also used during the reporting period. Approximately 800 yd³ of compacted solid waste were removed over the reporting period and represent approximately 86.23 tons. The remaining 80 yd³ of uncompacted solid waste collected in roll-off containers represent an additional 32 tons. Presumably, the landfill operators were able to recycle the 208 yd³ of cardboard collected over the reporting period.
- ^h APSC personnel report that the Palmer landfill is used exclusively for disposal of asbestos containing waste resulting from asbestos-containing material removal/remediation actions, and then only when the resulting volumes are large enough to make shipment to Palmer cost effective. Alternatively, small volumes of asbestos waste are shipped out of state together with hazardous waste (Seward 2002b).

The industrial wastewater sewer system (IWSS) is an integral component of the Valdez Marine Terminal and is designed to route industrial wastewater to the BWTF (e.g., incidental spills, oily water, potentially contaminated storm waters, and process wastewater). Areas served by the IWSS that may contribute contaminants from spills or leaks are the tank farms; power generation/vapor recovery area; fuel storage and loading areas; emergency response building/administration area (which includes the laboratory and otter cleaning station); fire training grounds; sludge tank area; transformer dike areas; berths; fire pump buildings; west metering facilities; maintenance/warehouse area; SERVS; and SERVS contract vessels, including tank vessel escort tugs, discharge bilge waters, and oil spill waters. Drainage to and through the IWSS in the

upper Valdez Marine Terminal area is by gravity. Water and contaminants are contained by dikes and drain through the sewer lines to the ballast water headers. Flow from the various areas is controlled by valves. A chemical sewer line from the vapor recovery area is used to route scrubber water, effluent knockout water, vapor recovery water condensate, and boiler chemicals directly to the BWTF 90s tanks.

Wastewater is discharged from the Valdez Marine Terminal pursuant to a National Pollutant Discharge Elimination System (NPDES) permit issued by the EPA, Region 10, effective May 21, 1997 (APSC 1997). The Valdez Marine Terminal is authorized to discharge treated ballast and bilge water, storm water, and other wastewaters from a submarine outfall near Berth 3 into the Port of Valdez. Only treated wastewaters that

TABLE C-4 APSC Recycled Waste Types, Sources, Disposition, and Amounts

Material	Source ^a	Disposition	Year/Amount ^b
Office paper	Doyon Industrial Facility ^c	Delivered to Eielson Air Force Base for use as supplemental fuel in the power plant	1999/350 yd ³
Mixed paper	APSC employee residences	Delivered to Eielson Air Force Base for use as supplemental fuel	1999/150 yd ³
Copy machine toner cartridges	FBU	Returned to manufacturer	1999/307 units
Copy machine toner cartridges	Anchorage, VMT, and some pump stations	Returned to manufacturer	1999/576 units
Aluminum (beverage cans, printing plates)	Systemwide	Sent to aluminum recycler (delivery had not yet occurred as of April 10, 2000)	1995/8,408 lb 1996/6,345 lb 1997/992 lb 1999/8 yd ³
Styrofoam packing peanuts	FBU	Given to commercial mailing service for reuse	1999/64 lb
Therminol TM (heat transfer fluid)	Systemwide	Sent for burning as supplemental fuel	1999/18,000 gal
Lead-acid batteries	Systemwide	Returned to manufacturer for recycling	1995/5,990 lb 1999/51,408 lb 2000/38,700 lb
Scrap metal	Systemwide	Sent to metal recyclers	1995/795.52 tons 1996/984.34 tons 1997/1,065.91 tons 1999/910.44 tons 2000/548.95 tons
Freon TM	Systemwide	Recovered for reuse	1999/759 lb
Cardboard	Systemwide	Sent to recyclers, reused, distributed to employees for home use	1997/5,912 lb
Antifreeze	Systemwide	Returned to manufacturer for reprocessing	NA ^d

TABLE C-4 (Cont.)

- ^a APSC = Alyeska Pipeline Service Company; FBU = Fairbanks Business Unit (Doyon Industrial Facility); VMT = Valdez Marine Terminal.
- ^b Latest available data are displayed. Data were derived from an internal APSC memorandum as well as from a draft report on APSC recycling programs (Seward 2000d; APSC 2001a).
- ^c Includes FBU administrative offices at Doyon.
- ^d NA = data not available.

originate from sources listed in the Best Management Practices (BMP) Plan may be discharged through Outfall 001. Any waste stream not listed in that document or in quantities significantly greater than the estimated amounts listed in the BMP Plan are not to be discharged without prior authorization of the EPA, in consultation with the ADEC. These waste streams and estimated average flow are shown in Table C-5.

On a volume basis, tank vessel discharges of ballast and bilge water account for approximately 93% of the total wastewater processed by the BWTF (APSC 2001b). Influent that is primarily oil is routed to the BWTF oil recovery system or injected into the crude stream at the east metering building sump. Influent that is primarily water is introduced into the BWTF through the 90s tanks.

The BWTF effluent flow averages in CY 2000 are shown in Table C-6. The total BWTF effluent flow for 2000 was 3,785,050,000 gal.

The BWTF permit establishes effluent limits for BTEX (monthly average-0.3 mg/L, daily maximum-1.0 mg/L), total suspended solids (TSS) (monthly average-2.5 mg/L, daily maximum-40 mg/L, except on the day of and the day after stripper activation when the limit is a daily maximum of 170 mg/L), flow (monthly average-21 mg/L, daily average-30 mg/L), and pH (minimum 6.5, maximum 8.5). It also contains detailed, periodic monitoring and reporting requirements for both influents and effluents. In addition, the permit also sets out detailed mixing zones where human health and chronic aquatic life criteria sampling and analysis apply. The BMP Plan establishes

specific practices to control the quality of incoming ballast from tankers and bilge waters from SERVS and contracted vessels.

Sludge accumulates in the bottoms of the 90s tanks, the DAF cells, and the BTTs. Sludge of similar composition also accumulates in sumps and portions of the IWSS. The 80s tanks are hybrid tanks because they act as both wastewater treatment tanks and recovered crude oil storage tanks. The 80s tanks recovered crude oil is routinely routed to the crude oil storage tank or directly onto a tanker. The heavier crude oil components, commonly called "tank bottoms," are treated the same as crude oil tank bottoms and are also routed to crude oil storage tanks or onto tankers. If maintenance or inspection of the 80s tanks is necessary, the recovered crude oil and tank bottoms will be routed to the crude oil storage tanks or tankers. Normal maintenance requires periodic cleaning of the BWTF tanks and the IWSS. The removed sludges are not reintroduced into the treatment system.

Sludge that is transferred from the tanks into containers must be managed as a solid waste, including sampling to determine if it is a hazardous waste (e.g., exceeds the toxicity characteristic levels for benzene). If it is a hazardous waste it is accumulated and managed as hazardous waste and removed by the hazardous waste contractor. Even if it is not a hazardous waste, because of its high hydrocarbon content, it is not disposed of to the local landfill but is transported off-site for thermal remediation.

The APSC also holds a NPDES Permit authorizing discharge from various sites along the 800-mi route of the TAPS, effective June 30,

TABLE C-5 Ballast Water Treatment Facility Influent Sources at Valdez Marine Terminal

Waste Stream ^a	Estimated Average Flow (bbl/d) ^b	Description ^c
Chemicals for water treatment maintenance/processing/analysis	0.40	Dilute solutions of caustics, acids, solvents, and inorganic salts from regeneration of ion-exchange resins used to treat boiler feed water, for maintenance such as piping repairs, and for water analysis from process monitoring.
Concentrate fire foam	2.00	Proprietary foam concentrates used as fire fighting agents. Mixtures generally include protein hydrolysate, glycol solvents, fluorosurfactants, hydrocarbon surfactants, inorganic salts, and water. Sources include incidental leakage and equipment maintenance activities.
Fire water ^d	3,000.00	Salt water used for fire protection, fire training at the fire training grounds, snow removal from tops of 80s and 90s tanks, and pressure testing lines or vessels.
Dilute fire foam ^e	50.00	Mixture of fire foam concentrate and fire water that is also used in sumps for vapor suppression to allow for hot work and for fire training.
Waste glycol	<0.10	Incidental leakage from vehicle cooling systems.
Dilute glycol	2.00	Mixture of glycol and water used for cooling and maintenance of stationary equipment.
Potable, raw saltwater	240.00	Primary source of continually flowing emergency eyewash stations at the vapor recovery/power generation plant and BWTF/Oil Recovery Building. May also include safety shower discharges that may contain trace amounts of chemicals, petroleum or grease. Raw, potable, and salt water may contain residual products associated with periodic maintenance activities on fire, fuel, ballast, or crude systems. Pipe lining activities may generate residual products associated with in-situ lining operations.
Rain and snow melt	11,000.00	Precipitation collected as surface runoff from contained drainage areas. May contain free oil, dissolved hydrocarbons, and suspended solids. Trace amounts of nitrogen and phosphorous may be present because of the application of fertilizer on soils exposed to crude oil or diesel fuel as a result of surface spills or subsurface leakage from tanks or piping. The fertilizer is applied to promote hydrocarbon biodegradation in contaminated soils located in secondary containment areas for crude oil, diesel fuel, or ballast water tankage. May also contain contaminants from the contaminated soils storage area. Roadway, equipment, and tank de-icing products may be present from the application of de-icing products during winter months. The de-icing products are primarily composed of mineral salts designed to meet various application demands.

TABLE C-5 (Cont.)

Waste Stream ^a	Estimated Average Flow (bbl/d) ^b	Description ^c
Scrubber water	1,500.00	Water used to absorb SO ₂ from boiler flue gas prior to introduction into the vapor recovery is mixed with caustic solution. Scrubber water contains sodium compounds, sulfates, sulfites, hydroxides, and carbonates at a pH of approximately 2.0 to 8.0.
Boiler blowdown	2,000.00	Water discharged from steam boiler circuit to prevent buildup of scale, corrosive substances, and corrosion products. Contains inorganic salts and dilute boiler treatment chemicals.
Filter backwash	14.00	Combination of fresh water and glacial silts from treating water for potable consumption and boiler water make-up and vapor recovery compressor suction filters. Water filter backwash includes some carryover from charcoal sand and resin beads. Vapor recovery filter backwash contains iron oxide and trace hydrocarbons and is sent occasionally to the 80s tanks or sludge tank, depending on availability, and primarily to the 90s tanks via the IWSS.
Washdown water	300.00	Water and steam condensate collected during washdown of mobile and spill contingency equipment and stationary equipment and facilities. Contains small amounts of crude oil residues, rust residues, dissolved hydrocarbons, free phase crude oil, dilute glycol, floor/vehicle wax, lubricating oils, degreasers, water soluble detergents, and soil/sediment.
Dry fire fighting chemical	3.00	Chemical fire extinguishing agent that is a dry mixture of monoammonium phosphate, ammonium sulfate, mica, clays, methyl hydrogen polysiloxane, and pigment.
Knockout water ^f	121.00	Water from the oil/water separation drum at a pH of 1.8 to 7.0, which is anticipated to contain some dissolved hydrocarbons.
Degreasers	<1.00	Primarily kerosene-based used to remove crude oil and crude oil residues from parts and equipment. May occasionally include small amounts of water-soluble detergents to remove oil and/or oily residues from parts and equipment. May contain free hydrocarbons, dissolved hydrocarbons, surfactants, ethers, amines, alkyl sulfonates, and chelating agents. Use of chlorinated solvent is allowed, providing that any such spent liquid solvent will not be discharged to the BWTF.
Diesel fuel	1.00	Incidental leakage from hoses, vehicles, stationary equipment, draindown of loading arms, and spills during fuel transfer operations.
Gasoline	<0.03	Incidental leakage from hoses, vehicles, operations, and fire training.

TABLE C-5 (Cont.)

Waste Stream ^a	Estimated Average Flow (bbl/d) ^b	Description ^c
Lubricating oils	0.03	Incidental leakage from pump seals, bearings, and vehicles. The majority of spent lubricating oils are collected and injected into the crude oil system.
Hydraulic fluids	<0.03	Incidental leakage from pumps, valve actuators, and vehicles. The majority of spent hydraulic fluid is collected and injected into the crude oil system.
Transformer fluid	g	Highly refined petroleum distillate used in high voltage capacitors and transformers. Does not contain PCBs. Normally not discharged to the BWTF; incidental leakage or spill from catastrophic transformer failure would be collected.
Crude oil	2,000.00	Primary sources are tanker ballast, draindown of loading arms, and sample tap blowdowns at metering facilities.
Crude oil residues	0.333	Major sources are cleaning of pipeline scraper pigs and oil spill contingency equipment.
Crude oil and diesel tank water draws	786.00	Mixture of produced brine, minor amounts of fresh water, bottom sediments, dissolved hydrocarbons, and free-phase crude oil periodically removed from the bottom of crude oil and diesel storage tanks. Trace constituents from routine activities associated with operational and maintenance activities of oil production fields and the pipeline may include corrosion inhibitors, methanol, glycol, fire foam, nonhalogenated cleaning agents, and emulsion reduction agents.
Tank cleaning solution	370.00	Mixture of water, dissolved hydrocarbons, drag reducing agent, crude oil, diesel, and heavy-duty emulsifying cleaner (containing surfactants, monoaromatic hydrocarbons, diaromatic hydrocarbons, and terpenes). Usage rate for undiluted cleaner is approximately 100–500 gal/yr, depending on the number of tanks cleaned.
Hydrotest water	27.00	Mixtures of fresh or salt water and crude oil or petroleum products collected during pressure testing of crude oil loading arms at berths and/or other process piping and tanks at the VMT, or originating from tankers, tugs, escort vessels, barges or other APSC/SERVS service vessels. May include up to 1 ppm of Intracid Rhodamine W + liquid dye.

TABLE C-5 (Cont.)

Waste Stream ^a	Estimated Average Flow (bbl/d) ^b	Description ^c
Oil spill cleanup water	2,500.00	Highly variable mixtures of fresh water and/or salt water, dissolved hydrocarbons, sediments, crude oil residues, petroleum product residues, trace amounts of dispersants and emulsion breakers, and oil spill cleanup chemicals from cleaning of equipment. Sources may include storm-water runoff from temporary spill debris collection sites, bilge waters from vessels involved in spill cleanup, and oily water (including degreasers) collected during cleanup activities, including cleanup of equipment. For tanker crude oil spills resulting from tanker structural failures, agency notification will be made prior to discharge to the BWTF.
Tanker ballast	400,000.00	Harbor water, river water, and/or sea water added to vessel ballast spaces to maintain ship stability. Generally, a mixture of water, salts, suspended solids, dissolved hydrocarbons, 0.5–1.5% crude oil, and occasionally hydrogen sulfide. May include bilge water, cleaning agents, and crude oil produced water with associated constituents, but may not include machinery space oils.
Oil recovery system water draws	5,000.00	Clarified wastewater separated by gravity in the 80s tanks. Inputs to the 80s tanks are recovered crude oil skimmed from 90s tanks, DAF float, BTT skimmings, oily waters from cleaning pipeline scraper pigs and oil spill recovery equipment, rain and snow melt from diked areas not connected to the IWSS (e.g., some transformer areas and maintenance/warehouse building sump), and, as necessary, oily wastewater from spill cleanup operations when free oil content exceeds that of typical tanker ballast. Clarified wastewater from 80s tanks may contain inorganic salts, suspended solids, dissolved hydrocarbons, H ₂ O ₂ residuals, glycol, small quantities of free oil, dilute fire foam, and hydrogen sulfide.
Service vessel bilges and slops	26.60	Bilge water from SERVS vessels and its contract vessels (including water, salts, and incidental volumes of used oil, diesel, degreasers, and engine coolants) sent to the 90s tanks via the IWSS or vacuum truck or direct piping. Segregated used oil discharged to the VMT does not enter the BWTF.
Sludge processing filtrate	33.00	Water derived from dewatering operations. Contains approximately 1% crude oil, inorganic salts, dissolved hydrocarbons, suspended solids and trace amounts of glycols, oxyalkylated fatty acids, bacteria, polymer, enzymes, surfactants and nutrients. Estimated average flows are averages, but sludge processing usually occurs only once per year. Total quantity of water generated during each sludge processing event is approximately 400,000 to 500,000 gal. Sources include the ballast water treatment tanks, recovered crude oil tanks, crude oil, and other petroleum storage tanks.

TABLE C-5 (Cont.)

Waste Stream ^a	Estimated Average Flow (bbl/d) ^b	Description ^c
Hydrogen peroxide	2.00	Commercial-strength solution of H ₂ O ₂ injected on an as-needed basis to control hydrogen sulfide in tanker ballast and crude oil recovery system water draws. Sulfide control is necessary as a health and safety measure and to avoid upsets in the biological treatment system.
Dilute polymer	5.00	Approximately 1% solution of cationic, high molecular weight polyamine added as a flocculant at DAF to enhance separation of finely dispersed oil and suspended solids.
Nutrient	8.00	Solution of urea, ammonia, and phosphate added to DAF effluent to stimulate microbiological activity in BTTs.
Corrosion inhibitors	2.00	Minimal amounts of corrosion inhibitor compounds added to the crude oil piping at the VMT to control corrosion. The inhibitors are composed of proprietary mixtures of oil and water-soluble amines in an alcohol carrier fluid. The inhibitors contain no heavy metals or priority pollutants. Trace residuals of these compounds may be present in crude tank water draws.
Chemicals used for laboratory tests	<0.10	Substances used for water testing at the analytical laboratory, BWTF Sample Room, and Powerhouse Water Treatment Room as follows: dilute aqueous solutions of acids, caustics, salts, hydrocarbon-based solvents, alcohols, ketones, aldehydes, unused standardization and calibration solutions, unused samples of water (including potable water, ballast water, boiler feedwater, steam condensate, and fire foam water). No halogenated solvents are disposed of in this waste stream.
Wildlife wash water	2,000.00	Mixture of water, oil, and household detergents from cleaning wildlife members that have been oiled (is not routinely generated).
Groundwater	1,400.00	Groundwater that is slightly contaminated with petroleum hydrocarbons as a result of surface spills or leaks of these materials from tankage or piping at the VMT.
Hydrochloric acid	0.13	HCl acid injected into the sampling line for the on-line BTEX analyzer to control the growth of microorganisms within this line. The analyzer provides data that can be used to determine when the air strippers will be activated. The biogrowth interferes with the analyzer's ability to accurately measure BTEX concentrations.
Gray water	40.00	Water from kitchen, bathroom, and mop sinks, washing machines, and floor cleaning activities in the BWTF Control Building, Emergency Response Building, Administration Building, Marine Building, and Maintenance Warehouse. These sources do not include human wastes. They may contain small amounts of crude oil residues, dissolved hydrocarbons, soil/sediment, water-soluble detergents, floor wax, and household wastewater (excluding human wastes).

TABLE C-5 (Cont.)

- a These waste streams are not always part of the influent stream and may enter on a seasonal or even related basis.
- b Quantities shown for each waste stream are estimated from consumption and meteorological data. The numbers shown are only averages.
- c Abbreviations: BTT = biological treatment tank; BWTF = Ballast Water Treatment Facility; DAF = dissolved air flotation; H₂O₂ = hydrogen peroxide; IWSS = industrial wastewater sewer system; PCB = polychlorinated biphenyl; SERVS = Ship Escort/Response Vessel System; SO₂ = sulfur dioxide; VMT = Valdez Marine Terminal.
- d More firewater is generated in winter than in summer.
- e Approximately 70 bbl of dilute fire foam is generated during fire training exercises.
- f More knockout is generated in spring than in winter.
- g Waste not routinely generated; enters BWTF on emergency basis only.

Source: Modified from APSC (2001b).

TABLE C-6 Ballast Water Treatment Facility Effluent Flow Averages in 2000

Month	Volume (million gal/d)
January	13.3
February	12.0
March	12.0
April	12.7
May	11.1
June	7.8
July	7.1
August	8.5
September	9.1
October	9.9
November	10.1
December	10.8
Average daily flow	10.37

Source: APSC (2000e).

1993 (EPA 1993). This permit governs four types of discharges, secondary containment dewatering, excavation dewatering, hydrostatic testing wastewaters, and domestic sanitary wastewaters from MCCFs. A Notice of Disposal (NOD) must be submitted to the EPA for each area where excavation dewatering discharges in

excess of 500,000 gal will take place. NODs are also required for discharge of hydrostatic testing wastewater in excess of 30,000 gal or discharge of domestic wastewater in excess of 500 gal.

Discharge of hydrostatic test water not covered by the APSC individual NPDES permit is controlled by an ADEC Wastewater General Permit issued in April 1999 (ADEC 1999). Under that permit, discharges of up to 1,000,000 gal/d of hydrostatic test water are authorized. NOD's must also be filed with ADEC for disposals in excess of 50,000 gal.

The average volumes for discharges addressed in the linewide NPDES permit, as calculated in preparation for the 1998 renewal application, are shown in Table C-7.

The permit establishes effluent limitations and, if the discharge reaches receiving waters, monitoring requirements. The permit also establishes acceptable types of treatment and control methods for excavation sites depending upon seasonal, topographic, vegetative, soil and receiving water conditions (e.g., a discharge to areas of ice in a manner that prevents the effluent from reaching unfrozen receiving waters or a discharge to upland areas in a manner that does not cause destruction of vegetation or an increase in soil erosion). Wherever possible, discharge to dry channels, tundra, or upland areas is preferred to discharge to surface waters (TAPS Owners 2001). The permit requires the

TABLE C-7 Discharges Addressed in the Linewide NPDES Permit for 1998^a

Category	Source	Discharge Volume	Discharge Point	Treatment
Excavation dewatering	Maintenance of buried pipeline	380 gal/d to 21 million gal/d	Varies; upland discharge preferred	BMP, erosion control, infiltration
Hydrostatic testing	Leak testing of new or repaired pipelines and tankage	Varies – 1996/7: 7,800,000 gal/yr	Dry channel, snow	BMP, erosion control, infiltration
Sanitary wastewater	PS 5, 6 MCCFs	6,000 gal/d 14,000 gal/d each	Tundra wetlands	Secondary biological
Secondary containment dewatering	Tank farms Valve vaults Basement Leading edge flow meters Fuel loading areas	4,000,000 gal/yr 500,000 gal/yr 50,000 gal/yr 30,000,000 gal/yr 10,000 gal/yr	PS workpad	BMP, sorbent used if sheen noted
Potentially containing oil	Petroleum product spill PS air filter cleaning Monitoring well purging Pump test water PS mop water PS meltwater PS equipment shop meltwater PS accumulated rain water Vacuum truck hydrotest	500,000 gal/yr 20,000 gal/yr 100 gal/event 300-900 gal/event 50,000 gal/yr 10,000 gal/yr 10,000 gal/yr 1–500 gal/event 25,000 gal/yr	Facility workpad	BMP
Containing particulate	Outdoor vehicles washing Indoor vehicles washing Equipment/structure washing	10,000 gal/yr 10,000 gal/yr 100–3,000 gal/event	PS workpad	BMP
Containing chlorine	Water truck disinfection Drinking water facility disinfection	2,000–4,000 gal/event 1–500 gal/event	Facility workpad	BMP

TABLE C-7 (Cont.)

Category	Source	Discharge Volume	Discharge Point	Treatment
Containing residual AFFF	Fire line flushing	100,000 gal/yr	PS workpad	BMP
	Fire training	2,000 gal/yr		
	Fire truck flushing	3,000 gal/event	Airport taxiway	

^a Abbreviations: AFFF = aqueous-film-forming foam; BMP = best management practices; MCCF = mobile contingency camp facility; PS = pump station.

Source: TAPS Owners (2001).

APSC to maintain a Storm Water Pollution Prevention Plan (SWPPP) for industrial activity, including excavation dewatering projects in excess of 5 acres.

On December 27, 1996, the APSC submitted an application to the ADEC for a Wastewater Disposal Permit for a number of wastewaters generated at facilities located along the TAPS. At that time, the ADEC acknowledged it did not have time to review the application and issue a permit in a timely manner. Consequently, it granted APSC verbal authorization to discharge all of the wastewater streams listed in the Draft Wastewater Disposal Permit submitted with the application (Gryder-Boutet 1996). The permit covers discharges from secondary containment areas, waters potentially containing oil and/or sediments, petroleum product spill water (land discharges only), waters containing chlorine, waters potentially containing aqueous film-forming foam (AFFF), and waters collected in active cells of permitted solid waste disposal sites. The permit establishes effluent limitations and monitoring requirements for each wastewater stream, including limits on erosion and sediment accumulation, as well as total aromatic hydrocarbons, total petroleum hydrocarbons, and total aqueous hydrocarbons.

The Valdez Marine Terminal also operates a sanitary waste treatment plant (SWTP). SWTP effluent discharges to permitted Outfall 002, which is located at latitude 61° 05'14" N and longitude 146° 23'24" W. Effluent limitations are established for flow, biochemical oxygen demand (BOD₅), TSS, and pH. The permit establishes a mixing zone and effluent monitoring requirements.

Table C-8 gives the SWTP effluent flow averages in CY 2000. The total SWTP effluent flow for CY 2000 was 705,399 gal; the average daily flow was 1,932.6 gal.

The sanitary sewage system collects and treats sewage generated at the Valdez Marine Terminal, including shower, sink, kitchen, and toilet wastewater. Sewage generated at the main onshore buildings is piped to the SWTP (Building 58-BD-6) via gravity-flow sanitary sewer pipelines. Holding tanks located at Berths 1, 3, 4, and 5, Area 19, and the Ballast Water Treatment (BWT) Control Area collect

TABLE C-8 Sanitary Waste Treatment Plant Effluent Flow Averages for 2000

Month	Volume (gal/d)
January	2,644.0
February	2,355.0
March	2,274.0
April	1,714.0
May	1,635.0
June	1,486.0
July	1,611.0
August	1,927.0
September	1,724.0
October	1,745.0
November	1,999.0
December	2,077.0
Average daily flow	1,932.6

Source: APSC (2000d).

sewage generated in those buildings/areas. A vacuum tank truck periodically removes the sewage from the holding tanks and transports it to the SWTP.

The SWTP consists of a below-grade wet well or sump tank, which is the final collection point for all sanitary wastewaters generated on-site. The sump is equipped with lift pumps to transport wastewater to the influent end of the biological treatment unit. The SWTP is a package biological treatment unit consisting of a skid-mounted, compartmentalized, steel tank with pumps, blowers, and the electrical control circuitry. The unit has a rated hydraulic capacity of 10,000 gal/d (APSC 2000f).

The aeration basins do not discharge to either the BWTF or the SWTP. Therefore, these wastes are cleaned out periodically by a contractor and hauled to the City of Valdez under Non-Residential Wastewater Discharge Permit (City of Valdez 2001). The wastes are discharged to Sewer Pump Station No. 1 at the City of Valdez sewage treatment plant. Sludges from the SWTP aerobic digester, Valdez Marine Terminal septic tanks, and various Valdez Marine Terminal and SERVS holding tanks are also hauled to Sewer Pump Station No. 1 (City of Valdez 2000). Other APSC facilities discharge domestic sanitary wastewater directly to the City of Valdez sewage collection system. The SERVS barge waste is also disposed of through the City of Valdez sewage treatment plant. A total of 43,000 gal of sewage was discharged to the City of Valdez in 1999 (APSC 2000e). Of that, 22,700 gal was attributable to the aerobic digesters, 15,000 to the SWTP, and 5,300 to SERVS.

Domestic sanitary and industrial wastewater from the Van Horn Facility is discharged to Golden Hearts Utilities pursuant to an Industrial Pre-Treatment Program Wastewater Discharge Permit, effective November 24, 1999 (Noll 2001). Pretreatment of the wastewater from this facility is accomplished with an oil/water separator. PS 5 is served by an extended aeration activated sludge sewage treatment plant (STP), which discharges through a diffuse outfall across tundra wetlands (TAPS Owners 2001). Digested sludge from the PS 5 treatment plant is collected and hauled by a contractor for discharge directly

to the Golden Hearts Utilities facility sludge thickener unit. This discharge is permitted under a Special Discharge Permit, effective December 17, 2000 (Owen 2000).

As described in the *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* (TAPS Owners 2001), screened domestic sanitary wastewater from PS 1, 3, and 4 is stored in a holding tank and then pumped to the exhaust stacks of the engines powering the crude oil pumps. High-pressure nozzles inject the wastewater into the hot exhaust flow, where it is atomized and dispersed into the atmosphere as sterilized water vapor. Screenings are incinerated at each pump station. Periodically, holding tank sludges are cleaned out and trucked away for disposal at municipal wastewater utilities, including North Slope Borough, Fairbanks Municipal Utility System, and City of Valdez Sewage Treatment Plant (APSC 2000g). Since an extended aeration-activated sludge plant was installed at PS 6, stack injection technology is no longer utilized at that station (Edwards 2002a; Mikkelsen 1997). MCCF 2 and MCCF 3 have self-contained sanitary wastewater secondary treatment systems that use a rotating biological contractor technology and a holding tank. Treated wastewater from each site is discharged locally in accordance with the linewide NPDES permit. (TAPS Owners 2001). Domestic sanitary wastewater from PS 7, 8, 9, 10, and 12 is discharged to individual septic systems. The PS 6 Fly Camp has a septic system, however, PS 6 is now using the personnel living quarters rather than the fly camp (Edwards 2002a). These systems are periodically cleaned out by a contract service. Domestic sanitary wastewater from the APSC office complex in Anchorage and in Fairbanks is connected to the municipal wastewater treatment systems. Typical flows and design capacity for these systems are shown in Table C-9.

APSC has filed Notices of Intent (NOIs) to be governed by the EPA Multi-Sector General Permit for Industrial Activities for each of 12 industrial areas affiliated with pipeline operations, such as the operations material sites. Each NOI includes a Stormwater Characterization Checklist, which provides information on the site history, site

TABLE C-9 Typical Effluent Flows of Sanitary Wastewater at Various Sites in 1997

Site	Current Wastewater Disposal	Typical Flow (gal/d)	Design Capacity (gal/d)
PS 1	Stack injection	2,000	10,000
PS 2	Stack injection (not in use)	4,00 (sic)	10,000
PS 3	Stack injection	7,500	10,000
MCCF 2	Secondary biological	2,900	14,000
PS 4	Stack injection	4,700	10,000
PS 5	Secondary biological	6,300	8,000
PS 6 ^b	Stack injection (not in use)	6,500	6,000
Fly Camp at PS 6 ^c	Septic	950	850
PS 7	Septic	3,800	3,400
PS 8	Septic	600	1,000
PS 9	Septic	780	1,000
PS 10	Septic	4,200	12,000
MCCF 3	Secondary biological	3,500	14,000
PS 11	NA ^a	NA	NA
PS 12	Septic	4,200	9,100

^a NA = data not available.

^b PS 6 is now using a self-contained biological wastewater treatment system.

^c PS 6 is now using the pump station living quarters rather than the Fly Camp (Sweeney 2002).

Sources: Mikkelsen (1997); TAPS Owners (2001).

setting/topography, precipitation and storm-water characterization, observed barriers to storm-water flow reaching adjacent water bodies, and adjacent water bodies/wetlands that may be impacted by the site (APSC 1999b). The Multi-Sector General Permit authorizes storm-water discharges from certain types of industrial facilities provided the permittee complies with the conditions of the permit, including preparing and implementing a SWPPP. The SWPPP identifies sources of potential pollutants that could contaminate storm-water discharge from the area and establishes BMP to minimize and control these potential pollutant sources, such as

preventive maintenance, good housekeeping, and sediment and erosion control.

As needed, the APSC files NOIs to be governed by the EPA General Permit for Discharges from Construction Activities. This permit allows discharge of storm-water runoff from construction sites in excess of 5 acres if the permittee complies with the conditions of the permit. This permit may not be used if the storm-water discharges are not protective of federal listed endangered and threatened species or designated critical habitat. A SWPPP must be developed for each construction site, including

the identification of pollutant sources and mitigation actions to prevent contamination of storm water runoff. A Notice of Termination must be filed within 30 days of the final stabilization of the site.

C.6 Special Wastes

Special handling procedures have been established for numerous other wastes associated with TAPS operations. Wastes discussed under this category include wastes for which specific regulatory controls exist, wastes that are routinely generated, wastes for which unique management and disposal schemes have been established, and wastes that have a high potential for adversely affecting the environment or human health if not managed properly. TAPS special wastes include polychlorinated biphenyl (PCB) wastes, asbestos wastes, pesticide wastes, drag reducing agent wastes, spent glycols, tanker garbage, medical wastes, spent sandblast media, asphalt, radioactive wastes, naturally occurring radioactive materials (NORM) wastes, and spill debris and remediation wastes.

C.6.1 Polychlorinated Biphenyl Wastes

PCBs are known to be present in some APSC equipment at pump stations, maintenance facilities, and the Valdez Marine Terminal. An initial systemwide survey for PCB-containing items was conducted in 1989. Equipment and systems surveyed included electrical equipment, such as transformers, capacitors, relays, electrical actuators, and switches. Both in-service and stored equipment were included in the survey. In addition, fluorescent lighting fixtures that are not expressly labeled by the manufacturer as PCB-free were presumed to have PCBs present in their ballasts. Hydraulic systems and equipment containing heat transfer fluids were also surveyed and characterized. A second verification survey was conducted in 1995 (EMCON Alaska, Inc., 1995). Survey techniques included physical inspections, reviews of equipment nameplate information and product specifications, interviews with equipment or product manufacturers, interviews

with maintenance supervisors, and reviews of maintenance records. In some instances, suspect fluids (e.g., dielectric oils, heat transfer oils, etc.) were sampled and analyzed for the presence of PCBs in regulated concentrations.

Together, the two surveys established the following with respect to the presence of PCBs in TAPS facilities.

- Capacitors in solid-state controls in the static inverter system at the North Pole metering station contain PCBs. These capacitors meet the definition of “small capacitor” contained in EPA regulations (40 CFR 761.3(1)). They are located within a building that provides adequate containment of any spills or leaks and are expected to continue in service until the ends of their useful lives.
- Twelve large capacitors in service at the Valdez Marine Terminal are assumed to contain PCBs in concentrations below 50 ppm. All capacitors are located within restricted access areas inside buildings that provide adequate containment of any spills or leaks. All capacitors are properly labeled as “PCB Articles” and are expected to continue in service until the ends of their useful lives.

As a matter of APSC policy, capacitors present in the ballasts of some fluorescent lighting fixtures throughout the APSC are presumed to contain PCBs unless explicitly labeled to the contrary by the manufacturer. These fixtures will stay in service until the ends of their useful lives. At that point, the ballasts will be removed and managed through the APSC hazardous waste contractor.

The PCB inventories suggest that there is the potential for only very small amounts of PCB wastes to be generated. Such wastes will result when PCB-containing electrical equipment is taken out of service or in response to a spill or leak from operating equipment. The surveys also confirmed that the operating locations for all PCB-containing equipment satisfy EPA requirements for containment of any spills or leaks from such equipment. APSC procedures call for all disposals of equipment that contains or may contain PCBs to be coordinated through APSC environmental authorities. Although

certain PCB-containing articles can be disposed of in municipal landfills in accordance with EPA regulations, APSC policies require that PCB waste be handled through the APSC hazardous waste contractor and disposed of in facilities specifically permitted for PCB wastes.

C.6.2 Asbestos Wastes

Asbestos-containing materials (ACMs) are known to be present at APSC pump stations and the Valdez Marine Terminal. Surveys by APSC's industrial hygienists revealed that ACM is present in some infrastructure components (building materials) and some components of pipeline equipment (Norton 2001a). APSC's Fire Safety and Industrial Hygiene (FSIH) personnel are in the process of developing a formal systemwide asbestos management plan, expected to be available in early 2002. Despite the lack of a formal plan, however, other controls are in place to ensure timely identification of ACM and proper management of ACM wastes. Each APSC industrial hygienist maintains an inventory of ACM in facilities for which they are responsible and periodically inspects their facilities to verify that ACM is not damaged or deteriorated to a degree where the release of asbestos fibers to the air is possible. Whenever infrastructure or equipment maintenance, repair, or refurbishment has the potential to disturb ACM (including asbestos abatement actions such as the planned removal of deteriorated ACM), FSIH personnel reviewing the planned activities will intervene and impose special controls to ensure proper isolation of ACM. The APSC Safety Manual SA-38, Requirement 1.26, requires that such reviews be incorporated into work plans.

APSC maintenance employees are responsible for removing and replacing ACM items such as gaskets. Such simple replacement activities are not considered by OSHA to be asbestos abatement and are performed by APSC maintenance personnel. Wastes generated from such simple maintenance activities are nevertheless identified as containing asbestos. The ACM wastes are delivered to one of the Alaska municipal landfills or disposed of through the hazardous waste contractor facilities. Currently, the municipal

landfills at Palmer and Anchorage, as well as the South Cushman landfill in Fairbanks, are authorized by ADEC to receive asbestos wastes. All three landfills have received ACM wastes from the APSC. When infrastructure maintenance, repair, or remodeling impacts ACM present in building components, specially licensed contractors will remove and properly containerize the ACM. APSC environmental staff make advanced disposal arrangements for any ACM waste and are responsible for making any necessary notifications to the EPA for such removal and disposal events.

C.6.3 Pesticide Wastes

Only very small amounts of pesticides are used to maintain the pipeline ROW and other APSC facilities. With the exception of personal protection products (e.g., mosquito repellent), each chemical to be used and its application restraint must be approved by the Authorized Officer (Stipulation 2.2.5.1). In most instances, commercial, licensed applicators are used when pesticide applications are necessary. Those contractors are responsible for using the pesticide in the manner prescribed by the label and in engaging in practices that will minimize the amounts of pesticide wastes needing disposal. When necessary, disposal of pesticide waste is controlled by federal hazardous waste regulations as a Universal Waste. Disposal of pesticide waste occurs at out of state RCRA TSDFs.

C.6.4 Drag Reducing Agent Wastes

Drag reducing agent is injected into the pipeline at various pump stations to reduce turbulence and enhance laminar flow in the pipeline, thus reducing the amount of horsepower needed to pump crude oil. A number of different commercial formulations are used. Drag reducing agent is a proprietary mixture of olefinic long-chained petroleum distillates with flash points in the range of 105° to 131°F. Under normal conditions, drag reducing agent will come in contact with the crude oil and undergo molecular changes resulting from mechanical actions of turbine impellers. It does not need to

be removed from the oil when it reaches the Valdez Marine Terminal. The APSC has established specific controls for managing drag reducing agent wastes that result from accidental spills or releases at its points of use. Waste drag reducing agent and spill debris (including rags and absorbent pads) are containerized in vapor-tight fiber drums or clear plastic bags and stored in designated hazardous waste storage areas. Small amounts (less than ½ gal) are incinerated at APSC facilities. Larger amounts are handled by the APSC hazardous waste contractor and delivered to designated facilities where it is burned as supplemental fuel.

C.6.5 Spent Glycols

Glycols are used as antifreezes and coolants and as rust inhibitors in a variety of APSC equipment. Ethylene glycol, propylene glycol, and triethylene glycol wastes are generated primarily at pump stations and the Valdez Marine Terminal, as well as at the contractor facility where APSC vehicles are maintained. APSC procedures prohibit the incinerating or placing any waste glycol into landfills. All waste glycols are stored in designated waste storage areas until they are removed by the APSC waste contractor. Currently, all waste glycols are delivered to a recycling facility.

C.6.6 Tanker Garbage

Separate management procedures are in place for putrescible solid wastes from tankers from Hawaii and foreign ports that berth at the Valdez Marine Terminal. In accordance with U.S. Coast Guard and USDA Animal and Plant Health Inspection Service regulations, garbage from tankers is considered “regulated garbage” and is treated as potentially infectious waste. Wastes are collected in red bags, designated as regulated garbage, and delivered to a commercial facility in Anchorage where the waste is sterilized by autoclaving. Sterilized wastes are subsequently delivered to the Anchorage municipal landfill by the sterilization contractor.

C.6.7 Medical Waste

Separate management procedures are in place for medical waste generated throughout the TAPS at clinics and first aid stations. Out-of-date medical products that exhibit the characteristics of ignitable or toxic hazardous waste are managed as hazardous waste. Medical supplies that are nonhazardous are managed as solid wastes and, depending on the points of generation, sent directly to the landfill serving that facility or to one of the APSC incinerators.

TABLE C-10 Amounts of Medical Wastes and Solid Wastes Burned in APSC Incinerators in 2000^a

Incinerator Location ^b	Total Solid Waste Incinerated (lb)	Medical Waste Incinerated (lb)	% of Medical Waste to Total Waste Incinerated
PS 1	69,975	0	0
PS 3	305,290	86	0.028
PS 5	154,953	55	0.036
PS 7	105,128	0	0
PS 12	17,716	0	0
Valdez Marine Terminal	82,720	53	0.064
Total	735,782	194	0.026 (average)

^a Data provided by APSC (Seward 2001b).

^b Incinerators at PS 2, 4, 6, and 10 were not operational during CY 2000.

Very limited amounts of medical waste that may be biohazardous or infectious (i.e., containing blood, tissue, or blood-borne pathogens) are incinerated at APSC incinerators. The APSC conforms to the requirements of 40 CFR Part 60, Subpart E, for such incineration, including notification, record keeping, and reporting. The APSC incinerators are also covered by air emission permits issued for each pump station and the Valdez Marine Terminal by the ADEC. However, the latest iterations of those permits require the APSC to maintain records of amounts of wastes burned in each incinerator, but these have been modified to remove previous record-keeping requirements with respect to amounts of medical waste incinerated (ADEC 1996). Nevertheless, the APSC continues to maintain such data. Table C-10 provides data on amounts of medical wastes and solid wastes burned in the pump station incinerators during CY 2000. Data provided for the first two quarters of 2001 indicate that rates of medical waste and solid waste incineration have not changed significantly from 2000 (Seward 2001b).

C.6.8 Spent Sandblast Media

Spent sandblast media wastes are generated as the result of a number of repair and refurbishment activities as well as part of corrosion control activities. Wastes are generated under controlled conditions at maintenance facilities or pump stations and are also generated under uncontrolled conditions along the ROW in connection with maintenance or repair activities, corrosion control activities, or special projects such as technology enhancements or control valve vaulting. Sandblasting media are normally Green Diamond or red garnet sand. Manufacturers of the Green Diamond sand have provided information that demonstrates that the sand does not contain leachable heavy metals that would cause the spent sand to become hazardous waste (Glenbrook Nickel Co., undated). An internal APSC memorandum confirms that the red garnet sand is similarly inert (Redmond 1994). Spent sandblast media become contaminated with pieces of the coatings present on the equipment or surfaces being sandblasted. APSC's routine analyses of spent media have

consistently demonstrated that spent media does not exhibit characteristics of hazardous waste.

Data were provided to the ADEC in 1995, along with a request for approval to use spent media that do not exhibit characteristics of hazardous waste as fill, rather than discarding them as waste (Morton 1995; Lipchak 1995). The ADEC has concurred in this practice, provided the APSC continues to document the nonhazardous nature of spent media with appropriate analyses (Chapple 1995). Consequently, spent media generated in controlled conditions are collected, analyzed to confirm their nonhazardous character, and stored for later use as fill material. When spent media waste can be anticipated in ROW activities where its collection is difficult to control use, the coating being removed is evaluated for the presence of heavy metals that would cause spent media to exhibit hazardous waste characteristics. When no such heavy metals are known to be present in the coating to be removed, spent media are allowed to remain at the job site (e.g., in the excavation). All analytical results are retained as part of the documentation for each specific ROW project. No precise volumes of spent media are available. However, internal APSC memoranda suggest that most ROW projects result in the use of anywhere from 25 to 100 lb of media (Redmond 1994).

C.6.9 Asphalt

Waste asphalt paving is periodically generated as a result of workpad maintenance or the removal of tank aprons and parking areas. In 1995, the APSC explored options for reuse and recycling of this material with the ADEC (Morton 1995; Lipchak 1995). The ADEC has approved the reuse of spent asphalt as construction backfill, road/pad base and bedding for tanks, pipes, and conduit. However, although the asphalt is weathered, it still may have some potential to leach petroleum hydrocarbons. Consequently, the ADEC has limited use of asphalt as bank stabilization material in circumstances where it may come into contact with surface water (Chapple 1995). No volumes of waste asphalt being reused are available.

C.6.10 Radioactive Wastes

Small amounts of radioactive wastes are possible from the operation and maintenance of TAPS facilities. These include discarded smoke detectors that contain americium and self-illuminated EXIT signs that contain small amounts of tritium. Both the radioisotope and its concentration dictate the disposal path for such materials. Wastes containing radioactive materials are segregated from other solid wastes, containerized, and given two labels: "nonhazardous waste" and "radioactive waste." Containers of spent EXIT signs are stored in designated hazardous waste storage areas and subject to the same routine inspections for container integrity as hazardous waste containers. Spent EXIT signs are ultimately shipped by the TAPS facility at which they were generated to the manufacturer for recycling. The Waste Management Specialist arranges for the lights to be shipped to a recycler for recovery and reprocessing of the tritium. Smoke detectors are containerized and shipped back to the manufacturer for disposal. Facilities at which spent smoke detectors are generated are responsible for ensuring that the detectors are not incinerated or sent to any of the APSC-operated landfills. Otherwise, the smoke detectors are placed in landfills.

C.6.11 Naturally Occurring Radioactive Material (NORM)

Radioactive isotopes of uranium and thorium (and their respective progenies) are known to be present in rock formations from which North Slope oil is recovered. These naturally occurring radioisotopes dissolve in formation water and are brought to the surface along with oil and gas recovered from the formation. NORM waste is generated as the result of the precipitation of these isotopic salts onto the inside surfaces of well pipes (tubulars) as well the surfaces of various "downhole" equipment such as safety valves and gas mandrels.

Radioisotopes are present only in the aqueous phase of materials brought to the surface during oil exploration and recovery. Because the TAPS has established rigorous

criteria limiting the amount of water allowed to be present in oil accepted at PS 1, the potential is very low for NORM waste issues to be manifested in pipeline or marine terminal operations. A memoranda from British Petroleum (BP) to the APSC confirms that NORM wastes are associated primarily with the water fractions and that since production water and sediments from aboveground production vessels are removed before oil is delivered to PS 1 for metering and introduction into the pipeline, the amount of NORM waste entering the pipeline is negligible (Taylor 2001a).

APSC FSIH personnel have conducted surveys of selected TAPS facilities for the presence of NORM in 1991, 1993, and 1994. Survey locations were places where water and condensate could accumulate and where precipitation of dissolved salts might occur. They included rust and scale in crude oil Tank 111 (PS 1), tank bottoms from Tanks 16 and 17 (Valdez Marine Terminal), heat exchanger bundles at PS 6 and the Desalter at PS 10. None of these surveys detected NORM above background levels (APSC 2001c).

Currently, the APSC is engaged in a wholesale removal of tank bottoms, rust, scale, and other sediments from crude oil storage tanks at the Valdez Marine Terminal. NORM surveys are being conducted on the tank bottoms as they are being removed from the tanks and on condensate withdrawal plumbing inside the tank. Surveys completed to date for Tank 5 indicated no NORM to be present above background levels in tank bottoms or on the inside surface of the condensate withdrawal line. In addition, surveys conducted on the soles of workers' shoes as they exited the tank also showed no NORM contamination. Valdez Marine Terminal Industrial Hygiene personnel intend to sample the rust and scale on the inside tank walls when the removal of tank bottoms is completed (Norton 2001b). Because the tank bottoms have been accumulating over a long period of time, the materials and areas surveyed during the tank cleanout operation are considered to represent a "worst case" with respect to NORM contamination. The data appear to indicate, therefore, that significant amounts of NORM wastes are not associated with routine pipeline operations.

C.6.12 Spill Debris and Remediation Waste

Section 6, *Waste Management*, of the TAPS *Environmental Protection Manual*, EN-43-2, provides detailed guidance on the management of wastes resulting from accidental releases of crude oil, refined petroleum product, or hazardous materials (APSC 2000b). Wastes may result from the initial response to a release and also as a result of subsequent remediation of affected environmental media. Ultimate spill site remediation and restoration are subject to case-by-case approval of JPO agencies. Nevertheless, the APSC has an obligation to correctly manage all wastes resulting from the release event within the context of the approved remediation/restoration plan. Specific guidance has been developed for spill debris including contaminated rags, sorbents, and personal protective equipment (PPE), as well as for contaminated environmental media (soil, including gravel that makes up the pipeline workpad or backfill materials associated with buried pipeline segments, surface water, and groundwater). For the purpose of this discussion, contaminated soils include natural materials such as soils, subsoils, or gravel that have been contaminated with crude oil, refined petroleum products such as gasoline, diesel fuel and turbine fuel, lubricating oils, hydraulic oils, sludge contained in pipeline storage tanks or equipment, or petroleum-based heat transfer fluids. Section 3.16.4 provides information on the management of petroleum-contaminated waters.

In general, the management of all spill debris and contaminated media first involves their characterization as hazardous or nonhazardous wastes. This is carried out by the application of circumstantial factors (e.g., the material spilled), or as the result of sampling and analyses when process knowledge is insufficient to support a complete waste evaluation. Waste determined to be hazardous is incorporated into the existing hazardous waste management program as dictated by logistics of the spill. Waste determined to be nonhazardous is further evaluated against the ADEC soil cleanup levels contained in state regulations (see 18 AAC 75.341). Case-by-case decisions are made regarding the management of nonhazardous wastes after this evaluation is completed.

Options include incineration at the nearest PS, in-situ remediation through the application of such technologies as biological treatment or soil venting (if approved by JPO authorities), stockpiling for later thermal treatment or placement in APSC-operated or municipal landfills. Soil that contains hazardous substances in concentrations exceeding one or more of the applicable “migration to groundwater” levels prescribed in state regulations, exhibits a characteristic of toxicity defined in 40 CFR 261.24(a), or is determined by the ADEC to pose a threat of migration (of hazardous constituents) to surface water is prohibited from disposal in any of the APSC landfills. Acceptance criteria have been established for petroleum-contaminated soils at all of the municipal landfills that currently accept APSC solid wastes.

Finally, within the context of the approved remediation and restoration plan for each spill event, special provisions may also be included for the interim storage of spill debris or contaminated media at or near the spill site, at the nearest pump station, or at the Valdez Marine Terminal. Storage that is incident to the “immediate response action” is approved by ADEC authorities overseeing response actions. Normally, such immediate storage or stockpiling lasts for 30 days or less. Storage for longer periods of time may also be approved; however, “short-term stockpiling” or “long-term stockpiling” plans must be developed and submitted to the ADEC for approval. The APSC has obtained preapproval from ADEC to construct long-term stockpiles at some pump stations and the Valdez Marine Terminal. Pump station stockpiles can be maintained for up to two years. Those at the Valdez Marine Terminal are authorized for up to four years. In both instances, volume limits are also specified in the approved stockpiling plans. These approaches incorporate the design specifications and operational control for soil stockpiles contained in APSC’s linewide soil stockpile management plan (APSC 1999a).

In recent years, contaminated soils have been stockpiled at PS 1, 2, 3, 4, and 9, at Check Valves 10 and 12, and at the Valdez Marine Terminal (APSC 2001d; Schmidt 2000; Schnabl 1996; Clearwater/Golder J.V. 2000; OIT Inc. 1999, 2001a,b). Soils and other debris from

responses to accidental releases remain in the ADEC-approved stockpiles until the maximum authorized volumes or storage time limits are reached, or until sufficient volumes have been aggregated to allow for cost-effective transport and treatment. In accordance with provisions of the ADEC-approved remediation and restoration plan discussed above, all stockpiled contaminated soils are ultimately removed by a transport contractor and delivered under a "Contaminated Soils (Non-Hazardous) Custody Transfer" form to a subcontractor for thermal treatment. Most recently, a contractor located in North Pole, Alaska, has been utilized (Schmidt 2000; Schnabl 1996; Clearwater/Golder J.V. 2000). The treatment contractor conducts treatment under the auspices of an air emissions permit issued by the ADEC. The treatment contractor also subjects treated media to analytical testing to verify successful treatment to contaminant levels below those specified in ADEC regulations. Other contaminated items related to soil stockpiling, such as liners and covers, are managed in the same manner.

In 1999, 2,302.23 tons of stockpiled soils from PS 1, 2, 3, and 4 and from Check Valves 10 and 12 were delivered for thermal treatment. This total represents contaminated soils resulting from spills along the ROW and at the pump stations over an approximate two-year period. Also included in this total are contaminated soils removed during remediation of historic releases at the Toolik Work Camp.² Table C-11 gives the amounts of contaminated soils that have been stockpiled at the Valdez Marine Terminal since 1996.

Acceptable levels of treatment are specified in ADEC regulations and are specific to material spilled, potential for migration, potential receptors, and various other site-specific parameters. Treatment levels appear in ADEC regulations at 18 ACC 75.325 through 75.390. These levels define the allowable residual levels of specific chemical constituents that will be allowed to remain at the location where a release has occurred. The thermal treatment contractor's analyses of treated soils are referenced against these allowable residual

TABLE C-11 Contaminated Soil Stockpiled at the Valdez Marine Terminal^a

Year	Volume (yd ³) ^b	Weight (tons) ^c
1996 ^d	131.9	237.4
1997	607.9	1,094.2
1998	168.2	302.8
1999	208.5	375.3
2000	670.2	1,206.4
2001	867.7	1,561.9

- ^a Soils stockpiled at the Valdez Marine Terminal result from response to, and remediation of, releases at the Valdez Marine Terminal as well as along the ROW at such locations where it was feasible to transport contaminated soil from the spill site to the Valdez Marine Terminal for stockpiling.
- ^b All volumes are approximate.
- ^c The weight of a cubic yard of contaminated soil will vary greatly, depending on such parameters as soil type, percent moisture, and extent of contamination. For the purpose of this table, one cubic yard of contaminated soil is assumed to weigh 1.8 tons. This number was empirically derived by comparing weights of soils from each APSC stockpile location undergoing thermal treatment (as reported by the treatment contractor) to estimated yardages of soils removed from those same APSC stockpile locations (as provided by the transport contractor).
- ^d Volume and weight displayed represent soils stockpiled from September 25, 1996, to December 31, 1996. On September 25, 1996, 2,172.9 yd³ of contaminated soils from the Valdez Marine Terminal stockpile underwent thermal treatment, bringing the stockpiled volume of contaminated soils at the Valdez Marine Terminal to zero.

Source: APSC (2001d).

² Contaminated soils from Toolik totaled approximately 58 tons (Authier 2002).

levels, providing maximum flexibility for management of treated soils. Options for disposition of successfully treated soils include returning them to the spill location, sending them to a landfill to be used as clean cover material, or using them in other circumstances as fill.

C.7 Cumulative Waste

C.7.1 Wastes Associated with Cumulative Factors

Waste impacts can be associated with many of the past, present, and reasonably foreseeable activities that qualify as cumulative impacts. In most instances, the majority of waste impacts associated with those activities are generally related to human habitation or presence (i.e., the generation of domestic solid wastes and domestic and sanitary wastewaters). With the exception of North Slope activities, human habitation related to these cumulative actions (i.e., the workforce engaged in those actions) would likely occur at or near population centers or established communities. It is therefore assumed that solid wastes and domestic and sanitary wastewaters attributable to that workforce would be managed in existing municipal treatment or disposal facilities. It is further assumed that the relative sizes of the workforces engaged in most cumulative actions are small relative to the sizes of the communities in which they reside or work, and that cumulative actions would have only incremental impacts on existing waste management systems. Consequently, those waste impacts are not analyzed further. Such assumptions are only partially correct for the North Slope; thus, waste impacts from the presence of a workforce at the North Slope are included in this analysis. Among the potential cumulative actions identified in Table 4.7-2, three ongoing actions have

substantial waste impacts: (1) North Slope oil exploration, development, and production (including maintaining the North Slope workforce); (2) oil refining at three of the four operating refineries in Alaska; and (3) tanker loading activities at the Valdez Marine Terminal. One proposed action, the construction of a natural gas pipeline also has the potential for substantial waste impacts.

C.7.2 Hazardous Materials and Wastes Associated with Oil Exploration, Development, and Production

The volumes and chemical characteristics of wastes associated with oil exploration, development, and production are heavily dependent on the characteristics of the oil-bearing formation from which the oil is extracted and the extraction techniques employed. However, some general similarities exist. In October 2000, the EPA published a comprehensive profile of the oil and gas extraction industry (EPA 2000). The profile covered all major activities within the Standard Industrial Classification (SIC) 13.³ Unless otherwise referenced, the generic descriptions of wastes and waste management options provided below were derived from that EPA publication.

Mixtures of oil, production water, and natural gas are recovered from each onshore well at the North Slope and sent without separation to a central processing facility where separation of oil, water, and natural gas is accomplished. Similar mixtures recovered from offshore production wells undergo initial separation at those offshore facilities before being sent to natural gas pipelines or the TAPS, or managed as wastes.

³ The SIC codes were developed by the federal Office of Management and Budget (OMB) to track the flow of goods and services within the economy. The OMB has recently devised a different industry categorization system, the North American Industry Classification System (NAICS). A complete list of SIC codes and conversions between SIC and NAICS categories is available on the Internet at <http://www.census.gov/epcd/www/naics.html>. There are five major groups within SIC 13: (1) SIC 1311 Crude Petroleum and Natural Gas, (2) SIC 1321 Natural Gas Liquids, (3) SIC 1381 Drilling Oil and Gas Wells, (4) SIC 1382 Oil and Gas Field Exploration Services, and (5) SIC 1389 Oil and Gas Field Services Not Otherwise Classified.

C.7.2.1 Hazardous Material Usage in North Slope Oil Exploration, Development, and Production

Only a limited variety of hazardous materials are used in oil exploration, development, and production. Relatively small volumes of chemicals may be used as additives to facilitate drilling or to enhance the capability of the well to recover hydrocarbons. For example, mineral acids (primarily, hydrochloric acid and hydrofluoric acid) may be added to increase permeability of the rock in the oil-bearing formation (a process sometimes referred to as stimulation) or to stem the buildup of salts on downhole equipment. Biocides may be introduced to the well to inhibit the growth of sulfide-loving bacteria, the growth of which is enhanced when air is introduced into the sulfide-rich environment that often exists in oil-bearing formations. Refined petroleum fuels and lubricants are also used to power the well drilling and recovery equipment.

C.7.2.2 Wastes Generated during Oil Exploration, Development, and Production

Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy are not hazardous wastes under RCRA (40 CFR 261.4(b)(5)). Any wastes that do not meet these criteria (e.g., generated from support facilities or maintenance activities), that demonstrate a hazardous characteristic, or that are listed under RCRA as hazardous wastes, would have to be managed as RCRA hazardous wastes. British Petroleum Exploration (Alaska), Inc. (BPXA) and Phillips Alaska, Inc. (PAI) have jointly developed a waste management certification program for staff and contractors. Training covers basic regulations, waste classification, facility restrictions, and paperwork requirements. BPXA developed the *Alaska Waste Disposal & Reuse Guide* to provide consistent waste management guidance to field personnel. This guide has been

adopted by PAI, and is followed by both companies (BPXA 2001).

Well Drilling Wastes. Wastes generated during well drilling and completion include rock cuttings and drilling muds brought to the surface. Drilling muds are solutions of natural or man-made materials introduced as a slurry to reduce friction during drilling and can be either water- or oil-based. The volume of cuttings generated is primarily a function of the depth and diameter of the well being drilled and can range anywhere from 0.2 to 2.0 bbl per vertical foot of well.

Disposal of drilling muds and cuttings can be problematic not only because of their potentially large volumes, but also because of the potential presence of trace contaminants, including mercury, cadmium, arsenic, and hydrocarbons. These contaminants are present in the natural materials from which the muds are made and also in the oil-bearing rock formations. Acidic aqueous wastes may also be generated during well installation if acid is introduced to control the buildup of scale.

Production Wastes. By far, the largest volume by-product of oil extraction is water that is removed from the formation together with the oil. In wells nearing the ends of their productive lives, water can make up 98% of the material brought to the surface. Water production rates can be as high as 8 barrels for every barrel of oil extracted. Although phase separation of oil and water fractions recovered from each well is easily accomplished, many of the hydrocarbons and trace metal contaminants present in the oil-bearing formation will be water soluble. Inorganic contaminants in production water can include chlorides and carbonates of sodium, calcium, magnesium, potassium, lead, arsenic, barium antimony, and zinc, and various sulfur compounds, including elemental sulfur and hydrogen sulfide. Organic contaminants routinely include benzene, naphthalene, toluene, phenanthrene, bromodichloromethane, and pentachlorophenol. Radionuclides can also be present in production waters as a result of the naturally occurring presence of uranium and thorium and their respective radioactive decay products in the oil-bearing formation. Additional discussions on oil field wastes containing radionuclide contaminants, often referred to as

naturally occurring radioactive material (NORM) wastes, are presented below.

Underground Injection Wells. Well drilling wastes and production wastes on the North Slope are generally disposed of via underground injection. Class I disposal wells are regulated by the EPA.⁴ On the North Slope, Class I wells are approved only for nonhazardous and RCRA-exempt wastes, such as produced fluids, nonhazardous chemicals, meltwater pumped from impoundments, and residues from spill cleanups. Some North Slope facilities also use Class I wells to inject treated sanitary and domestic waste. Class II disposal wells are regulated by the Alaska Oil and Gas Conservation Commission (AOGCC) and are used for waste that has come to the surface during the production of oil, and gas, including, produced fluids, cuttings, and drilling muds that have circulated in the well. Up to 8,000 bbl of muds and cuttings are generated per well installation. In the past on the North Slope, muds and cuttings were placed in surface impoundments; now, however, the cuttings from the upper portion of a well are washed and used as construction gravel for roads and pads, after meeting the state reuse criteria. The remaining cuttings are ground to a fine slurry in an on-site grind and inject plant and reinjected to an underground injection well (BPXA 2001).

Other wastes approved for Class II disposal include water that collects in well cellars and fluids used to protect wells and process lines from freezing. Class II recovery wells inject approved fluids directly into the oil-producing formation to maintain reservoir pressure and sweep residual oil from pore spaces in the rock. This process, known as enhanced oil recovery, is regulated by the AOGCC (BPXA 2001). The AOGCC also regulates injection of nonhazardous drilling wastes into the annulus of an oil or gas well. This process, called the Annular Disposal Program, is considered incidental to drilling and not subject to regulation under the underground injection control (UIC)

program (Alaska Oil and Gas Association 2001).

Table C-12 shows the number of wells and barrels of fluid injected to date for disposal purposes for North Slope activities (Alaska Oil and Gas Association 2001).

C.7.2.3 Other Wastes Associated with North Slope Activities

Other wastes generated in association with North Slope oil exploration, development, and production include tank bottoms that result from the settling in of transfer lines and separation and processing equipment of solids suspended in liquids brought to the surface in the production wells, and a variety of wastes associated with well maintenance, including NORM wastes. Some wastes also result from the operation of the central gas separation facility and the operation and maintenance of housing facilities.

Gas Separation Facility. Materials retrieved from each onshore production well (production water, oil, and gas) are delivered without separation to the North Slope central processing facility (also known as the Gathering Facility) for separation of the various fractions. Similar initial separations of crude oil, production water, and gas are performed at the offshore facilities. Crude oil is delivered from the Gathering Facility to PS 1 of the TAPS, where it is analyzed, categorized as to its quality, and metered into the TAPS pipeline. Production waters are returned to the wellhead for re-injection or to the Class II injection well for disposal. Natural gas undergoes dehydration or “sweetening” before being sent to the fuel gas pipeline or is disposed of by incineration in a flare stack. (Flaring of natural gas may also occur at the wellhead when necessary to maintain safe working conditions.) Sweetening routinely involves reacting the gas with a glycol (typically, triethylene glycol) that acts as a desiccant. Glycols can be recycled and reused,

⁴ Underground injection control (UIC) wells are authorized by the Safe Drinking Water Act (SDWA). Class II UIC wells are wells that inject fluids that are brought to the surface in connection with natural gas storage operations or conventional oil or natural gas production and may be commingled with wastewaters from gas plants that are an integral part of production operations, unless those waters are classified as hazardous waste at the time of injection (see 40 CFR 144.6). In Alaska, the Alaska Oil and Gas Conservation Commission (AOGCC) has been granted primacy for regulation of Class II UIC wells (see 40 CFR Part 145).

TABLE C-12 North Slope Injection Wells

Type of Injection Well	Number of Wells	Type of Waste Fluid	Volume of Waste Fluid Injected (bbl)
Class II Disposal	21	Produced water (E&P ^a exempt)	1.5 billion
Class II Disposal	8	Muds/cuttings and associated E&P exempt wastes	70 million
Class I Industrial	6	Nonexempt, nonhazardous, and exempt E&P wastes	13 million

^a E&P = exploration and production.

but ultimately, would need to be disposed of. Because no disposal facility exists on the North Slope that can properly handle spent glycol, this waste is shipped off-site for proper treatment or disposal. Other wastes related to gas sweetening such as molecular sieves, recovered sulfur, or spent amine solutions (also used to remove water) may also be generated. All such wastes would be sent to off-site treatment or disposal facilities.

Tank Bottoms. Sands and other insoluble particulates that settle from production waters and oil brought to the surface will collect in various production vessels and equipment at the gas/water/oil separation facility.⁵ (Similar tank bottoms will accumulate in separation equipment at offshore facilities.) These tank bottoms (also sometimes referred to as basic sediments and water [BS&W]) are primarily inert rock or sand particles but may contain trace metallic and hydrocarbon contaminants. Often, tank bottoms that settle from oil will exhibit characteristics of hazardous wastes, primarily because of the presence of benzene. Tank bottoms can safely accumulate in process equipment until that point where their presence affects the proper functioning of that equipment.

At that point, the equipment must be cleaned and this “material in process” must be removed, characterized for its hazardous or nonhazardous properties, and managed accordingly. Any tank bottoms produced at the North Slope that exhibit hazardous waste characteristics would be transported out-of-state to permitted TSDFs. Tank bottoms that are nonhazardous can be disposed of at the Oxbow Landfill.⁶

Maintenance Wastes. Infrastructure maintenance involves the use of various paints and coatings for corrosion control of equipment and structures and solvents and cleaning agents for equipment cleaning or surface preparation prior to the application of corrosion control coatings. While some of these maintenance-related wastes may be hazardous, collectively, infrastructure maintenance activities generate only relatively small amounts of wastes. Maintenance-related wastes that are RCRA wastes would be transported to out-of-state RCRA-permitted TSDFs. Nonhazardous maintenance wastes would be disposed of in the Oxbow Landfill.

Throughout their working lives, production wells require routine maintenance, rejuvenation,

⁵ Despite the name commonly assigned to this waste stream, there are no crude oil “storage” tanks on the North Slope. However, separation of the recovered fractions involves the use of various flow-through or surge tanks from which tank bottoms are typically recovered.

⁶ The Oxbow Landfill is a Class I landfill permitted by the ADEC to accept nonhazardous industrial solid wastes and domestic solid wastes from North Slope activities. Class I landfills are defined in ADEC regulations as facilities that accept for disposal 20 tons or more of municipal solid waste daily, based on an annual average (see 18 AAC 60.300).

or rebuilding. Wastes from these activities, together with wastes from initial well installation and development are collectively known as "Associated Wastes." Water contained in formations normally exists at elevated temperatures and pressures, thereby enhancing the solubility of inorganic and polar organic species also present in the formation. As this water is brought to the surface along with oil and gas, its pressure and temperature begin to equilibrate to ambient conditions. Chemicals dissolved in the water then begin to precipitate, forming scale on downhole⁷ equipment and aboveground wellheads and other production equipment that comes in contact with this water. If allowed to build up, this scale will ultimately interfere with production rates. One of the primary purposes of periodic rejuvenation of production wells is the removal of accumulated scale. Because the scale primarily consists of sodium and calcium chlorides and carbonates, with trace amounts of barium salts, strong mineral acids such as hydrochloric and hydrofluoric are often used to "descale" the well. Well maintenance may also involve replacing segments of well casings or downhole equipment and the introduction of corrosion inhibitors, typically containing zinc carbonate and aluminum bisulfate. Additional acids may be introduced into the well after maintenance or rebuilding to stimulate future oil production. In most instances, the acidic descaling solutions are reinjected into the well or delivered to the North Slope Class II injection well for disposal.

NORM Wastes. As stated previously, scale formation is a continuing occurrence at each production well. Scale can also form on equipment at the Gathering Facility. When the oil-bearing formation contains naturally occurring radioactive species, such as radioactive isotopes of uranium or thorium and their respective radioactive decay products (or daughters), the scale that forms will exhibit radioactive properties and may require special

management for the purposes of both controlling worker exposures to radioactivity and providing for proper ultimate disposal. The extent to which NORM wastes will form and the levels of radioactivity they display are functions primarily of the natural occurrence and mobility of the radioactive species in the oil-bearing formation, and the amount of water produced in conjunction with the hydrocarbons. The radioactive species of greatest concern (from a worker exposure perspective) are radium-226 and radium-228, the salts of which exhibit generally high solubilities in production waters. Other radionuclides of concern, especially in natural gas processing, are lead-210 and radon-222, which is often present in natural gas (Smith 1992).

The incidence of naturally occurring uranium and thorium in the oil-bearing formations on the North Slope is relatively low; consequently, while NORM species will be present in production waters and NORM scale will form on well equipment, the resulting activity levels are relatively low. No federal or state regulations currently exist that speak directly to the management of NORM wastes in Alaska.⁸ Nevertheless, North Slope drillers have established formal procedures for managing potentially NORM-contaminated by-product streams and solid wastes (BP Amoco Alaska 2001). These procedures call for routine surveys of work environments at the wellheads and the gas processing plant to determine worker exposure levels, establishing handling procedures for NORM-contaminated equipment, and the provision of general worker training regarding potential NORM hazards and proper avoidance techniques. In past years, NORM-contaminated wastes were cleaned at BP Amoco's centrally located Mukluk Cold Storage Yard by a special services contractor and cleaning solutions containing NORM species were disposed of in the Class II injection well (Johnson 1991). Under current procedures,

⁷ Downhole equipment includes safety valves, gas lift mandrills, downhole pumps, and production well tubulars (casings).

⁸ NORM wastes are excluded from regulation as RCRA wastes by basic statutory construction. The State of Alaska has not developed rules that apply to the management and disposal of NORM wastes. Regulations promulgated by the U.S. Nuclear Regulatory Commission potentially apply to disposal of NORM wastes. However, NORM wastes have activity levels ranging from 526 to 12,000 pCi/g and average 7,690 pCi/g, levels that are below regulatory concern.

all scale-encrusted equipment retrieved from all North Slope wells is stored at the Mukluk Cold Storage Yard until being removed for cleaning and disposal (Kany 2001). The area is posted, equipment is wrapped in plastic or otherwise plugged to prevent the airborne release of the scale, and the ground surface is routinely surveyed by BP Amoco health physicists for evidence of release of radioactive species. Surveys conducted in June 2000 clearly indicate that migration of radioactive contamination is not occurring (BP Amoco Alaska 2000; McArthur 2000). Periodically, NORM-contaminated equipment is transported by contractor to a commercial firm in Louisiana for cleaning. NORM-contaminated scale is disposed of in a Class II injection well in east Texas, and the cleaning company takes possession of the cleaned equipment for salvage value as partial compensation for its services. The cleaning contractor routinely provides BP Amoco Alaska with completed waste transportation manifests as well as quality control analytical results (Taylor 2001b; ARS 2001).

North Slope Support Facilities.

Various suppliers of oil field equipment maintain storage areas in Deadhorse. Likewise, numerous special service contractors (e.g., well installation contractors) maintain offices and business units in Deadhorse. Wastes associated with maintaining living quarters for these individuals include domestic solid wastes (from residences and food service facilities) and domestic and sanitary wastewaters.⁹ Solid wastes are disposed of at the Oxbow Landfill. Domestic and sanitary wastewaters are combined with similar wastes generated from living quarters and business locations maintained by the drilling companies. Management of those wastewaters is discussed below.

North Slope support facilities also include aboveground transfer pipeline maintained by the various North Slope drilling companies that interconnect onshore wellheads, the Central Gathering Facility, and TAPS PS 1 and submarine transfer pipelines that interconnect the offshore wellheads with PS 1. Collectively, these transfer pipelines constitute approximately

1,123 mi in length (USACE 1999). Although these pipelines are smaller in scale and less sophisticated in their overall designs than the TAPS, their maintenance requirements are assumed to be similar to those for the TAPS. Because the pipelines traverse relatively small distances over virtually level grades, pumping systems do not need to be as technically complex at those at TAPS pump stations and their maintenance is much less involved. Procedures for maintaining corrosion control, preventing unacceptable degrees of curvature or deformation, maintaining pipeline VSMs, and maintaining overall asset integrity result in maintenance-related wastes. Similarly to the TAPS, most maintenance-related wastes for the North Slope transfer pipelines are expected to be non-hazardous and are likely to be eligible for disposal in the Oxbow Landfill. However, residues recovered from internal cleaning of these pipelines may exhibit hazardous waste characteristics. In addition to solid and/or hazardous wastes, maintenance of these transfer pipelines are likely to result in the generation of wastewaters from hydrostatic testing that routinely occurs. As with the TAPS, it is assumed that hydrostatic test water is eligible for discharge to the ground surface at the point where it is generated under the authority and control of an NPDES permit. Alternatively, hydrostatic test water may be eligible for disposal in the North Slope Class II injection well. Response to spills or leaks from these pipelines would result in remediation waste, some of which may display hazardous characteristics, however. All such hazardous waste resulting from spill response must be sent to out-of-state RCRA TSDFs.

North Slope Workforce. The exigencies of weather on the North Slope together with the remoteness of the area require that the North Slope oil field workers reside at or near their work sites. Consequently, all North Slope oil field workers reside in dormitories at Deadhorse or at offshore oil platforms. Maintenance of these housing facilities results in the generation of domestic solid wastes (including food preparation wastes) and domestic and sanitary wastewaters. Solid wastes are disposed of in the Oxbow Landfill at

⁹ Domestic wastewaters are waters from sinks, showers, and laundry and food preparation areas. Sanitary wastewaters are generated from toilets and routinely contain fecal coliform bacteria.

Deadhorse. A small incinerator is also operational at the Oxbow Landfill in which combustible, nonhazardous solid wastes can be burned before being placed in the landfill. Domestic and sanitary wastewaters are combined with similar wastes generated from North Slope special service contractor facilities for treatment and disposal. A number of management options are available. The wastewaters undergo biological treatment, and treated effluents are discharged under NPDES permits to either area lakes or to the Beaufort Sea. When those discharge options are not available (because of weather, access, or frozen receiving water bodies), treated wastewaters can also be injected into the Class II injection well on the North Slope that routinely receives production waters (Kitagawa 2002).

Individual NPDES permits also cover the discharge of seawater treatment plant residues (natural salts and solids removed from seawater as it is processed for industrial and potable use) and fire-control system test water (intermittent fresh or saltwater discharges from fire-control equipment (BPXA 2001). The EPA and ADEC have developed a general NPDES permit for oil and gas facilities on the North Slope. The North Slope General Permit covers the temporary or intermittent discharges of sanitary wastewater (up to 15,000 gal/d); domestic wastewater; gravel pit dewatering (up to 1.5 million gal/d) to tundra, water bodies, or for use in road watering and ice road/ice pad construction; construction dewatering; and hydrostatic test water (from new pipelines only, not from pipelines that have carried oil) (BPXA 2001). NPDES storm-water permits allow discharges of uncontaminated rainwater and snowmelt. Arctic drilling and production pads do not have conventional storm drains, so storm-water discharges are in the form of surface runoff during the brief spring thaw season (BPXA 2001).

C.7.3 Wastes Associated with Oil Refining Operations

Currently, four petroleum refineries are operating in Alaska: the Petro-Star Refinery on

the Kenai peninsula, the Petro-Star Valdez Refinery, Petro-Star North Pole Refinery, and Williams Alaska Petroleum Co. North Pole Refinery (formerly, the MAPCO Refinery). Of these, only the last three receive crude oil from the TAPS. Consequently, only activities at the three refineries in North Pole and Valdez are considered to be within the area of interest and to result in cumulative impacts for the purpose of this EIS. Petroleum refining is the physical, thermal, and chemical separation of crude oil into its major distillation fractions, which are then processed through a series of separation and conversion steps into finished petroleum products. Unless otherwise noted, the generic descriptions and data for petroleum refining that are presented below were obtained from the EPA Office of Compliance Sector Notebook Project "Profile of the Petroleum Refining Industry" (EPA 1995). Oil refining is in SIC 2911.

Refinery Products. The primary products of petroleum refineries fall into three major categories: fuels (e.g., motor gasoline, diesel and distillate fuel oil, liquefied petroleum gas, jet fuel, residual fuel oil, kerosene, and coke); finished nonfuel products (e.g. solvents, lubricating oils, greases, petroleum wax, petroleum jelly, and asphalt); and chemical industry feedstocks (e.g., naphtha, ethane, propane, butane, ethylene, propylene, butylenes, butadiene, benzene, toluene, and xylene).¹⁰ Petroleum refineries are complex and consist of multiple physical and chemical operations depending upon the properties of the crude oil being refined and the desired products. For these reasons, no two refineries are alike. Portions of the outputs from some processes are fed back into the same process, fed to new processes, fed back to a previous process, or blended with other outputs to form finished products. Refining crude oil into useful petroleum products can be separated into two phases and a number of supporting operations. The first phase is desalting of crude oil and the subsequent distillation into its various components or "fractions." The second phase is made up of three different types of "downstream" processes: combining, breaking, and reshaping. Downstream processes convert some of the

¹⁰ Some chemicals commonly categorized within the refining industry as feedstock chemicals can also be used as fuels (e.g. ethane, propane, butane) and solvents (e.g. benzene, toluene, xylene).

distillation fractions into petroleum products through any combination of different cracking, coking, reforming, and alkylation processes. Supporting operations may include wastewater treatment, sulfur recovery, additive production, heat exchanger cleaning, blowdown systems, blending of products, and storage of products.

Refinery Wastes. The nature and volumes of wastes generated at refineries are functions of the quality and throughput of the raw materials (crude oil) as well as the products being generated. Recent crude oil throughputs for the refineries within the area of interest are provided in Section 4.7.4.2. Because operations at refineries change frequently in response to market demands, a review of the historical waste generation data for one of the Alaska refineries is considered to be sufficiently descriptive of wastes that may be generated at any of the Alaska refineries in future years. The following discussions, therefore, incorporate information and data specific to the Williams North Pole Refinery, but are intended to be generally representative of wastes from any of the other two refineries within the area of interest for this EIS.

Wastewater. The petroleum refining industry uses relatively large volumes of water. Four types of wastewater are produced: surface water runoff (precipitation draining from industrialized land areas), cooling water, process water, and domestic/sanitary wastewaters.¹¹ Surface water runoff is intermittent and will contain constituents from spills to the surface, leaks in equipment, and any materials that may have collected in drains. Storm-water runoff from oil refineries would be controlled by the facility's NPDES permit for storm water associated with industrial activity and would normally be routed to the nearest surface water body. Federal regulations governing the discharge of storm water from industrial areas¹² requires the capture and treatment of storm water at all petroleum refineries, including removal of large fraction of both conventional pollutants, such as suspended solids and constituents that contribute to the

water's biological oxygen demand (BOD), as well as toxic pollutants, such as certain metals and organic compounds.

A large portion of water used in petroleum refining is used for cooling. Cooling water typically does not come into direct contact with process oil streams and therefore has less potential for hydrocarbon contamination than do process wastewaters. Most cooling water is recycled with only a small bleed or blowdown stream diverted to the wastewater treatment unit at each cooling water cycle to control the concentration of contaminants and the solids content. The water used for cooling often contains chemical additives such as chromates, phosphates, and antifouling biocides to prevent scaling of pipes and biological growth. It may also contain some level of oil contamination caused by leaks in the process equipment. Process wastewater arises from desalting of crude oil, steam stripping operations, drainage from product fractionation operations, and boiler blowdown. Because process water comes into contact with the oil process streams, it is usually highly contaminated with the polar hydrocarbons routinely present in oil. Oily water generated during routine heat exchanger cleaning is also considered process water.

Petroleum refineries typically utilize primary and secondary wastewater treatment. Primary wastewater treatment consists of separation of oil, water, and solids in two stages. The first stage is an oil/water separator where the oil is allowed to float to the surface and be skimmed off, and solids settle to the bottom to be scraped off into a sludge hopper. The second stage may be a series of settling ponds or DAF, where air is bubbled through the wastewater and both oil and suspended solids are skimmed off the top. Chemicals, such as ferric hydroxide or aluminum hydroxide, can be used to coagulate impurities into a froth or sludge that can be skimmed off the top. After primary treatment, wastewater can be discharged to a POTW or undergo secondary treatment before being discharged directly to surface waters under an appropriate NPDES permit. Some refineries use an additional stage

¹¹ See footnote 9.

¹² Industrial areas are defined in 40 CFR 122.26(b)(14)(ii) and include facilities in SIC 29.

of wastewater treatment, called polishing, to meet NPDES permit pollutant discharge limits. Polishing usually includes filtering (e.g., carbon, anthracite, or sand).

Williams North Pole Refinery holds an NPDES permit issued by EPA Region 10, for the discharge of wastewater into a former gravel pit located on the Williams property. In addition, process wastewater is discharged to the City of North Pole Municipal Sewage Treatment Plant (EPA 2002).

Hazardous and Solid Wastes.

Primary wastewater treatment generates wastes that may be considered hazardous, including oil/water separator sludge, primary treatment sludge, sludges from other gravitational separation techniques, float from DAF units, and wastes from settling ponds. Secondary wastewater treatment also generates wastes, including biomass waste that is typically treated through digestion by anaerobic bacteria and then dewatered. This oily wastewater treatment waste may contain contaminants (e.g., chromium or lead) that would require it to be managed as a RCRA hazardous waste. The periodic cleaning of heat exchangers may produce hazardous waste sludges because of the use of chromium as an additive to cooling water.

Other refinery wastes include various types of sludge (e.g., oily waste sludge, tank bottoms, calcium chloride sludge from isomerization processes and neutralized sulfuric acid, or calcium fluoride sludge from alkylation processes), spent process catalysts, and spent clay filtering media. Treatment of these wastes includes incineration, land treating off-site, land filling on-site, land filling off-site, chemical fixation, neutralization, and other treatment methods. A number of wastes commonly generated at refineries are EPA listed hazardous wastes, including oil separator sludge (EPA Hazardous Waste No. K051); slop oil emulsion solids (EPA Hazardous Waste No. K049); dissolved air flotation floats (EPA Hazardous Waste No. K048), and heat exchanger bundle sludge (EPA Hazardous Waste No. K050). In addition, some wastes may contain hazardous constituents (e.g., lead, chromium, or benzene) and must be managed as hazardous waste. Because there are no EPA-permitted hazardous waste treatment or disposal facilities located in

Alaska, oil refinery wastes that are characterized or listed as hazardous wastes would have to be shipped off-site and out of state for treatment and final disposal.

Williams North Pole Refinery is a large quantity generator of RCRA hazardous wastes. In 1997, Williams North Pole Refinery generated 43 tons of hazardous waste (EPA 2002), which was all shipped off-site to out-of-state TSDFs. These hazardous wastes included benzene-contaminated wastes; heat exchanger bundle cleaning sludge; ignitable, reactive sludge; used solvents contaminated with lead and benzene; laboratory wastes; used filter media; tank removal sludge; used batteries; paint wastes; and contaminated air stripping media. Some wastes from Williams North Pole Refinery are shipped off-site for energy recovery.

Those solid wastes characterized as nonhazardous wastes (e.g., packing materials or nonhazardous sludge) can be disposed of in on-site landfills; in off-site, local solid waste landfills; or shipped out-of-state to appropriately permitted landfills. Some outputs, such as sulfur, acetic acid, phosphoric acid, and recovered metals, are sold as by-products and transported off-site.

C.7.4 Waste Impacts from Tanker Operations at the Valdez Marine Terminal

Wastes associated with oil tanker visits to the Valdez Marine Terminal include tanker ballast and bilge water and domestic solid wastes generated on board (including some potential medical wastes) during the ship's voyage to the Valdez Marine Terminal.

Oil tankers berthing at the Valdez Marine Terminal discharge their ballast and bilge waters to the BWTF at the Valdez Marine Terminal for treatment before discharge to Prince William Sound (e.g., removal of oil). Average inflows of tanker ballast and bilge water are 400,000 bbl/d. A number of factors influence this total, including, primarily, the frequency of tanker visits (in general, a function of crude oil pipeline throughput as well as the capacities of each tanker) and the design of the tankers. The Oil

Pollution Act of 1990 requires that, after January 1, 2015, all vessels operating in the United States navigable waters or the Exclusive Economic Zone of the U.S. be equipped with a double hull, or double containment system. The statute also establishes a schedule by which conversions of existing vessels must occur, on the basis of the vessel's year of commissioning, gross tonnage, and salvage value. It is anticipated that some double-hulled tankers will also have segregated ballast tanks (i.e., ballast tanks that are separate from crude oil tanks). For these vessels, the volume of ballast water requiring treatment at the BWTF would be dramatically reduced since the potential for oil contamination of the seawater ballast does not exist. However, it is also possible that other vessels without segregated ballast tanks that still comply with the double-hull requirement may also still be part of the Valdez Marine Terminal fleet and would require treatment of their ballast water before discharge to Prince William Sound. Further, double-hulled tankers with segregated ballast tanks may still need to use cargo tanks for additional ballast storage to ensure stability in certain open sea conditions. Thus, conversion of the Valdez Marine Terminal tanker fleet to comply with double-hull requirements would dramatically reduce, but would not completely eliminate, the volume of ballast water treated in the BWTF. It can be reliably assumed that the maximum reduction in ballast water volumes would be realized by January 2015. However, a schedule for reductions in the interim period is difficult to predict since many vessel owners are reconfiguring their fleet, or purchasing new vessels on more aggressive schedules than those required by the statute. Regardless of their hull design, tankers visiting the Valdez Marine Terminal would still have bilge water that would require treatment before discharge.

Domestic solid wastes generated on board are managed as "International Wastes" and treated as potentially biohazardous. As a service to the berthing tankers, upon request, the Valdez Marine Terminal accepts domestic solid wastes, separately bags those wastes, and delivers them to a commercial firm for sterilization and ultimate disposal in a municipal landfill. The quantities of domestic waste are very limited. Valdez Marine Terminal personnel report that requests from

vessel captains for assistance with disposal of domestic solid wastes are rare (Edwards 2002b).

Personnel at Valdez Marine Terminal report that it does not treat domestic and sanitary wastewaters generated by the tankers. These wastewaters are treated according to existing U.S. Coast Guard and ADEC regulations and discharged to the ocean. None of the tankers commingle domestic or sanitary wastewaters with ballast waters (Edwards 2002b). Finally, wastes generated during the vessel's trip to Prince William Sound as a result of maintenance or repair of on-board mechanical systems are not off-loaded at Valdez but rather return with the vessel to its home port for treatment or disposal (Edwards 2002b).

C.7.5 Wastes Associated with Natural Gas Pipelines

The proposed construction and operation of the natural gas pipeline would have the potential to generate wastes. Waste impacts would be both short term, associated with initial construction, and long term, associated with subsequent operation. During construction, substantial amounts of domestic solid waste and domestic and sanitary wastewaters would be generated in support of the construction workforce. In addition to the pipeline, the natural gas system would involve construction of a natural gas separation and treatment facility on the North Slope and compressor stations along the pipeline route. If natural gas was brought to Valdez, a gas liquefaction facility and marine terminal might be located at Anderson Bay in Prince William Sound. Because the temperature of the gas could be controlled before the gas would be introduced into the pipeline, the entire length of the pipeline could be buried, notwithstanding localized factors that would preclude burial.

Wastes associated with operation of a natural gas system would include wastes resulting from the support of a workforce and wastes associated with maintenance of the pipeline. Although less complex in its design than the TAPS, the natural gas pipeline would still require maintenance, and such activities would also generate wastes, many of which

would be similar to those resulting from maintenance of the natural gas TAPS. Because the natural gas project is only at a preliminary conceptual stage, no additional details can be provided about the amounts or types of operation wastes that would result or about their ultimate disposal.

The liquefied natural gas (LNG) plant would generate industrial wastewaters related to plant operations as well as domestic and sanitary wastewater in support of the workforce. In addition, LNG tankers visiting the LNG plant could generate bilge/ballast wastewaters that would have to be treated and discharged into Prince William Sound under the auspices of appropriate NPDES permits. Prince William Sound would then receive treated wastewaters from both the Valdez Marine Terminal and any new LNG plant.

In addition, the LNG plant would generate solid wastes that could be disposed of in the City of Valdez municipal landfill. They would be in addition to any solid wastes generated at the Valdez Marine Terminal and disposed of at the municipal landfill. Under the no-action alternative, solid wastes from the LNG plant could continue to be disposed of at the municipal landfill, even though Valdez Marine Terminal operations ceased. However, under the no-action alternative, solid wastes generated during pipeline and Valdez Marine Terminal closure and dismantlement could also be disposed of at the municipal landfill.

Finally, the construction and operation of the LNG plant might cause an increase in the population of Valdez and other nearby communities, together with increases in domestic solid wastes and domestic and sanitary wastewaters, the management of which represents cumulative impacts in addition to those already resulting from other activities, including those associated with the Valdez Marine Terminal operational workforces. Under the no-action alternative, these cumulative impacts would be less as employment related to the Valdez Marine Terminal declined.

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Appendix D:
Subsistence in the Vicinity of the TAPS

Appendix D: Subsistence in the Vicinity of the TAPS

D.1 Introduction

Congress has defined subsistence in Alaska as “the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption” (cited in Federal Subsistence Board 1999). Subsistence activities can involve hunting, fishing, collecting, or trapping. Resources harvested include fish, land mammals, marine mammals and invertebrates, riverine invertebrates, and assorted plants (including wood). Uses of these resources include food, clothing, fuel, transportation, construction, art, crafts, exchange, home goods (e.g., sleeping mats), and customary trade (Wolfe 2002).

Subsistence in rural Alaska tends to play economic, sociocultural, and ceremonial roles, the last two of particular importance to Alaska Natives. Although all of the uses listed above are legitimate components of subsistence, when exploring the importance of subsistence activities researchers frequently emphasize the use as food. During the 1990s, rural residents of Alaska harvested an average of 375 lb of wild foods per capita per year (Wolfe 2000). In communities surveyed by the Alaska Department of Fish and Game (ADF&G) in the 1980s and 1990s, 75–98% of the households harvested fish and 92–100% used fish, and 48–70% harvested wildlife and 79–92% used wildlife. Subsistence resources meet most or all of the caloric and protein requirements in many rural communities (Wolfe 1996). Even if subsistence were only of importance as a source of food, it is easy to understand the high level of concern of rural Alaskans with any activities that might disrupt or otherwise compromise subsistence activities. With the addition of other economic functions, as well as sociocultural and ceremonial functions, the recognized importance of subsistence and the desire to protect this key activity from disruption only grows.

Section 3.24 of this EIS presents background material for an analysis of subsistence in the vicinity of the Trans-Alaska Pipeline System (TAPS), including the differences in legal definitions used by federal and state agencies and an abbreviated summary of much of the data considered. This appendix presents available tabular and cartographic data on subsistence in greater detail to provide more thorough background on this topic in the vicinity of the TAPS and a more complete basis for the evaluation of potential environmental impacts on subsistence.

D.2 Community-Specific Subsistence-Harvest Patterns in the Vicinity of the TAPS

D.2.1 Challenges in the Study of Subsistence Patterns

The data relied upon in this EIS are primarily those collected by the ADF&G Subsistence Division for many rural communities in Alaska. These data are the result of recent ethnographic studies of individual (or small groups) of rural communities that include systematic surveys of subsistence behavior (Fall 1990). Survey results include quantitative data on amounts of various wild resources harvested, used, received, and given, thereby providing a sense of the amount resources obtained and how they were obtained. The *exchange* of subsistence resources, reflected by amounts given and received, provides insight on key sociocultural functions of subsistence as various resources flow through a community. Surveys collected information on a wide variety of fish, land mammals, birds and

eggs, marine mammals, marine invertebrates, and vegetation subsistence resources, thereby enabling researchers to break subsistence activities down in considerable detail.

In addition to the rich detail provided by ADF&G subsistence surveys, the data generated are of particular utility to this EIS because they provide insights on geographically distinct localities. With a focus on communities in the vicinity of the TAPS, this evaluation explores potential impacts to subsistence along an 800-mi transect across Alaska that includes a range of very different ecological and sociocultural settings. The use of ADF&G community harvest data enables examinations that explicitly incorporate such heterogeneity with data collected and compiled in a similar manner — thereby supporting comparisons, as necessary, of subsistence under very different conditions in very different geographic settings.

At first glance, the study of subsistence seems to lend itself to analysis with quantitative data. To a degree this is true. Subsistence harvest activities show relatively consistent patterns, especially in the suite of species harvested and use areas. Most variability comes in quantities of particular resources harvested from year to year, based on changing availability. Overall harvest levels change slowly, as subsistence users increase harvests among some species to make up for others. However, subsistence patterns for a particular locality often vary considerably over space and time. Although it is possible to deal with such variability, the research necessary to understand it ideally requires the systematic collection of data over many consecutive years, which are unavailable for subsistence in Alaska. The data presented in this EIS are useful for understanding the role of subsistence in several communities that could be affected by the renewal of the Federal Grant for the TAPS right-of-way (ROW). They provide a sense of the number and amount of resources harvested, the proportion of community residents involved in their harvest, and the percentage of community residents who use, give, and exchange various resources. However, these data must be considered in context; they provide essentially one or more discrete *snapshots* of community subsistence activity that is changing constantly.

The main difficulty with the quantitative study of subsistence is the nature of subsistence itself: it is an adaptation to available resources. The problem is that availability varies over time. One aspect of this is seasonality, with various resources harvested when they become accessible (e.g., during salmon runs or caribou migrations) or desirable to harvest (e.g., when the coats of certain furbearers are of highest quality). Seasonal harvests characterize all of the communities examined in this study. Recording subsistence data over the course of an entire year — the approach employed by the ADF&G — removes problems with variability between different parts of the year.

A second aspect of changing availability consists of changes from year to year. As fish and animal populations fluctuate and migration patterns change, harvests change as well. Available data for annual harvests over multiple years provide a sense of the degree of variability possible (Figure D-1). However, in many communities, data are available for only one or two years. There is only one case among the communities considered in this study (Chenega Bay) in which data capture subsistence patterns for as many as five consecutive years (ADF&G 2001). The data presented in Section D.2.3 provide an idea of the subsistence patterns that occur in an adaptive process that, by its nature, varies and that, because of this variability, challenges the utility of any quantitative information on harvest levels, participation, and use collected for a couple points in time (see Nelson 1992).

Along with harvest levels, the geographic areas in which subsistence resources are obtained also vary over time. Throughout Section D.2.3, maps of subsistence harvest areas are referenced to provide a sense of the relationship between areas used for subsistence and the TAPS. The same adaptation to available resources that causes variability in harvest *levels* over time also causes variability in harvest *areas* over time (Nelson 1992). However, the ADF&G mapping interviews document uses over 10 years, 20 years, or the lifetime of respondents, so the maps represent areas incorporating variability over a period time.

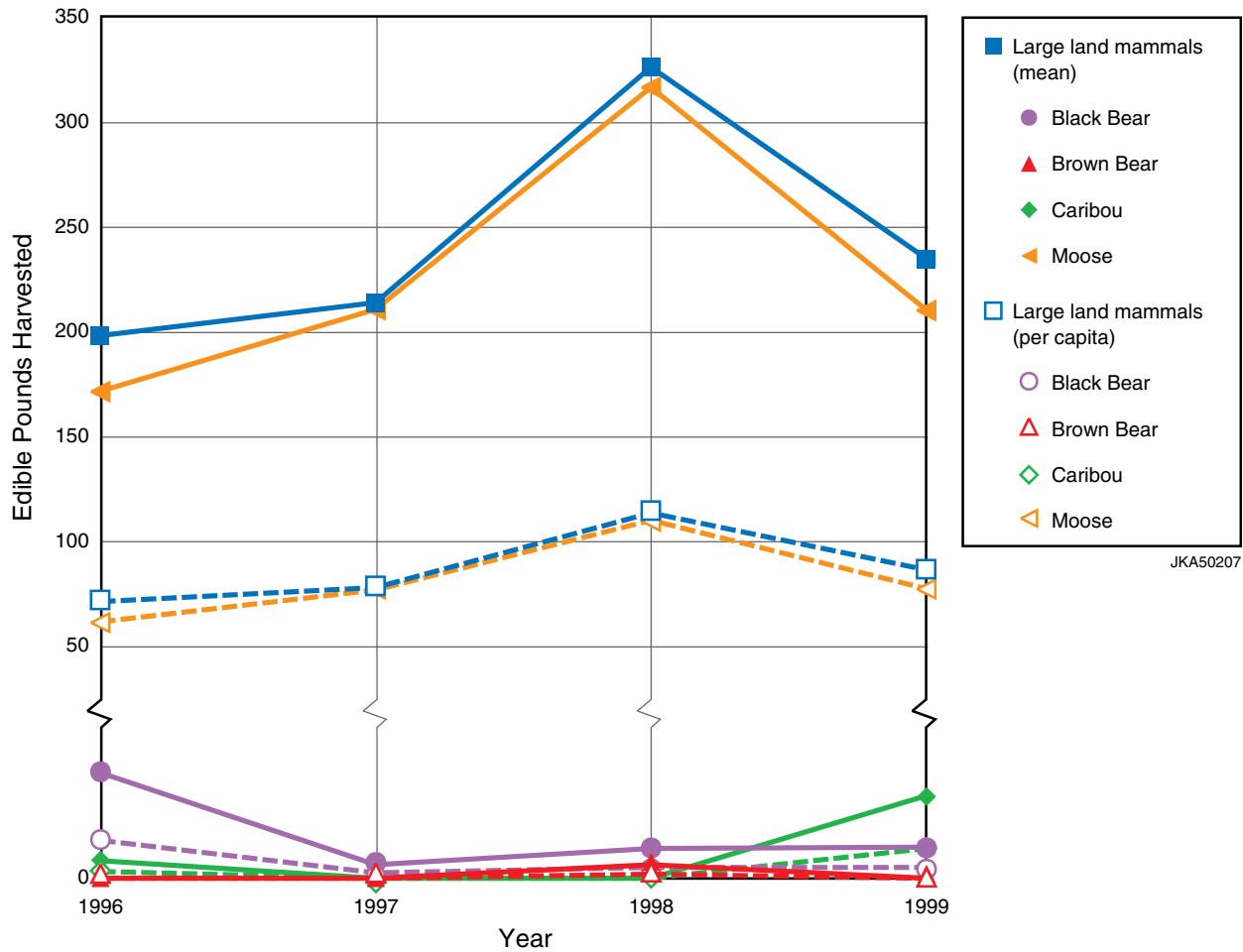


FIGURE D-1 Changing Harvests over Time for Selected Resources in Stevens Village (Data Source: ADF&G 2001)

Maps D-3 through D-24¹ should therefore be viewed as presenting a general picture of geographic subsistence tendencies rather than as maps with strict boundaries that remain unchanged year after year.

The data used in this appendix to characterize subsistence patterns of communities near the TAPS were the best available at the time of EIS preparation. All the information presented is dated — indeed, some as collected two decades ago. That stated, because of the inherent variability in subsistence activities older data are not necessarily of limited utility for present purposes as they may represent *typical* subsistence in the early 21st century. The main exceptions to this statement

likely are some North Slope communities affected by oil development and the communities affected by the Exxon Valdez oil spill. For the five communities examined in this EIS that experienced direct impacts from this spill (Chenega, Cordova, Nanwalek, Port Graham, and Tatitlek), the data presented were collected before and after the 1989 spill, so they do provide a sense of subsistence patterns established following the spill.

D.2.2 Focus of the Subsistence Analysis

As noted above, this EIS examines subsistence at the level of individual

¹ Maps referenced in this appendix are located in Volume 7 of this EIS.

communities to help understand subsistence patterns that have historically varied considerably in different parts of Alaska (see Hosley 1981). The characterization of subsistence relies on ADF&G data for selected settlements located in the vicinity of the TAPS.

This study first identified 45 communities in proximity of the TAPS for potential subsistence analysis. The communities of interest consisted of 21 largely federally recognized tribes identified by the BLM as those that could be potentially directly affected by the renewal of the Federal Grant for the TAPS ROW (BLM 2001) and 24 communities geographically close to the TAPS that were considered so that all places in the vicinity of the TAPS would be treated equally (Map D-1). Three of the places considered were Native villages well south or west of Valdez. Their inclusion reflects their proximity to areas affected by the Exxon Valdez oil spill, the impacts they experienced during that spill, and formal requests to be included within the EIS process as a consequence of those impacts (Map D-2).

This study does not examine subsistence for all 45 communities. As noted in Section D.1, this EIS relies on a federal definition of subsistence that includes the precondition of rural residency. Since 10 of the 45 communities lie within the Fairbanks North Star Borough Nonrural Area and one lies within the Valdez Nonrural Area (USFWS 2001), they were excluded from this study. Ten other communities meet the rural requirement but were excluded because they have never been the subject of detailed subsistence surveys. The remaining 24 communities are examined because they meet the rural requirement and because some sort of subsistence data were available for them (Table D-1).

D.2.3 Descriptions of Community Subsistence Patterns

This section provides brief descriptions of the 24 communities examined in this study for which systematically collected subsistence data exist. The aim is to provide key data in tabular and graphic (map) form to supplement

information presented in Section 3.24 of the EIS. Text is purposefully kept to a minimum, enabling the appendix to function primarily as a source of important information. For reader convenience, all the tables for individual communities are grouped at the end of the Appendix. The maps are in Volume 7. The emphasis of this data presentation is on fish, game, and other wild foods that are harvested. Although data on harvest levels for vegetable foods and wood exist for many communities, this appendix does not consider these resources because they are not typically felt to be affected directly or indirectly by the TAPS.

The following discussions of subsistence data are organized into four broad geographic groupings of communities: North Slope, Yukon River Drainage, Copper River Basin, and Prince William Sound and Lower Cook Inlet. This approach enables the presentation of subsistence patterns in communities that share certain components of their sociocultural systems and generally similar ecological settings — yielding subsistence patterns within a particular grouping with important commonalities.

D.2.3.1 North Slope

The North Slope consists of the portion of north-central Alaska lying north of the Brooks Range. Alaska Natives in this region comprise two Iñupiat sociocultural systems, the Nunamiut and the Tareumiut. The Tareumiut live along the north coast of Alaska and traditionally have relied on a combination of terrestrial and marine resources. The Nunamiut live inland from the coast in the Brooks Range and rely primarily on terrestrial resources, particularly caribou. The communities examined in this EIS include one Nunamiut community, Anaktuvuk Pass, and one Tareumiut community, Nuiqsut.

D.2.3.1.1 Anaktuvuk Pass. Anaktuvuk Pass, the last remaining settlement of the Nunamiut, lies in the central Brooks Range about 49 mi west of the TAPS (Map D-1) (ADCED 2001). The population of Anaktuvuk Pass was 282 in 2000 (Table D-1).

Due in part to geographic isolation and in part to the sociocultural heritage of Anaktuvuk

TABLE D-1 Communities in Proximity to the TAPS, Demographic and Subsistence Overview

Community	2000 Population ^a	Subsistence Survey Years	Sources for Subsistence Data ^b
<i>North Slope</i>			
Anaktuvuk Pass	282	1990, 1991, 1993 ^d 1993 ^c	Unpublished ADF&G analyses
Deadhorse	0 ^d	No survey conducted	
Nuiqsut	433	1985, 1993 ^d 1993 ^c	Fall and Utermohle 1995; unpublished ADF&G analysis
Prudhoe Bay	5	No survey conducted	
<i>Yukon River Drainage</i>			
Alatna ^e	35	1982 ^c , 1983, 1984; 1997, 1998, 1999	Marcotte and Haynes 1984; unpublished ADF&G and USFWS analyses
Allakaket ^e	97	1982 ^c , 1983, 1984; 1997, 1998, 1999	Marcotte and Haynes 1984; unpublished ADF&G and USFWS analyses
Big Delta	749	No survey conducted	
Coldfoot	13	No survey conducted	
College ^f	11,402	No survey conducted	
Delta Junction	840	No survey conducted	
Ester ^f	1,680	No survey conducted	
Evansville	28	1982 ^c , 1983, 1984	Marcotte and Haynes 1984; unpublished ADF&G and USFWS analyses
Fairbanks ^f	30,224	No survey conducted	
Fox ^f	300	No survey conducted	
Harding-Birch Lakes ^f	216	No survey conducted	
Hughes	78	1982 ^c	Marcotte and Haynes 1984
Livengood	29	No survey conducted	

TABLE D-1 (Cont.)

Community	2000 Population ^a	Subsistence Survey Years	Sources for Subsistence Data ^b
Manley Hot Springs	72	No ADF&G survey conducted	Betts 1997
Minto	258	1984 ^C	Andrews 1988
Moose Creek ^f	542	No survey conducted	
North Pole ^f	1,570	No survey conducted	
Pleasant Valley ^f	623	No survey conducted	
Rampart	45	1993, 1994, 1995, 1996, 1997	Betts 1997; unpublished ADF&G analysis
Salcha ^f	854	No survey conducted	
Stevens Village	87	1984, 1993, 1994, 1997	Betts 1997; Sumida 1988; Sumida and Alexander 1985; unpublished ADF&G analysis
Tanana	308	1987 ^C , 1996, 1997, 1998, 1999	Anderson 1992; Case and Halpin 1990; Betts 1997; unpublished ADF&G analysis
Two Rivers ^f	482	No survey conducted	
Wiseman	21	No survey conducted	
<i>Copper River Basin</i>			
Chitna	123	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
Copper Center	362	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
Copperville	179	No survey conducted	
Gakona	215	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis

TABLE D-1 (Cont.)

Community	2000 Population ^a	Subsistence Survey Years	Sources for Subsistence Data ^b
Glennallen	554	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
Gulkana	88	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
Kenny Lake	410	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
Paxson	43	1987 ^C	McMillan and Cuccarese 1988; Stratton and Georgette 1985
Tazlina	149	1987 ^C	McMillan and Cuccarese 1988; Stratton and Georgette 1985; unpublished ADF&G analysis
Tonsina	92	1982, 1987 ^C	Fall and Stratton 1984; McMillan and Cuccarese 1988; Stratton 1983; Stratton and Georgette 1984, 1985; unpublished ADF&G analysis
<i>Prince William Sound and Lower Cook Inlet</i>			
Cheneg Bay	86	1984, 1985, 1989, 1990, 1991, 1992, 1993 ^C , 1997	Fall 1991; Fall and Utermohle 1995; Stratton and Chisum 1986; Stratton et al. 1996; unpublished ADF&G analysis
Cordova	2,454	1985, 1988, 1991, 1992, 1993, 1997 ^C	Stratton 1989, 1992; Fall and Utermohle 1995; unpublished ADF&G analysis
Nanwalek	177	1987, 1989, 1990, 1991, 1992, 1993, 1997 ^C	Fall 1991; Fall and Utermohle 1995; unpublished ADF&G analysis
Port Graham	171	1987, 1989, 1990, 1991, 1992, 1993, 1997 ^C	Fall 1991; Fall and Utermohle 1995, 1999;
Tatitlek	107	1987, 1988, 1989, 1990, 1991, 1993, 1997 ^C	Fall 1991; Fall and Utermohle 1995; Stratton et al. 1996; unpublished ADF&G analysis
Valdez ⁹	4,036	1991, 1992, 1993	Fall and Utermohle 1995, 1999

Footnotes on next page.

TABLE D-1 (Cont.)

- a Data are from U.S. Bureau of the Census (2001).
- b Data for survey years listed are as reported in ADF&G (2001).
- c Designated “representative year” by ADF&G.
- d Officially, there are no permanent residents in Deadhorse. The population consists of about 5,000 transient oil workers.
- e 1982, 1983, and 1984 subsistence survey data for Alatna and Allakaket are reported for both communities combined.
- f No subsistence data are reported because the community is in the Fairbanks North Shore Borough Nonrural Area (USFWS 2001).
- g Although ADF&G conducted three subsistence surveys, the EIS does not examine them because Valdez is in the Valdez Nonrural Area (USFWS 2001).

Pass, residents of this community rely heavily on subsistence for economic and other purposes (ADCED 2001; North Slope Borough 1999). The dominant subsistence resource in Anaktuvuk Pass is caribou, the sole subject of ADF&G subsistence surveys in 1990, 1991, and 1993 (ADF&G 2001). Survey data from 1993 indicate that nearly 43% of Anaktuvuk Pass households participated in caribou hunting, producing nearly 220 lb per capita (Table D-2).² Anecdotal data indicate that all households share in the consumption of this resource (e.g., Mekiana 1992). Other data indicate that a range of other species also played a role in Anaktuvuk Pass subsistence, including sheep, grizzly bear, moose, ground squirrel, marmot, wolf, wolverine, ptarmigan, grayling, lake trout, lingcod, and whitefish (Spearman et al. 1979).

The subsistence use area for Anaktuvuk Pass includes a broad expanse of the southern Brooks Range primarily west of the TAPS, in all covering about 11,300 mi² (Map D-3). A small portion of the subsistence use area for this village overlaps with the TAPS. Villagers exploit the vast majority of the subsistence use area for caribou and furbearers, with small subsections used to hunt moose and sheep. Fishing occurs in localized areas, often in lakes.

D.2.3.1.2 Nuiqsut. Nuiqsut is an incorporated community lying on the western

bank of the Nechelik Channel of the Colville River Delta, about 57 mi west of the TAPS (Map D-1) (ADCED 2001). The population of Nuiqsut was 433 in 2000 (Table D-1).

Although some wage employment is available in nearby oil fields and with North Slope Borough and state governments, subsistence remains extremely important to the Nuiqsut economy (North Slope Borough 1999). Moreover, much of Tareumiut sociocultural and ceremonial tradition revolves around the harvest and exchange of subsistence resources. Marine mammals (notably whales), large land mammals (especially caribou), and fish (particularly whitefish) each contributed more than 230 lb of subsistence resource per capita to households surveyed in Nuiqsut in 1993 (Table D-3) (Fall and Utermohle 1995; see Galginaitis 1990). Hunting large land mammals and fishing involved 74 and 81%, respectively, of the Nuiqsut households studied that year. More than 98% of those households used large land mammals, 100% used fish, and nearly 97% used marine mammals for subsistence — providing a sense of the amount of exchange that also occurred involving subsistence resources. Birds, bird eggs, and small land mammals completed the subsistence resources for Nuiqsut in 1993, but the amount harvested was negligible in comparison to the three categories noted above (although more than 95% of households surveyed used birds and bird eggs). Although

² Tables for individual communities are grouped at the end of this Appendix.

detailed data are lacking, available evidence indicates that harvest patterns, in the sense of species mix and level of importance, would be similar over time (Libby et al. 1979; North Slope Borough Planning Commission and Commission on History and Culture 1979; see also ADF&G 1986). Subsistence data from 1994–1995, the year following the representative year presented in Table D-3, indicate that the breadth in subsistence species and in their emphasis was similar then, with caribou being particularly important (Brower and Opie 1997).

The subsistence use area for Nuiqsut covers an irregularly shaped area of roughly 13,200 mi² centered on the Colville River in north-central Alaska (Map D-4). The vast majority of this area involved caribou hunting, with smaller areas used for fishing (primarily the Colville River and its associated delta) and moose hunting. A small portion of the eastern edge of the subsistence use area intersects the TAPS. Map D-4 does not include areas off the coast used for marine mammal hunting.

D.2.3.2 Yukon River Drainage

The Yukon River Drainage consists of a broad expanse of the interior Alaska Plateau between the Brooks Range and the Alaska Range, drained by several rivers and streams that flow into the Yukon River. The Alaska Natives of this region originally were several Athabascan peoples, including Gwich'in, Koyukon, and Tanana. Adaptive strategies of these peoples, as well as rural non-Native sociocultural systems, emphasize combinations of terrestrial mammals and both anadromous and resident fish. Salmon harvests represent a particularly large portion of total subsistence foods in this region. Because the salmon runs to important to subsistence in the Yukon River drainage originate in the ocean waters west of Alaska, this portion of Interior Alaska in a sense relies on conditions (climate, commercial harvests) in the same distant region. This EIS discusses 10 communities that lie in the Yukon River drainage: Alatna, Allakaket, Evansville, Hughes, Manley Hot Springs, Minto, Rampart, Stevens Village, Tanana, and Wiseman. As the data presented reveal, subsistence varies among these localities, although it plays an

important economic, sociocultural, and ceremonial role in each.

D.2.3.2.1 Alatna. Alatna is a small village located on the northern bank of the Koyukuk River, immediately south of its intersection with the Alatna River and about 56 mi west of the TAPS (see Map D-1) (Alaska Department of Community and Economic Development [ADCED] 2001). Alatna has its roots as a trading location, with Kobuk River Iñupiat living on the northern bank of the river in Alatna and the Koyukon Athabascans living on the southern bank in modern-day Allakaket. The population of Alatna in 2000 was 35, with the majority of residents of Kobuk River Iñupiat heritage (Table D-1).

Subsistence dominates the economic activity of Alatna, supplemented by a small amount of wage labor from seasonal work and the production of Native crafts. Much of the subsistence data available for Alatna combine information on this village with data on neighboring Allakaket (Northern Land Use Research, Inc. 2000b). However, the ADF&G conducted surveys of large land mammal harvests in 1997, 1998, and 1999 for Alatna alone. Table D-4 presents results of the 1998 survey, which recorded harvest for caribou and moose. Table D-5 presents 1982 subsistence harvest data for a broader range of resources, but for Alatna combined with Allakaket (Marcotte and Haynes 1984). Subsistence activities reported in the latter table involved a variety of land mammals, birds, and fish, with the latter being of particular importance. Household participation rates for harvests varied widely by resource, with 70% of Alatna households harvesting large land mammals in 1998 and 100% of community households using those resources. Harvest levels were less for these same animals in 1982, with information unavailable on participation rates.

The subsistence use area for Alatna (recorded in combination with Allakaket) covers about 4,400 mi² west of the TAPS. Although this area does not intersect the pipeline, it does include part of south fork of the Koyukuk River downstream of the TAPS (Map D-5). Residents of Alatna use the vast majority of their subsistence use area to harvest furbearing

animals. The area used for moose hunting is much smaller, confined largely to areas near rivers in the vicinity of the village. Fishing occurs primarily in the Alatna, Kanuti, and Koyukuk Rivers.

D.2.3.2.2 Allakaket. Allakaket, a rural village consisting primarily of Koyukon Athabascans, is on the southern bank of the Koyukuk River about 55 mi west of the TAPS (Map D-1) (ADCED 2001). As noted for Alatna, Allakaket occurs at an important trading locality on the Koyukuk, particularly for exchange with the neighboring Kobuk River Iñupiat in Alatna. In 2000, the population of this village was 97 (Table D-1).

Allakaket relies heavily on subsistence for the economic, sociocultural, and ceremonial roles this activity plays in the village. Wage labor, which is primarily seasonal or part time, helps to supplement subsistence in the economy. Subsistence in Allakaket relies on large amounts of both land mammals and fish (Marcotte and Haynes 1984; Brannian and Gnath 1988). As with Alatna, ADF&G harvest data for Allakaket as an individual community to date have focused solely on large land mammals (Table D-6). The data indicate that the majority of the households surveyed harvested these animals and that virtually all households used them. Data from the specified representative year of 1982, which combined Allakaket with Alatna, provide information on subsistence harvest patterns for a broader range of resources in the two villages combined (Marcotte and Haynes 1984) (see Table D-5). Subsistence activities reported in conjunction with Alatna indicate harvests of a variety of land mammals, birds, and fish, with the latter being of particular importance. Household participation rates for harvests varied widely by resource, with about 58% of Allakaket households harvesting large land mammals in 1998 and 100% of community households using those resources (an indication of the breadth of sharing that occurs). Harvest levels were slightly less for these same animals in 1982, with information unavailable on participation rates.

The subsistence use area for Allakaket (recorded in conjunction with Alatna) covers about 4,400 mi² west of the TAPS. Although this

area does not intersect the pipeline, it does include part of south fork of the Koyukuk River downstream of the TAPS (Map D-5). Residents of Allakaket use the vast majority of their subsistence use area to harvest furbearing animals. The area used for moose hunting is much smaller, confined largely to areas near rivers in the vicinity of the village. Fishing occurs primarily in the Alatna, Kanuti, and Koyukuk Rivers.

D.2.3.2.3 Evansville. Evansville is an Interior village located on the southern bank of the Koyukuk River about 22 mi west of the TAPS (Map D-1) (ADCED 2001). Evansville and the neighboring community of Bettles came into being in the 1940s when an airfield was built to support exploration of the Naval Petroleum Reserve No. 4 (Northern Land Use Research, Inc. 2000b). Construction of the airfield attracted both Alaska Natives and non-Natives to the area, with the former settling primarily in Evansville (near the northern end of the airfield) and the latter settling mostly in Bettles (near the southern end of the airfield). The decennial census in 2000 recorded 28 people in Evansville (Table D-1)

In contrast to residents of most rural communities in Alaska, many Evansville residents are engaged in wage labor; most jobs are associated with air transportation, visitor services, and the local and federal government. Nevertheless, subsistence remains important to Evansville residents for economic as well as sociocultural reasons (Marcotte and Haynes 1984). Detailed subsistence surveys in 1982-1984 combined data on Evansville with those from nearby Bettles. In contrast, in 1997, 1998, and 1999 subsistence studies of large game harvests focused exclusively on Evansville (ADF&G 2001). Evansville-specific data for 1998 indicate that large game (caribou and moose) contributed fewer than 84 lb per capita to village residents (Table D-7). Nevertheless, although only about one-third of the households surveyed actually hunted caribou or moose, nearly 92% used these resources, an indication of how much exchange occurred even for a relatively small amount of meat harvested. Subsistence data for Bettles and Evansville combined in 1982 indicate that large game provided nearly 135 edible lb per

capita, while fish contributed nearly as much as 107 edible lb per resident the same year (Table D-8). Harvesting small animals also occurred in 1982, although it contributed little meat and was probably done to obtain skins to sell. In all cases, relatively small percentages of Bettles/Evansville households were involved in the actual harvest of subsistence resources.

The subsistence use area for Bettles/Evansville covers nearly 2,000 mi², with most of the area lying west of the TAPS (Map D-6). Large amounts of the area are used for harvesting fur-bearing animals and hunting moose. Fishing, which also is important to Bettles/Evansville subsistence, occurs relatively close to the two communities, primarily on the John and Koyukuk Rivers. A very small portion of the subsistence use area for Bettles/Evansville intersects the TAPS near PS 5, while another portion includes the south fork of the Koyukuk River downstream of the pipeline.

D.2.3.2.4 Hughes. Hughes is located on a bluff on the eastern bank of the Koyukuk River, some 105 mi west of the TAPS (Map D-1) (ADCED 2001). Located in an area that included Athabascans, Kobuk, Selawik, and Nunamiut, the community of Hughes was founded formally in 1910 as a riverboat landing and supply port for the Indian River gold fields. Its population varied during the 20th century, as gold fields and various economic activities came and went. The most recent decennial census in 2000 recorded 78 people in Hughes (Table D-1).

Subsistence is extremely important to residents of Hughes for economic and cultural reasons. Residents of Hughes harvested a broad range of land mammals, birds, and fish in 1982, the reference year for the community (Table D-9) (Marcotte and Haynes 1984; see also Brannian and Gnath 1988). Overall, Hughes residents harvested nearly 1,500 lb per capita in 1982. Salmon by far contributed the greatest amount of pounds harvested, providing more than 1,234 lb per capita for households surveyed. Ironically, the number of households participating in harvesting was higher for large and small land mammals and birds (and certain other types of fish) than for salmon, although the harvest totals of those species were much lower than those of salmon. Small land mammal and furbearer

harvests were high (in terms of numbers harvested), indicating that trapping played an important role in Hughes subsistence.

The traditional subsistence use area for Hughes covers more than 2,100 mi² well to the west of the TAPS. Although this area does not intersect the TAPS, it does include part of the Koyukuk River downstream of the pipeline — although that section of the area is used primarily for moose rather than fish (Map D-7). The subsistence use area consists of two relatively large areas arranged north-south, with a constriction near its center in the proximity of Hughes itself. Much of the total area is used for furbearers, with a large expanse of river bottom land used for moose hunting. Fishing occurs primarily in discrete sections of the Koyukuk River.

D.2.3.2.5 Manley Hot Springs.

Manley Hot Springs is a small, unincorporated community located about 65 mi west of the TAPS (Map D-1). Lying about 5 mi north of the Tanana River at the end of Elliott Highway, Manley Hot Springs began as a single homestead, supply point for miners, and U.S. Army telegraph station in the early 1900s (ADCED 2001). The hot springs for which the village eventually was named provided the basis for a resort that, mixed with mining and small amounts of government employment, provided a basis for the community's early economy. Wage-based economy eventually faltered, and the population of Manley Hot Springs declined. The total number of inhabitants in 2000 was recorded at 78 (Table D-1).

The current economy of Manley Hot Springs involves employment in diverse areas — such as small businesses, government, and commercial fishing — and involvement in subsistence. Gardening, hunting, and fishing all play important roles in providing food for residents of the village, with salmon and moose being particularly important (Betts 1997; Brannian and Gnath 1988). Specific data on harvest levels, participation rates, and specific subsistence concerns were not available from the ADF&G. However, subsistence data compiled recently for an environmental assessment of road construction in the Manley area indicate that a broad range of large

mammals, small mammals, fish, and birds are exploited (Table D-10) (Betts 1997). Manley Hot Springs residents harvested more than 30,130 salmon in 1995 (more than 386 per person based on 2000 population levels). The residents also harvested 843 whitefish per year and an average of 10.8 moose per year between 1990 and 1995.

The subsistence use area for Manley Hot Springs covers more than 2,800 mi² of Interior Alaska. Although this area does not intersect the TAPS, it does include sections of the Yukon and Tanana Rivers downstream from the pipeline (Map D-8). Large sections of the total subsistence use area are used for moose and small game hunting; the localities used for these resources occasionally are separate from main subsistence use area adjacent to Manley Hot Springs itself. Areas used for salmon fishing include portions of the Yukon and Tanana Rivers, as well as smaller waterways in the vicinity of the village.

D.2.3.2.6 Minto. Minto lies on the western bank of the Tolovana River, about 47 mi south of the TAPS (Map D-1) (ADCED 2001). The precursor of Minto, now called Old Minto, was founded on the Tanana River by members of the Minto band of Athabascans in 1915 (Olson 1981). Gradually, that village grew as a Bureau of Indian Affairs school (founded in 1937) and other amenities attracted members of other bands. The original community was relocated in 1969 after a series of floods (ADCED 2001). In 2000, the population of Minto was 258 people (Table D-1).

Subsistence is extremely important in Minto, providing key resources and serving important sociocultural and ceremonial functions for the largely Alaska Native population. The most important subsistence resource recorded by the ADF&G in 1984 was fish, which yielded more than 860 lb per capita for the households surveyed; of this total, salmon contributed about 687 lb per capita (Table D-11) (Andrews 1988). Many Minto residents were involved in subsistence activities, with nearly all households fishing (often traveling to fish camp during the summer). Large land mammals accounted for nearly 91 lb per capita, with the majority of this being provided by moose. A wide range of small

game hunted or trapped helped to provide both meat and (more importantly) furs to sell for cash. Finally, Minto residents also harvested a large quantity of birds, many coming from Minto Flats immediately to the southeast of the village. Data on sharing are unavailable from the ADF&G survey.

Minto's subsistence use area covers slightly more than 1,300 mi². Most of this area lies well west of the TAPS, although two eastern extensions cross the pipeline slightly north of PS 7, while a larger section includes the Tanana River and associated valley downstream from the pipeline (Map D-9). The geographic configuration of the subsistence use area is quite complicated, as shown in Map D-9. Large expanses are used for moose and furbearers, while smaller portions are associated with bear and waterfowl hunting. The Tanana River, traditionally important for fishing in Old Minto, continues to provide the most important areas for salmon and other fish.

D.2.3.2.7 Rampart. The village of Rampart lies on the south bank of the Yukon River, about 75 mi upstream from its intersection with the Tanana River and about 33 mi south-southwest of the TAPS (Map D-1) (ADCED 2001). Established in 1897 as a supply point on the Yukon River for nearby gold mining operations, the population of Rampart may have reached 10,000 in the first years of the 20th century (Betts 1997). Gold strikes elsewhere depleted the Rampart population just as quickly, and by 1903 only a small Alaska Native community remained amidst the abandoned buildings of a once-thriving frontier settlement. Population varied throughout most of the 20th century, but remained relatively small. In 2000, only 45 people resided in Rampart; closure of the school in 1999–2000 was considered, which if it occurred almost certainly would trigger further decline in population (Table D-1).

Subsistence is the main economic activity in this small village, fulfilling both economic and cultural functions. Data on subsistence use available from ADF&G are less complete for Rampart than they usually are for rural communities. The available data indicate that fishing (mainly salmon and whitefish) and hunting (primarily large game, such as caribou

and moose) provided most of the meat for the community in 1993 (Table D-12; Brannian and Gnath 1988). Lesser amounts of birds and small game, the latter likely used mainly for the furs they provide, completed the subsistence use for Rampart.

The traditional subsistence use area for Rampart covers more than 1,200 mi². Although most of this area lies west of the TAPS, a small extension along the Yukon River intersects the pipeline near PS 6 (Map D-10). The subsistence use area also includes more than 100 mi of the Yukon River downstream of the TAPS. The greatest geographic expanse of subsistence use area involves moose hunting. The most productive subsistence activity, fishing, primarily occurs in the Yukon River and selected tributaries (notably Minook Creek).

D.2.3.2.8 Stevens Village. Stevens Village is located on the northern bank of the Yukon River, about 17 mi upstream from where it crosses the Dalton Highway and 20 mi north of the TAPS (Map D-1) (ADCED 2001). The community was founded in about 1900 by three Athabascan brothers and named after one of them (Old Steven) when he was elected chief in 1902 (Sumida 1988). Although Stevens Village residents provided some services to people involved with the gold rush and received certain modern amenities (e.g., a trading post in the early 1900s, a school in 1907, and a post office in 1936), the population apparently never fluctuated dramatically as did the populations of other nearby communities. In 2000, the decennial census recorded 87 people in Stevens Village (Table D-1).

Most of the economic activity in Stevens Village revolves around subsistence, which also serves key sociocultural and ceremonial functions for the largely Koyukon population. Residents of Stevens Village rely on a broad range of subsistence resources (Table D-13) (Sumida 1988). In 1984, the reference year for this village, fishing provided more than 1,000 lb per capita, with the vast majority coming from salmon (see also Brannian and Gnath 1988). Large land mammals provided much less edible meat per person surveyed, with the majority coming from moose. Stevens Village residents harvested a range of small land mammals,

primarily for fur (although some furbearers, such as muskrat, also were eaten). Birds yielded about 20 edible lb per person. Sharing resources also is important in Stevens Village, despite the high participation in the actual harvesting process, although direct data are limited to certain categories and species.

Residents of Stevens Village use an area in excess of 17,900 mi² for subsistence purposes. The vast majority of this area is east of the TAPS, but a small amount on its western periphery intersects the pipeline, and another section includes a short stretch of the Yukon River downstream of the TAPS (Map D-11). Much of the subsistence use area is used for harvesting land mammals, notably moose and small mammals. The area used for hunting bear is much smaller. Fishing is focused on three stretches of the Yukon River.

D.2.3.2.9 Tanana. The village of Tanana is about 2 mi west of the junction of the Tanana and Yukon Rivers, 83 mi southwest of the TAPS (Map D-1) (ADCED 2001). Located in a prime setting at the confluence of two major rivers in Interior Alaska, Tanana had served as an important trading settlement for Athabascans in the region long before the arrival of Europeans. The introduction of several amenities in and around Tanana in about 1900 (including a school-hospital complex, U.S. Army Fort Gibbon, a post office, and several trading posts) helped to establish Tanana as the dominant community in the region. The village has maintained this role throughout the 20th century and to the present. In 2000, the decennial census recorded 308 inhabitants for Tanana (see Table D-1).

The economy of Tanana is mixed, with a range of wage-labor positions available, both full-time (with the city, village council, or school district) and seasonal (fire fighting, construction, and commercial fishing). However, subsistence continues to play an important role, both economically and as a culturally important activity. Fishing dominated subsistence activities in 1987, the reference year for Tanana, providing more than 1,958 lb per capita. Most of the fish caught were salmon, but other species (notably whitefish) were used as well (Table D-14) (see Andersen 1992; Betts 1997; Case and Halpin

1990). Large land mammals also provided considerable resources, on the order of 141 lb per capita. Although small mammals contributed much less to edible resources, Tanana residents harvested a range of them, presumably for their fur. The majority of households surveyed in 1987 participated in subsistence use of every resource category except small mammals and furbearers. Households using these resources totaled 79% or more for all categories. All of those surveyed used large land mammals.

Although the nearly 3,700-mi² subsistence use area for Tanana does not intersect the TAPS, it does include long stretches of both the Yukon and Tanana Rivers downstream from the pipeline that are used for fishing as well as hunting (Map D-12). Although subsistence resources included a range of terrestrial and riverine resources, the geographic configuration of the subsistence use area has a distinct river orientation. Areas used for moose, bear, and waterfowl cover the greatest geographic expanses.

D.2.3.2.10 Wiseman. Wiseman is a small village located on the western bank of the middle fork of the Koyukuk River, about 1 mi west of both the Dalton Highway and the TAPS (Map D-1). Wiseman began as a single roadhouse built at the intersection of Wiseman Creek and the Middle Fork of the Koyukuk River in the early 1900s. It grew gradually between 1907 and 1912, populated primarily by people who were relocating from nearby Coldfoot to be closer to local gold mines (Northern Land Use Research, Inc. 2000b). Population fluctuated over the years in the wake of continued small-scale gold mining in the area and, more recently, the construction of the TAPS and Dalton Highway from 1974 to 1976 and the formation of Gates of the Arctic National Park and Preserve in 1980. In 2000, the population of Wiseman was only 21 persons (Table D-1).

Very little opportunity for wage labor exists in Wiseman beyond gold mining and limited seasonal work (Scott 1998). As a result, subsistence is an important activity in this community. Available subsistence harvest data from the study by Scott (1998) indicate that most households participate in subsistence, with both hunting and fishing providing key resources.

Because the information in that study was obtained by different methods than those used by the ADF&G, its results are not strictly comparable with the data in other tables in this appendix that show species-specific harvest levels. Wiseman data for 1991 indicate that village residents harvested a range of mammals, fish, and birds (Table D-15). Caribou, hares, grayling, and upland game birds (grouse and ptarmigan) were the most frequently harvested resources in each of the main categories presented in the table. Large game made up only about two-thirds of the harvest that residents felt would be necessary to meet community food requirements. A large section of the subsistence use area for Wiseman intersects the TAPS (Scott 1998).

D.2.3.3 Copper River Basin

The Copper River Basin consists of the southern portion of the Alaskan Interior plateau drained by the Copper River and its tributaries. The region includes Alaska Native villages as well as rural communities inhabited largely by non-Natives. The Alaska Natives who lived in this region at the time of Euro-American contact were Ahtna Athabascans, the people whose sociocultural presence continues to dominate much of the basin. Subsistence in the Copper River Basin emphasizes a combination of fish (particularly salmon) and land mammals (with caribou and moose often the most important in terms of amount harvested), supplemented by small amounts of other resources, such as non-salmon fish, birds and eggs, and marine invertebrates. Heavy reliance on salmon in the Copper River and its tributaries ties much of the subsistence of this region to the ocean waters of south-central Alaska. The EIS discusses subsistence in nine Copper River Basin communities: Chitina, Copper Center, Glennallen, Gakona, Gulkana, Kenny Lake, Paxson, Tazlina, and Tonsina.

D.2.3.3.1 Chitina. The village of Chitina lies on the western bank of the Copper River near its confluence with the Chitina River, about 21 mi east of the TAPS (Map D-1) (ADCED 2001). Likely a home to Copper River Athabascans for centuries, the modern community of Chitina emerged as one terminus

of a railroad to the Kennicott Copper Mine in the early 1900s. Chitina's population grew rapidly in the early 20th century, then plummeted when mine support was relocated to Glennallen in 1938. The 2000 census recorded 123 residents in Chitina (Table D-1).

Although Chitina is located near the Richardson Highway and both year-round and seasonal wage employment opportunities, many village residents practice subsistence (Stratton and Georgette 1984) — testimony to the importance of this activity beyond purely economic functions. Fishing played a particularly important role in village subsistence in terms of pounds harvested, participation (nearly 78% of households), and use (more than 94% of households) in the reference year of 1987 (Table D-16) (see McMillan and Cuccarese 1988; National Park Service 1995). Salmon was by far the most important subsistence resource. Of terrestrial resources, caribou contributed the greatest amount of meat and other material to the Chitina subsistence totals. Despite high levels of participation indicated by participation in actual harvests, exchange of subsistence resources also plays an important role in Chitina — both in giving and receiving resources harvested.

The subsistence use area for Chitina is a complex geographical region covering more than 1,900 mi². Two extended sections of this area intersect the TAPS, one south of the village and one north. The overall subsistence use area consists of one main section near the village, an elongated riverine section along the Gakona and Gulkana Rivers, and an area south of Lake Louise (Map D-13). The first supports primarily moose and sheep hunting, and the other two support primarily caribou hunting. Most fishing occurs at relatively small localities along the Copper River and in nearby lakes and streams.

D.2.3.3.2 Copper Center. Copper Center is located on the western bank of the Copper River, where it joins the Klutina River, only 0.6 mi east of the TAPS (Map D-1) (ADCED 2001). A desirable location at the confluence of two important rivers, the site occupied by Copper Center has a long history of prehistoric and historic settlement. The modern community of Copper Center has its roots largely in the gold

rush and subsequent development of the Kennicott Copper Mine, beginning in the late 1800s. As of 2000, 362 people resided in Copper Center (see Table D-1).

The Copper Center economy is mixed. A variety of local services, businesses, the National Park Service offices for Wrangell-St. Elias National Park, and highway-related tourism provide more opportunities for wage employment than often occur in rural Alaska. However, many residents of Copper Center also practice subsistence, both to obtain important resources and (particularly for Alaska Natives) to maintain an important link with their cultural heritage. Subsistence activities in Copper Center involved a variety of terrestrial and riverine resources in 1987 (Table D-17) (McMillan and Cuccarese 1988; see also Stratton and Georgette 1984; National Park Service 1995; Simeone and Fall 1996). Fish, notably salmon, was the most important resource in terms of edible pounds per capita; more than 90% of the households surveyed used salmon. Caribou and moose each contributed about the same amount of edible pounds per capita, between about 26 and 28 lb, respectively; birds and small game provided much less. Although all of the households surveyed by the ADF&G in 1987 participated in subsistence resource harvests, nearly all also received resources as gifts — testimony of the importance of exchange in subsistence that transcends pure economic considerations.

The subsistence use area for Copper Center extends over more than 6,000 mi² of the Copper River Basin. Much of this area overlaps with the TAPS — notably a nearly 200-mi-length of the Richardson Highway corridor used for hunting moose and caribou (Map D-14). Much of the remaining part of the subsistence use area also is used for moose, caribou, or some combination of the two. Fishing, for both salmon and other species, occurs both in sections of rivers, including sections of the Copper and Gulkana Rivers, and in Klutina Lake. Sections of the subsistence use area used for other resources are depicted in Map D-14.

D.2.3.3.3 Gakona. Gakona is a small community located about 6 mi west of the TAPS, adjacent to the confluence of the Copper and

Gakona Rivers at MP 2 of the Tok Cutoff to the Glenn Highway (Map D-1) (ADF&G 2001). The site of Gakona was originally used for Ahtna Athabascan settlements. As a transportation system developed in the Copper River valley, a non-Native presence began to be seen in Gakona early in the 20th century, initially in the form of roadhouses and a post office (Northern Land Use Research, Inc. 2000a). The population in Gakona was 215 in 2000 (Table D-1), although this number reflects a dispersed settlement along the Tok Cutoff (Northern Land Use Research, Inc. 2000a).

The economy of Gakona relies largely on wages obtained from local businesses and seasonal tourism. Subsistence remains important to residents of Gakona, as demonstrated by the high level of participation in harvest as well as use (and exchange) of subsistence resources. Gakona residents participating in subsistence obtained approximately equal amounts of meat from large land mammals (47.6 edible lb per capita) and fish (40.9 edible lb per capita) in 1987 (Table D-18) (McMillan and Cuccarese 1988; see also National Park Service 1995; Simeone and Fall 1996; Stratton and Georgette 1984). Nearly 86% of the households surveyed used fish and almost 64% used large land mammals obtained from subsistence activities. Such indirect evidence of exchange, coupled with evidence of widespread use, emerges in a village where many other economic options exist and where economic reliance on subsistence resources is relatively low. This situation provides further evidence of the importance of such resources for more subtle sociocultural and ceremonial reasons.

The subsistence use area for Gakona covers nearly 5,300 mi² of the Copper River basin (Map D-15). Portions used for hunting moose, caribou, waterfowl, furbearers, and fish all intersect the TAPS. The largest expanse of the overall subsistence use area is used for harvesting furbearers, particularly west of the pipeline. Fishing occurs in lakes, such as Lake Louise and Susitna Lake, and in about 50 mi of the Gulkana River both upstream and downstream of the TAPS.

D.2.3.3.4 Glennallen. Glennallen is located on the Glenn Highway near its intersection with the Richardson Highway, about 3.5 mi west of the TAPS (Map D-1) (ADCED 2001). Founded in the early 1940s as a camp for U.S. Army troops building a road and airfield (Stratton and Georgette 1984), the population of Glennallen totaled 554 by 2000 (Table D-1).

Largely because of Glennallen's location at the intersection of two major highways and its proximity to Wrangell-St. Elias National Park, community residents have many more opportunities for wage employment than most rural Alaskans. Wage labor provides most of the livelihood in Glennallen, primarily involving work for government agencies (many of which have local headquarters there) and businesses serving the highway tourism industry (ADCED 2001). However, a large percentage of Glennallen residents also conduct subsistence (Table D-19) (McMillan and Cuccarese 1988; see also National Park Service 1995; Simeone and Fall 1996). Glennallen residents harvested a wide range of terrestrial mammals, fish, and birds. Although nearly 92% of the households surveyed harvested some type of subsistence resource and all of the households used them, none of these resources were harvested in large quantities. Fish and large land mammals provided the greatest amounts (54 and 43 edible lb per capita, respectively).

The traditional subsistence use area for Glennallen (recorded with that of Tazlina) covers more than 8,000 mi² in the Copper River basin. This area intersects the TAPS for more than 75 mi along the pipeline. Much of the subsistence use area involves moose and caribou hunting, with smaller areas used for sheep hunting in the mountains east of Glennallen (Map D-16). Fishing occurs in sections of the Gulkana and Copper Rivers that support fishing downstream from the pipeline, as well as lakes such as Lake Klutina, Lake Louise, and Susitna Lake.

D.2.3.3.5 Gulkana. Gulkana is a small village located on the eastern bank of the Gulkana River where it joins the Copper River, about 3 mi east of the TAPS (Map D-1) (ADCED 2001). This village had its origins as an Ahtna Athabascan settlement, of which there were

several along the Gulkana River at various times in the past. Non-Natives began to occupy the locality of present-day Gulkana in 1901 with the establishment of a trading post and telegraph station. Today the village is home to Natives and non-Natives. The total number of residents reached 88 in 2000 (Table D-1).

The village economy is mixed, combining subsistence hunting, fishing, gathering, and trapping with both year-round and seasonal wage employment in government, construction, and other sectors of the cash economy (Northern Land Use Research, Inc. 2000a). In terms of edible pounds harvested, fish contributed about twice as much as large mammals to the Gulkana subsistence economy in 1987 (Table D-20) (McMillan and Cuccarese 1988; see also National Park Service 1995; Simeone and Fall 1996; Stratton and Georgette 1984). Despite the relatively small amounts of subsistence resources harvested, 90% of the households surveyed harvested at least one type of subsistence resource, while 95% of the households used these resources. The greatest participation and use involved fish and large land animals. About half the households examined in 1987 hunted or trapped small mammals, which suggests trapping might play an important role as a means of supplementing cash income.

The area used for subsistence by residents of Gulkana (recorded as identical to the area used by Kenny Lake) covers more than 3,200 mi² in the Copper River basin and small sections of mountains to the east of the village. More than 130 mi of this area overlaps with the TAPS, much of this common land representing moose hunting area extending south along the Richardson Highway corridor (Map D-17). Large expanses, as well as long linear areas (along rivers), are used for caribou and moose hunting. A broad area mainly west of the TAPS also is used for the harvest of furbearing animals. Fishing occurs in the Gulkana River both upstream and downstream from the pipeline. In addition, the subsistence use area for this community includes part of the Copper River downstream from the pipeline, although this portion of the river was used for moose hunting rather than fishing.

D.2.3.3.6 Kenny Lake. Kenny Lake is a small community located about 7 mi east of the TAPS in the central Copper River basin (Map D-1) (ADCED 2001). Although in the past Ahtna Athabascans lived in the vicinity of Kenny Lake, the modern community consists primarily of non-Native people who homesteaded agricultural land there in the 1950s and 1960s. The total population of Kenny Lake in 2000 was 410, having declined from 507 only a decade earlier (Table D-1). The inhabited area comprises a 16-mi length of the Edgerton Highway (Northern Land Use Research, Inc. 2000a).

The economy of Kenny Lake is dominated by wage labor. The majority of employment involves commercial agriculture, but certain small businesses provide jobs as well (ADCED 2001). Subsistence activities also play an important role in the lives of many Kenny Lake residents. Although harvest levels were relatively small, all households surveyed both participated in subsistence use and used subsistence resources (Table D-21) (McMillan and Cuccarese 1998; see also National Park Service 1995). The largest contribution to subsistence was from fishing, in total contributing 83 lb per capita; salmon alone contributed more than 67 lb per person. Nearly 90% of the surveyed households fished, and 98% consumed fish. Large game provided 47 edible lb per person in households surveyed, with moose providing nearly 23 lb and caribou another 17 lb.

The area used for subsistence by residents of Kenny Lake (recorded as identical to the area used by Gulkana) covers more than 3,200 mi² in the Copper River basin and small sections of mountains to the east of the village. More than 130 mi of this area overlap with the TAPS, much of this common land representing moose hunting area extending south along the Richardson Highway corridor (Map D-18). Large expanses, as well as long linear areas (along rivers), are used for caribou and moose hunting. A broad area mainly west of the TAPS also is used for the harvest of furbearing animals. Fishing occurs in the Gulkana River both upstream and downstream from the pipeline. In addition, the subsistence use area for this community includes part of the Copper River downstream

from the pipeline, although this portion of the river was used for moose hunting rather than fishing.

D.2.3.3.7 Paxson. Paxson is a small rural community lying about 4 mi west of the TAPS in the Copper River basin, at the intersection of the Richardson and Denali Highways (Map D-1) (ADCED 2001). Located in an area of considerable prior Athabaskan occupation, Paxson was first occupied during construction of the Valdez-Fairbanks Trail (later the Richardson Highway) in the early 20th century. An initial roadhouse was augmented by a U.S. Army telegraph station, but the community never evolved beyond a small settlement of a few dozen people. In 2000, Paxson's total population was 43 (see Table D-1).

Paxson has a mixed economy, although wage labor is the dominant component as residents take advantage of their proximity to two major highways to work for small local businesses that provide services to travelers or for the government (primarily in highway maintenance). Subsistence serves as an important means of supplementing this rural cash economy. Large land mammals provided the greatest amount of pounds harvested: about 139 lb per capita in the reference year of 1987 (Table D-22) (McMillan and Cuccarese 1988; see also National Park Service 1995). Fish provided slightly fewer pounds harvested, at 107 lb per capita; fish other than salmon provided more pounds harvested (about 63) than did salmon (about 45 lb). Hunting and trapping small mammals provided a relatively small amount of edible resources. Most animals were harvested for fur, presumably to sell for additional cash. More than 92% of the households surveyed in Paxson both harvested and used some sort of subsistence resource, with participation and use rates varying for specific resources.

The area used for subsistence by residents of Paxson covers more than 3,000 mi² of the Copper River Basin. Nearly 70 mi of this subsistence use area intersects the TAPS (Map D-19). Much of the entire harvest area is used for moose and caribou hunting, with a considerable amount also used for harvesting

fur-bearing animals. Fishing occurs in both rivers — including a section of the Gulkana River both upstream and downstream of the TAPS — and in lakes (including Susitna Lake and Lake Louise).

D.2.3.3.8 Tazlina. Tazlina is a small community located on the Tazlina River near its intersection with the Copper River, about 2 mi northeast of the TAPS (Map D-1) (ADCED 2001). Tazlina was originally an Ahnna Athabaskan fish camp, and Alaska Natives had established a permanent village at this location by about 1900. Shortly thereafter, a roadhouse was constructed at Tazlina, and another was built in the late 1920s to take advantage of Tazlina's location on the main trail north to Fairbanks. Copper Valley School, a boarding school built in the village and operated until 1971, provided a basis for some village development. Despite its location on the Richardson Highway, Tazlina never grew very large. Its population in 2000 reached only 149 persons (Table D-1).

In part because of Tazlina's location on a major highway and in part because of its proximity to the largest community in the area (Glennallen, about 5 mi to the north), residents of Tazlina have several opportunities to earn cash income. Wage labor contributes to the livelihood of many in Tazlina, primarily through employment for local businesses or government agencies that date largely to the TAPS period (Northern Land Use Research, Inc. 2000a). Subsistence activities provide additional sources of resources as well as fill key sociocultural and ceremonial roles. Residents of Tazlina harvested approximately 100 lb of animal resources per capita in 1987, the reference year defined by ADF&G (Table D-23) (McMillan and Cuccarese 1988; see also National Park Service 1995; Simeone and Fall 1996; Stratton and Georgette 1985). About 56 lb of this total consisted of fish, with nearly 38 lb of the fish being salmon. Although only 63% of the households surveyed harvested salmon in 1987, nearly 94% consumed it — testifying to the amount of exchange that occurred. Large land mammals made up most of the remaining edible subsistence resources harvested, distributed among six major species (though moose and caribou accounted for most of the harvest). A range of small mammals were also harvested by

Tazlina residents in 1987; the majority of species were taken primarily for their fur.

The traditional subsistence use area for Tazlina (recorded with that of Glennallen) covers more than 8,000 mi² in the Copper River basin. This area intersects the TAPS for more than 75 mi along the pipeline. Much of the subsistence use area involves moose and caribou hunting, with smaller areas used for sheep hunting in the mountains east of Tazlina (Map D-16). Fishing includes sections of the Gulkana and Copper Rivers that support fishing downstream from the pipeline, as well as lakes such as Lake Klutina, Lake Louise, and Susitna Lake.

D.2.3.3.9 Tonsina. Tonsina is a small settlement in the central Copper River basin, located about 2 mi east of the TAPS in the vicinity of PS 12 (Map D-1) (ADCED 2001). The village of Tonsina dates to the beginning of gold mining in the area, at about the turn of the 20th century. A roadhouse was constructed at the current location of Tonsina in about 1900, along the Eagle-Valdez trail. Alaska Natives from the region subsequently relocated to Tonsina, possibly attracted to the roadhouse locality for trading or part-time employment. Despite additional developments, such as a U.S. Army telegraph station (constructed in 1902) and a road connecting it to Chitina (constructed in 1910), Tonsina has not been inhabited continually since its founding (Northern Land Use Research, Inc. 2000a). Much of the growth experienced in Tonsina over the past three decades has been related to the TAPS, a consequence of both construction and continued operation. The 2000 census recorded 92 inhabitants in Tonsina (Table D-1).

Many adults in Tonsina work for wages (ADCED 2001), with employment at PS 12 and on road maintenance crews providing much of the income. Subsistence remains important, however, for economic and noneconomic reasons. Subsistence activities contributed nearly 150 lb per capita to households surveyed in Tonsina in 1987, the representative year for subsistence defined by ADF&G (Table D-24) (McMillan and Cuccarese 1988; see also National Park Service 1995). The amount of pounds per capita harvested were split almost

equally between large land mammals and fish. Caribou and moose composed most of the large mammals by weight, although harvests included seven species in 1987. Nearly 70% of the households surveyed participated in large game harvests, with more than 90% using the resources obtained through the process of exchanging important subsistence resources. By weight, the vast majority of the fish harvested consisted of salmon; more than 83% of the households surveyed harvested fish, while nearly 92% used fish. Tonsina residents also harvested a wide range of small mammals and furbearers.

The subsistence use area for Tonsina covers more than 6,000 mi² of the Copper River basin and neighboring mountains to the east. The TAPS runs through the central portion of this area (Map D-20). The overall configuration of the subsistence use area for Tonsina resembles a series of discrete localities rather than a continuous region. Village residents use much of the area for moose and sheep hunting, with localities exploited for other terrestrial animals and fish more limited in extent. Rivers used for fishing include sections of the Copper, Gulkana, Little Tonsina, and Tiekkel, either near or downstream from the TAPS.

D.2.3.4 Prince William Sound and Lower Cook Inlet

Prince William Sound comprises the body of water along the coast of south-central Alaska extending from Cape Puget in the west to Cape Hinchinbrook in the east. The lower Cook Inlet in the present context refers to the marine setting south of Kachemak Bay, on the Kenai Peninsula's most southern reaches. Alaska Natives traditionally associated with the coasts of these bodies of water in south-central Alaska include the Chugach Alutiiq and Eyak, although currently many non-Natives also inhabit the region. Subsistence in these south-central Alaskan coastal communities typically involves a range of marine, riverine, and terrestrial animals, with resources from water environments tending to be most important in terms of total pounds harvested. The EIS discusses subsistence in three Prince William Sound communities — Chenega Bay, Cordova (which includes the

Native Village of Eyak), and Tatitlek. It also examines subsistence in Nanwalek and Port Graham, neighboring communities on the coast of the lower Cook Inlet. These communities all share broadly common ecological locations, providing them access to both terrestrial and marine subsistence resources.

D.2.3.4.1 Chenega Bay. Chenega Bay is a small, unincorporated community located on Evans Island in Prince William Sound about 85 mi southwest of the Valdez Marine Terminal (Map D-1) (ADCED 2001). The original Alutiiq village of Chenega, located at the southern tip of Chenega Island, was destroyed by the 1964 earthquake. The current location was settled in 1984. The population of Chenega Bay was 86 in 2000 (Table D-1) (ADCED 2001).

The residents of Chenega Bay harvest a wide range of land and marine mammals, fish, birds, and marine invertebrates for subsistence purposes (Table D-25) (Fall and Utermohle 1999; see also Fall and Utermohle 1995; Stratton and Chisum 1986). Marine resources play a particularly important role. More than 95% of the households were involved in subsistence fishing, and all households consumed fish. Nearly 74% of surveyed households collected marine invertebrates, and more than 91% of the households consumed resources in this category. Chenega Bay residents also harvested and used marine mammals (particularly seals), although at lower rates than they obtained and used fish and invertebrates. Sharing is an important feature of Chenega Bay subsistence, particularly so in the case of terrestrial mammals, with many more households using this resource than actually harvested them.

The subsistence patterns in Chenega Bay can be placed in historic context dating to shortly after statehood. On the basis of 1984–1986 data (pre-Exxon Valdez oil spill), per capita harvests appear to have declined substantially (42%) from levels in the 1960s. Reasons proposed for the decline included changing regulations and reduced resource levels (Stratton and Chisum 1986).

The traditional subsistence use area for Chenega Bay cover about 380 mi² and occurs primarily in western Prince William Sound. Most

of this area lies more than 50 mi west of the Valdez Marine Terminal, but small portions also occur closer to the south and east of the terminal (Map D-21) (see also Ganley 2001; Ganley and Wheeler 2000). Chenega Island and several neighboring islands provided much of the subsistence use area for terrestrial resources, while fishing occurred in a few well-defined areas near Chenega Island.

D.2.3.4.2 Cordova (and Eyak). Cordova is a small community located about 35 mi south-southeast of the TAPS, in the eastern part of Prince William Sound (Map D-1) (ADCED 2001). This community was founded in 1909 as the southern terminus of the Copper River and Northwest Railroad. Eyak, one of the 21 villages identified by the BLM (2001) as likely to be affected by the TAPS, refers to a locality lying about 5 mi southeast of central Cordova. At one time a separate Alaska Native settlement, Eyak was annexed by Cordova in 1992. The Native Village of Eyak refers to a federally recognized Tribe with offices currently located in Cordova. The population of Cordova was 2,454 in 2000, while that of Eyak (designated an Alaska Native Village Statistical Area by the U.S. Bureau of Census) was 168 in the same year (see Table D-1).

Much of the economy of Cordova is wage-based, relying primarily on commercial fishing and fish processing (ADCED 2001). Despite this availability of wage employment, subsistence continues as an extremely important activity to many residents in Cordova, both Alaska Natives and non-Natives. As in other coastal communities, the range of resources harvested in Cordova is quite broad. For instance, more than 100 species were used in 1992 (Stratton 1992). Harvest levels are lower in terms of per capita pound harvested than in other communities on Prince William Sound that have relatively large Alaska Native populations, such as Chenega Bay and Tatitlek. Fishing was by far the most important subsistence activity in Cordova in 1997, contributing more than 105 lb per capita and involving nearly 94% of the households surveyed (see Table D-26). Hunting large land mammals also involved relatively many Cordova households (77.1% of those surveyed), with deer and moose each

contributing more than 21 lb per capita to the diet.

The subsistence use area for Cordova covers more than 2,850 mi², stretching from Port Wells and the eastern shore of the Kenai Peninsula in the west to Cape Suckling in the east (Map D-22). This area includes a complex combination of islands in Prince William Sound, marine locations, shoreline and upland areas on the mainland, and rivers and streams on the mainland. Much of the terrestrial area defined by Cordova residents in the late 1980s is used for deer hunting. Salmon are harvested from mainland waterways to the east and west of Cordova (and Eyak), including the Copper River delta to the east. Note that the area on Map D-22 showing salmon use areas depicts drainages as opposed to individual streams and rivers.

D.2.3.4.3 Nanwalek. Nanwalek lies at the southern tip of the Kenai Peninsula, about 252 mi west of the TAPS (Map D-1) (ADCED 2001). Originally the site of a Russian trading post called Alexandrovsk, Nanwalek is primarily an Alutiiq village today. In 2000, the decennial census recorded a population of 177 (see Table D-1).

The economy of Nanwalek is mixed, combining subsistence activities and wage labor. Some wage employment is available in or near the village, mainly through seasonal work at the Port Graham Cannery and in commercial fishing. Nevertheless, subsistence remains extremely important to this rural village, its economic role augmented by sociocultural and ceremonial functions. One of the most noteworthy characteristics of subsistence in Nanwalek is the broad range of marine and terrestrial resources harvested by village residents (Table D-27). A marine adaptation is evident in harvest patterns, with fish as a whole providing nearly 200 edible lb per capita. All households surveyed participated in subsistence fishing and used fish for food. Marine mammals (primarily seals) also provide a source of subsistence for Nanwalek residents, as do large land mammals and marine invertebrates. Residents of Nanwalek share many subsistence resources — particularly marine mammals and terrestrial mammals — with the percentage of

households using these resources greatly exceeding the percentage harvesting them.

The subsistence use area for Nanwalek (and Port Graham) covers slightly more than 175 mi², the vast majority lying on the tip of the Kenai Peninsula and the end of Kachemak Bay (Map D-23). The areas used for moose and bear hunting cover the largest areas on land. Areas used for harvesting marine invertebrates and marine mammals, not shown on Map D-23, are in the waters off of the Kenai Peninsula.

D.2.3.4.4 Port Graham. Port Graham is a small fishing community located at the southern end of the Kenai Peninsula, about 223 mi southwest of the Valdez Marine Terminal on the shore of Port Graham (Map D-1) (ADCED 2001). Originally settled by Russians in the 19th century, Port Graham was also the location of a failed coal mine before commercial fishing activities began in the early 1900s. A fish cannery, originally established in 1911 and rebuilt in the late 1900s, has traditionally dominated the village economy. In 2000, Port Graham contained 171 people (see Table D-1).

The economy of Port Graham is mixed (Stanek 1985). Wage employment is available in the nearby cannery and hatchery, and 15 residents held commercial fishing licenses in 2000. However, subsistence remains extremely important both to the village economy and for sociocultural and ceremonial reasons. Residents of Port Graham harvested a broad range of resources, especially marine resources. In 1997, fish provided nearly 220 edible lb per capita (Table D-28). Marine invertebrates and marine mammals, in turn, contributed 13 and 9 edible lb per capita, with terrestrial mammals and birds completing the village subsistence sources. Almost the entire community participated in subsistence fishing, and all households used fish. Large proportions of the community also used marine invertebrates and marine mammals, although only the former were harvested by large numbers of households. Sharing subsistence resources was evident for many Port Graham households, particularly in the case of marine and terrestrial mammals (which were not harvested in particularly large quantities), reflecting a sociocultural role of subsistence in this small village.

The subsistence use area for Port Graham (and Nanwalek) covers slightly more than 175 mi², the vast majority lying on the tip of the Kenai Peninsula and the end of Kachemak Bay (Map D-23). The areas used for moose and bear hunting cover the largest areas on land. Areas used for harvesting marine invertebrates and marine mammals, not shown on Map D-23, are in the waters off of the Kenai Peninsula.

D.2.3.4.5 Tatitlek. Tatitlek is located on the Alaska mainland, on the shore of Prince William Sound in an area called the Tatitlek Narrows, about 17 mi southwest of the Valdez Marine Terminal (Map D-1) (ADCED 2001). It is a historic Alutiiq village that residents moved to its present location in about 1900. Following the 1964 earthquake and tsunami, many residents of Chenega moved to Tatitlek. In 2000, the decennial census recorded 107 people living in Tatitlek (Table D-1).

Subsistence is important to this Alaska Native village, providing important resources, a connection to traditional culture, a means of establishing and maintaining sociocultural links, and a basis for much ceremonial and spiritual life (see Fall 1991). Residents of Tatitlek harvested a wide range of marine and land resources in 1997, the representative year for subsistence identified by ADF&G (Table D-29) (Fall 1991; Stratton 1992; Stratton et al. 1996). Marine resources — notably marine mammals and fish — contributed the greatest amounts of food to the households surveyed, accounting for 165 and 159 lb per capita, respectively. Although only half the households surveyed harvested marine mammals and three-fourths harvested fish, nearly 94% used marine mammals and all households consumed fish — evidence of the amount of exchange that occurred in this small community. Marine invertebrates, birds, and bird eggs also served as subsistence resources. Small land mammals were harvested much less often and only by a small percentage of community residents, apparently for fur. Findings on the breadth of resources harvested were consistent with earlier research on the same community, although the data for different years demonstrate that considerable variability is possible, even between successive harvest years (Tomrdle and Miraglia 1993; see also Stratton 1992).

The traditional subsistence use area for Tatitlek covers nearly 350 mi² in Prince William Sound and on surrounding land. Although this area does not intersect the TAPS, it does include several localities in Prince William Sound close to the Valdez Marine Terminal (Map D-24) (see also Ganley 2001; Ganley and Wheeler 2000). Use areas for salmon, the only localities for marine species shown in Map D-24, occur as close as 2.6 mi from the terminal. The largest portion of the subsistence use area shown on the map is that used for deer, occurring on several islands in Prince William Sound as well as near the coast on the mainland.

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TABLE D-2 Subsistence Harvest Summary for Anaktuvuk Pass in 1993^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>Terrestrial Mammals</i>						
Large land mammal	574	67,713	846.4	219.4	42.5	NA ^b
Caribou	574	67,713	846.4	219.4	42.5	NA

^a Number of households in sample was 80; number of households in communities was 80.

^b NA = data not available.

Source: ADF&G (2001).

TABLE D-3 Subsistence Harvest Summary for Nuiqsut in 1993^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Total Resources	267,818 ^b	267,818	2,943.1	741.8	90.3	100.0
Marine Mammals						
Total marine mammal	113	85,216	936.4	236.0	37.1	96.8
Bowhead whale	3	76,906	845.1	213.0	4.8	96.8
Polar bear ^c	1	0	0.0	0.0	1.6	51.6
Seal	109	8,310	91.3	23.0	35.5	71.0
Terrestrial Mammal						
Large land mammal	691	87,306	959.4	241.8	74.2	98.4
Brown bear	10	734	8.1	2.0	8.1	32.3
Caribou	672	82,169	903.0	227.6	74.2	98.4
Moose	9	4,403	48.4	12.2	9.7	69.4
Small land mammal/furbearer ^d	599	84	0.9	0.2	41.9	53.2
Arctic fox ^c	203	— ^e	—	—	12.9	16.1
Parka squirrel	336	84	0.9	0.2	16.1	17.7
Red fox ^c	63	—	—	—	22.6 ^f	27.4 ^f
Weasel ^c	10	—	—	—	3.2	3.2
Wolf ^c	31	—	—	—	11.3	21.0
Wolverine ^c	19	—	—	—	16.1	22.6
Fishes						
Total fish	71,897	90,490	994.4	250.6	80.6	100.0
Total salmon	272	1,009	11.1	2.8	35.5	71.0
Total non-salmon	71,626	89,481	983.3	247.8	79.0	96.8
Burbot	1,416	5,949	65.4	16.5	56.5	79.0
Char	618	1,748	19.2	4.8	32.3	50.0
Cod	62	7	0.1	-	6.5	12.9
Grayling	4,515	4,063	44.7	11.3	64.5	79.0
Smelt	304	42	0.5	0.1	12.9	33.9
Whitefish	64,711	77,671	853.5	215.1	74.2	95.2
Birds						
Total bird and egg	3,558	4,325	47.5	12.0	75.8	95.3
Migratory bird	2,238	3,540	38.9	9.8	72.6	87.1
Duck	772	1,152	12.7	3.2	38.7	62.9
Goose	1,459	2,314	25.4	6.4	72.6	87.1
Swan	7	73	0.8	0.2	8.1	11.3
Upland game bird	973	681	7.5	1.9	45.2	59.7
Ptarmigan	973	681	7.5	1.9	45.2	59.7
Bird egg	346	104	1.1	0.3	19.4	40.3

See next page for footnotes.

TABLE D-3 (Cont.)

- a Number of households in sample was 62; number of households in community was 91.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Not eaten.
- d Some not eaten.
- e “—” = 0 or a number that rounds to 0.
- f Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001).

TABLE D-4 Subsistence Harvest Summary for Alatna in 1998^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>Terrestrial Mammals</i>						
Large land mammal	16	4,130	413.0	153.0	70.0	100.0
Moose	5	2,700	270.0	100.0	60.0	100.0
Caribou	11	1,430	143.0	53.0	30.0	100.0

- ^a Number of households in sample was 10; number of households in community was 10.

Source: ADF&G (2001).

TABLE D-5 Subsistence Harvest Summary for Allakaket/Alatna in 1982^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	138,242 ^b	138,242	3,544.7	905.6	NA ^c	NA
Terrestrial Mammals						
Large land mammal	66	18,044	462.7	118.2	NA	NA
Black bear	23	1,357	34.8	8.9	37.1	NA
Caribou	6	724	18.6	4.7	5.7	NA
Dall sheep	6	362	9.3	23.7	11.4	NA
Moose	31	15,600	400.0	102.2	77.1	NA
Small land mammal/furbearer ^d	2,895	3,622	92.9	23.8	NA	NA
Beaver	256	2,255	57.8	14.8	65.7	NA
Fox ^e	99	— ^f	—	—	34.3	NA
Hare	911	1,367	35.1	9.0	80.0	NA
Land otter ^e	4	—	—	—	5.7	NA
Lynx ^e	150	—	—	—	54.0	NA
Marten ^e	1,195	—	—	—	80.0	NA
Muskrat ^e	140	—	—	—	31.4	NA
Wolf ^e	2	—	—	—	5.7	NA
Wolverine ^e	4	—	—	—	11.4	NA
Fishes						
Total fish	24,187	111,689	2,863.9	731.7	NA	NA
Total salmon	13,170	84,641	2,170.3	554.5	NA	NA
Total non-salmon	11,017	27,048	693.6	177.2	NA	NA
Burbot	65	155	4.0	1.0	8.6	NA
Grayling	1,826	1,278	32.8	8.4	54.3	NA
Pike	447	1,252	32.1	8.2	40.0	NA
Sheefish	2,731	19,118	490.2	125.2	68.6	NA
Sucker	535	374	9.6	2.5	37.1	NA
Whitefish	5,413	4,871	124.9	31.9	71.2	NA
Birds						
Total bird and egg	1,658	3,766	96.6	24.7	NA	NA
Migratory bird	1,396	3,635	93.2	23.8	NA	NA
Duck	956	1,434	36.8	9.4	80.0	NA
Goose	440	2,201	56.4	14.4	77.1	NA
Upland game bird	262	131	3.4	0.9	NA	NA
Grouse	90	45	1.2	0.3	37.1	NA
Ptarmigan	172	86	2.2	0.6	45.7	NA

See next page for footnotes.

TABLE D-5 (Cont.)

- a Number of households in sample was 35; number of households in communities was 39.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c NA = data not available.
- d Some not eaten.
- e Not eaten.
- f “_” = 0 or a number that rounds to 0.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-6 Subsistence Harvest Summary for Allakaket in 1998^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>Terrestrial Mammals</i>						
Large land mammal	91	26,496	434.4	138.9	58.2	100.0
Black bear	11	1,109	18.2	5.8	12.7	98.2
Caribou	43	5,623	92.2	29.5	25.5	100.0
Moose	37	19,764	324.0	103.6	50.9	100.0

- ^a Number of households in sample was 55; number of households in community was 61.

Source: ADF&G (2001).

TABLE D-7 Subsistence Harvest Summary for Evansville in 1998^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>Terrestrial Mammals</i>						
Large land mammal	8	2,345	167.5	83.8	33.3	91.7
Caribou	4	455	32.5	16.3	16.7	66.7
Moose	4	1,890	135.0	67.5	25.0	91.7

- ^a Number of households in sample was 12; number of households in community was 14.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-8 Subsistence Harvest Summary for Bettles/Evansville in 1982^{a,b}

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	16,903 ^c	16,903	676.1	260.1	NA ^d	NA
Terrestrial Mammals						
Large land mammal	37	8,740	349.6	134.5	NA	NA
Black bear	6	363	14.5	5.6	25.0	NA
Brown bear	1	176	7.1	2.7	5.0	NA
Caribou	14	1,788	71.5	27.5	15.0	NA
Dall sheep	3	163	6.5	2.5	5.0	NA
Moose	13	6,250	250.0	96.2	35.0	NA
Small land mammal/furbearer ^e	585	555	22.3	8.6		NA
Beaver	14	121	4.9	1.9	15.0	NA
Coyote ^f	1	-9	-	-	5.0	NA
Fox ^f	25	-	-	-	20.0	NA
Hare ^f	289	434	17.4	6.7	35.0	NA
Lynx ^f	38	-	-	-	30.0	NA
Marten ^f	193	-	-	-	25.0	NA
Muskrat ^f	16	-	-	-	15.0	NA
Wolverine ^f	9	-	-	-	15.0	NA
Fishes						
Total fish	1,910	6,979	279.2	107.3	NA	NA
Total salmon	676	4,260	170.4	65.5	25.0 ^h	NA
Total non-salmon	1,234	2,718	108.8	41.7	NA	NA
Grayling	614	430	17.2	6.6	70.0	NA
Pike	16	45	1.8	0.7	15.0	NA
Sheefish	265	1,855	74.2	28.5	20.0	NA
Trout	76	152	6.1	2.3	15.0	NA
Whitefish	263	236	9.5	3.6	10.0	NA
Birds						
Total bird and egg	94	159	6.4	2.6	NA	NA
Migratory bird	60	143	5.7	2.3	NA	NA
Duck	45	68	2.7	1.1	15.0	NA
Goose	15	75	3.0	1.2	10.0	NA
Upland game bird	34	16	0.7	0.3	NA	NA
Grouse	9	3	0.2	0.1	10.0	NA
Ptarmigan	25	13	0.5	0.2	25.0	NA

See next page for footnotes.

TABLE D-8 (Cont.)

- a Number of households in sample was 20; number of households in community was 25.
- b Data reported for "Bettles/Evansville." Data reported solely for Evansville (1997, 1998, and 1999) only reported large terrestrial mammal harvests and did not include a "representative year" for harvest levels.
- c Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- d NA = data not available.
- e Some not eaten.
- f Not eaten.
- g "-" = 0 or a number that rounds to 0.
- h Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-9 Subsistence Harvest Summary for Hughes in 1982^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	141,689 ^b	141,689	6,440.4	1,492.3	NA ^c	NA
Terrestrial Mammals						
Large land mammal	56	20,113	914.2	211.8	78.9 ^d	NA
Black bear	17	1,007	45.8	10.6	52.6	NA
Moose	38	19,105	868.4	201.2	78.9	NA
Small land mammal/furbearer ^e	1,121	1,551	70.5	16.3	89.5 ^d	NA
Beaver	113	998	45.4	10.5	63.2	NA
Hare	368	552	25.1	5.8	5.8 ¹	NA
Land otter ^f	5	- ^g	-	-	10.5	NA
Lynx ^f	63	-	-	-	52.6	NA
Marten ^f	470	-	-	-	84.2	NA
Muskrat ^f	47	-	-	-	42.1	NA
Wolverine ^f	7	-	-	-	21.0	NA
Fishes						
Total fish	21,745	117,180	5,326.4	1,234.1	84.2 ^d	NA
Total salmon	16,939	110,356	5,016.1	1,162.3	68.4 ^d	NA
Total non-salmon	4,806	6,825	310.2	71.9	84.2 ^d	NA
Burbot	69	167	7.6	1.6	10.5	NA
Grayling	1,593	1,115	50.7	11.7	84.2	NA
Pike	244	684	31.1	7.2	52.6	NA
Sheefish	371	2,594	117.9	27.3	78.9	NA
Sucker	57	39	1.8	0.4	31.6	NA
Whitefish	2,472	2,226	101.6	23.4	-	NA
Birds						
Total bird and egg	1,079	2314	105.2	24.4	78.9 ^d	NA
Migratory bird	849	2198	99.9	23.2	78.9 ^d	NA
Duck	585	878	39.9	9.3	78.9	NA
Goose	264	1320	60.	13.9	73.7	NA
Upland game bird	230	116	5.3	1.2	68.4 ^d	NA
Grouse	139	70	3.2	0.7	68.4	NA
Ptarmigan	91	46	2.1	0.5	52.6	NA

See next page for footnotes.

TABLE D-9 (Cont.)

- ^a Number of households in sample was 19; number of households in communities was 22.
- ^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- ^c NA = data not available.
- ^d Data not recorded; value reported is the maximum of those recorded for subcategories.
- ^e Some not eaten.
- ^f Not eaten.
- ^g “–” = 0 or a number that rounds to 0.

Source: ADF&G (2001).

**TABLE D-10 Subsistence Resources
Harvested by Residents in the Manley
Hot Springs and Eureka Area in 1996^a**

Subsistence Resource	Amount Harvested
<i>Terrestrial Mammals</i>	
Large land mammal	NA ^a
Black bear	NA
Caribou	NA
Moose	NA
Small land mammal/furbearer	NA
Beaver	NA
Fox	NA
Hare	NA
Land otter	NA
Lynx	NA
Marten	NA
Mink	NA
Muskrat	NA
Porcupine	NA
Squirrel	NA
Weasel	NA
Wolf	NA
Wolverine	NA
<i>Fishes</i>	
Total fish	NA
Total salmon	NA
Total non-salmon	NA
Burbot	NA
Char	NA
Grayling	NA
Greenling (Lingcod)	NA
Pike	NA
Sheefish	NA
Whitefish	NA
<i>Birds</i>	
Total bird and egg	NA
Migratory bird	NA
Crane	NA
Duck	NA
Goose	NA
Upland game bird	NA
Grouse	NA
Ptarmigan	NA

^a NA = data not available.

Source (for species harvested): Betts (1997).

TABLE D-11 Subsistence Harvest Summary for Minto in 1984^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	190,619 ^b	190,619	3,971.2	1,015.4	95.6	NA ^c
Terrestrial Mammals						
Large land mammal	36	16,987	353.9	90.5	86.7	NA
Black bear	16	2,800	58.3	14.9	20.0	NA
Moose	20	14,187	295.6	75.6	40.0	NA
Small land mammal/furbearer ^d	1,502	5,861	122.1	31.2	84.4	NA
Beaver	147	4,122	85.9	22.0	36.0	NA
Fox ^e	20	— ^f	—	—	22.0	NA
Hare	389	1,090	22.7	5.8	60.0	NA
Land otter ^e	16	—	—	—	11.0	NA
Lynx ^e	4	—	—	—	7.0	NA
Marten ^e	299	—	—	—	47.0	NA
Mink ^e	26	—	—	—	13.0	NA
Muskrat	569	398	8.3	2.1	40.0	NA
Porcupine	13	251	5.2	1.3	18.0	NA
Weasel ^e	18	—	—	—	9.0	NA
Wolf ^e	1	—	—	—	2.0	NA
Fishes						
Total fish	36,218	161,510	3364.8	860.2	88.9	NA
Total salmon	24,372	128,891	2685.22	686.6	77.8	NA
Total non-salmon	11,846	32,619	679.6	173.8	73.3	NA
Burbot	151	515	10.7	2.7	31.0	NA
Pike	3,203	14,414	300.3	76.8	60.0	NA
Sheefish	381	2,285	47.6	12.2	27.0	NA
Sucker	1,634	2,451	51.1	13.1	40.0	40.0
Whitefish	6,477	12,954	269.9	69.0	69.0	69.0
Birds						
Total bird and egg	2,428	4,832	100.7	25.8	84.4	NA
Migratory bird	1,846	4,541	94.6	24.2	82.2	NA
Duck	1,339	2,008	41.8	10.7	82.0	NA
Goose	507	2,533	52.8	13.5	64.0	NA
Upland game bird	582	291	6.1	1.6	73.0	NA

See next page for footnotes.

TABLE D-11 (Cont.)

- a Number of households in sample was 45; number of households in community was 48.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c "NA" = data not available.
- d Some not eaten.
- e Not eaten.
- f "-" = 0 or a number that rounds to 0.

Source: ADF&G (2001).

TABLE D-12 Subsistence Harvest Summary for Rampart in 1993^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>All Resources</i>	5,141 ^b	28,666	NA ^c	NA	NA	NA
<i>Terrestrial Mammals</i>						
Large land mammal	7	2,110	NA	NA	NA	NA
Black bear	1	100	NA	NA	NA	NA
Caribou	3	390	NA	NA	NA	NA
Moose	3	1,620	NA	NA	NA	NA
Small land mammal/furbearer ^d	30	19	NA	NA	NA	NA
Beaver	1	9	NA	NA	NA	NA
Fox ^e	1	— ^f	NA	NA	NA	NA
Hare	3	6	NA	NA	NA	NA
Lynx ^e	1	—	NA	NA	NA	NA
Marten ^e	24	—	NA	NA	NA	NA
<i>Fishes</i>						
Total fish	5,044	26,495	NA	NA	NA	NA
Total salmon	2,766	22,512	NA	NA	NA	NA
Total non-salmon	2,278	3,684	NA	NA	NA	NA
Burbot	4	10	NA	NA	NA	NA
Grayling	143	100	NA	NA	NA	NA
Sheefish	47	258	NA	NA	NA	NA
Whitefish	2,084	3,616	NA	NA	NA	NA
<i>Birds</i>						
Total bird and egg	60	42	NA	NA	NA	NA
Upland game bird	60	42	NA	NA	NA	NA
Grouse	57	40	NA	NA	NA	NA
Ptarmigan	3	2	NA	NA	NA	NA

^a Number of households in sample, and number of households in community, were not recorded.

^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.

^c "NA" = data not available.

^d Some not eaten.

^e Not eaten.

^f "—" = 0 or a number that rounds to 0.

Source: ADF&G (2001).

TABLE D-13 Subsistence Harvest Summary for Stevens Village in 1984^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	102,485 ^b	102,485	3,416.2	1,138.7	100.0	NA ^c
Terrestrial Mammals						
Large land mammal ^d	26	6,600	220.0	73.3	46.7	NA
Black bear	17	1,700	56.7	18.9	40.0	NA
Brown bear ^e	2	— ^f	—	—	6.7	NA
Moose	7	4,900	163.3	54.4	20.0	NA
Small land mammal/furbearer ^d	1,856	1,856	61.9	20.6	73.3	NA
Beaver	14	210	7.0	2.3	13.3	NA
Fox ^e	40	—	—	—	30.0	NA
Hare	206	412	13.7	4.6	56.7	NA
Land otter ^e	1	—	—	—	3.3	NA
Lynx ^e	26	—	—	—	26.7	NA
Marten ^e	432	—	—	—	46.7	NA
Mink ^e	8	—	—	—	10.0	NA
Muskrat	950	950	31.7	10.6	53.3	NA
Porcupine	3	24	0.8	0.3	10.0	NA
Wolverine ^e	4	—	—	—	3.3	NA
Fishes						
Total fish	92,104	92,104	3,070.1	1,023.4	83.3	NA
Total salmon	82,950	82,949	2,765.0	921.7	73.3	NA
Total non-salmon	9,155	9,155	305.2	101.7	80.0	NA
Burbot	80	280	9.3	3.1	40.0	NA
Grayling	5	4	0.1	—	3.3	NA
Pike	730	2,555	85.2	28.4	66.7	NA
Sheefish	239	1,434	47.8	15.9	46.7	NA
Sucker	53	111	3.7	1.2	23.3	NA
Whitefish	2,511	4,771	159.0	53.0	73.3	NA
Birds						
Total bird and egg	1,761	1,761	58.7	19.6	90.0	NA
Migratory bird	609	1,543	51.4	17.1	76.7	NA
Crane	9	90	3.0	1.0	13.3	NA
Duck	442	663	22.1	7.4	70.0	NA
Goose	158	790	26.3	8.8	73.3	NA
Upland game bird	311	218	7.3	2.4	76.7	NA
Grouse	262	183	6.1	2.0	76.7	NA
Ptarmigan	49	34	1.1	0.4	20.0	NA

See next page for footnotes.

TABLE D-13 (Cont.)

- a Number of households in sample was 30; number of households in community was 30.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c "NA" = data not available.
- d Some not eaten.
- e Not eaten.
- f "—" = 0 or a number that rounds to 0.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-14 Subsistence Harvest Summary for Tanana in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	745,940 ^b	745,940	5,827.7	2,157.2	92.2	100.0
Terrestrial Mammals						
Large land mammal	137	48,604	379.7	140.6	68.3	100.0
Black bear	38	3,634	28.4	10.5	14.3	24.8
Brown bear	2	960	7.5	2.8	1.9	3.8
Caribou	40	3,961	30.9	11.5	12.1	30.2
Moose	57	40,050	312.9	11.8	35.1	100.0
Small land mammal/furbearer ^c	2,658	13,350	104.3	38.6	41.0	79.5
Beaver	379	11,357	88.7	32.8	12.8	57.4
Fox ^d	29	— ^e	—	—	11.5	12.4
Hare	891	1,781	13.9	5.2	32.6	43.8
Land otter ^d	14	—	—	—	2.8	3.7
Lynx ^d	34	—	—	—	9.0	12.7
Marten ^d	1,175	—	—	—	21.2	21.2
Mink ^d	37	—	—	—	6.2	6.2
Muskrat	64	167	1.3	0.5	5.3	6.2
Porcupine	6	44	0.4	0.1	4.3	8.1
Wolf ^d	5	—	—	—	3.7	5.6
Wolverine ^d	6	—	—	—	2.8	2.8
Fishes						
Total fish	119,394	677,209	5,290.7	1,958.4	76.7	93.2
Total salmon	86,554	553,266	4,322.4	1600.0	67.4	93.2
Total non-salmon	32,840	123,943	968.3	358.4	63.6	75.7
Burbot	370	370	2.9	1.1	26.7	22.7
Char	12	30	.2	0.1	0.9	0.9
Grayling	626	313	2.5	0.9	28.0	29.9
Pike	1,059	1,588	12.4	4.6	27.4	28.3
Sheefish	5,250	34,127	266.6	98.7	30.1	32.0
Sucker	605	302	2.4	0.9	12.2	12.2
Whitefish	24,918	87,212	681.3	252.2	32.0	50.9
Birds						
Total birds and egg	3,517	5,688	44.4	16.5	86.0	91.3
Migratory bird	1,424	3,710	29.0	10.7	45.4	64.6
Duck	794	1,191	9.1	3.4	36.7	55.0
Crane	12	47	0.4	0.1	3.4	3.4
Goose	618	2471	19.3	7.2	45.4	59.4
Upland game bird	2,094	1978	15.5	5.7	77.3	80.7
Grouse	1,515	1,515	11.8	4.4	77.3	80.7
Ptarmigan	579	463	3.6	1.3	77.3	80.7

See next page for footnotes.

TABLE D-14 (Cont.)

- a Number of households in sample was 45; number of households in community was 128.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “—” = 0 or a number that rounds to 0.

Source: ADF&G (2001).

TABLE D-15 Subsistence Harvest Summary for Wiseman in 1991^a

Subsistence Resource	Number Harvested	Preferred Total Community Harvest ^a
<i>Terrestrial Mammals</i>		
Large land mammal	20	31
Black bear	0	2
Caribou	10	12
Dall sheep	7	8
Grizzly bear	0	1
Moose	3	8
Small land mammal/furbearer	70	NA ^b
Hare	53	NA
Marmot	— ^c	NA
Porcupine	—	NA
Squirrel	17	NA
<i>Fishes</i>		
Total fish	200	NA
Total salmon ^d	31	NA
Total non-salmon	169	NA
Burbot	5	NA
Grayling	131 ^e	NA
Pike	8	NA
Sheefish ^d	6	NA
Trout	19	NA
<i>Birds</i>		
Total bird and egg	200	NA
Migratory bird	31	NA
Duck	17	NA
Goose	14	NA
Upland game bird	169	NA
Grouse	96	NA
Ptarmigan	73	NA

^a Reflects harvest levels desired to meet food requirements.

^b NA = data not available.

^c “—” = 0 or a number that rounds to 0.

^d Nonlocal harvest.

^e Actual number reported as range, 128–133; value shown is an average, rounded to the nearest whole fish.

Source: Compiled from data in Scott (1998).

TABLE D-16 Subsistence Harvest Summary for Chitina in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	10,229 ^b	10,229	627.6	342.4	88.9	94.4
Terrestrial Mammals						
Large land mammal	6	1,837	96.7	52.7	27.8	50.0
Caribou	3	412	21.7	11.8	11.1	16.7
Moose	3	1,425	75.0	40.9	16.7	27.8
Small land mammal/furbearer ^c	178	279	14.7	8.0	44.4	50.0
Hare	173	260	13.7	7.5	38.9	44.4
Marten ^d	1	— ^e	—	—	5.6	5.6
Porcupine	4	19	1.0	0.6	22.2	22.2
Fishes						
Total fish	9,239	9,239	486.2	265.3	77.8	94.4
Total salmon	1,726	8,337	438.8	239.4	61.1	72.2
Total non-salmon	902	902	47.5	25.9	61.1	83.3
Burbot	26	63	3.3	1.8	11.1	11.1
Char	117	152	7.9	4.4	16.7 ^f	16.7 ^f
Grayling	258	180	9.5	5.2	33.3	33.3
Halibut	53	53	2.8	1.5	11.1	38.9
Trout	257	359	18.8	10.3	33.3	50.0
Whitefish	106	95	5.0	2.7	5.6	66.7
Birds						
Total bird and egg	110	61	3.2	1.8	33.3	33.3
Migratory bird	26	19	1.0	0.6	5.6	5.6
Duck	24	17	0.9	0.5	5.6	5.6
Goose	2	2	0.1	0.1	5.6	5.6
Upland game bird	83	42	2.2	1.2	33.3	33.3
Grouse	83	42	2.19	1.21	33.3	33.3

^a Number of households in sample was 18; number of households in community was 19.

^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.

^c Some not eaten.

^d Not eaten.

^e “—” = 0 or a number that rounds to 0.

^f Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001).

TABLE D-17 Subsistence Harvest Summary for Copper Center in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	85,895 ^b	85,895	533.5	174.3	100.0	100.0
Terrestrial Mammals						
Large land mammal	153	28,338	176.0	57.5	51.8	78.1
Caribou	100	12,942	80.4	26.3	48.0	72.8
Goat	8	546	3.4	1.1	4.7	4.7
Moose	31	13,870	86.2	28.2	19.1	53.1
Dall sheep	15	979	6.1	2.0	4.7	9.4
Small land mammal/furbearer ^c	237	405	2.3	0.8	27.1	38.7
Beaver	4	67	0.4	0.1	0.7	13.9
Fox ^d	13	— ^e	—	—	6.1	6.1
Hare	112	169	1.1	0.3	6.9	17.9
Marten ^d	11	—	—	—	5.4	5.4
Porcupine	38	170	1.1	0.4	18.8	18.8
Squirrel ^d	33	—	—	—	0.7	0.7
Weasel ^d	24	—	—	—	6.1	6.1
Fishes						
Total fish	54,323	54,323	337.4	110.3	78.1	90.6
Total salmon	10,215	51,006	316.8	103.5	68.1	90.0
Total non-salmon	3,317	3,317	20.6	6.7	57.8	78.1
Halibut	739	739	4.6	1.5	4.5	28.7
Rockfish	20	81	0.5	0.2	1.6	1.6
Burbot	125	300	1.9	0.6	10.1	21.7
Char	476	593	3.7	1.2	-	13.9 ^f
Grayling	1,537	1,076	6.7	2.2	47.4	55.2
Sucker	6	4	0.0	0.0	0.7	0.7
Trout	158	435	2.7	0.9	-	8.4 ^f
Whitefish	98	88	0.6	0.2	3.0	18.4
Birds						
Total bird and egg	1,007	711	4.4	1.4	34.0	42.5
Migratory bird	244	329	2.0	0.7	6.3	6.3
Duck	184	130	0.8	0.3	6.3	6.3
Goose	45	108	0.7	0.2	4.7	4.7
Crane	15	90	0.6	0.2	4.7	4.7
Upland game bird	763	382	2.4	0.8	34.0	42.5
Grouse	607	303	1.9	0.6	29.3	36.3
Ptarmigan	156	78	0.5	0.1	12.3	20.1

See next page for footnotes.

TABLE D-17 (Cont.)

- a Number of households in sample was 39; number of households in community was 161.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “_” = 0 or a number that rounds to 0.
- f Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001).

TABLE D-18 Subsistence Harvest Summary for Gakona in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	19,916 ^b	19,916	284.5	95.3	85.5	92.7
Terrestrial Mammals						
Large land mammal	58	9,936	141.9	47.6	62.2	63.6
Brown bear	1	100	1.4	0.5	1.4	1.4
Caribou	35	4,609	65.8	22.1	44.9	50.6
Dall sheep	11	727	10.4	3.5	16.0	23.2
Moose	10	4,500	64.3	21.5	14.3	53.5
Small land mammal/furbearer ^c	625	140	2.0	0.7	46.4	46.4
Hare	93	140	2.0	0.7	26.1	26.1
Fishes and Marine Invertebrates						
Total fish	8,549	8,549	122.1	40.9	69.5	85.5
Total salmon	1,195	6,074	86.8	29.1	57.9	68.1
Total non-salmon	2,476	2,476	35.4	11.9	57.9	69.5
Burbot	201	483	6.9	2.3	26.1	27.5
Char	391	539	7.7	2.6	27.5	30.4
Cod	140	140	2.0	0.7	1.4	1.4
Flounder	12	12	0.2	0.1	1.4	1.4
Grayling	725	508	7.3	2.4	50.6	57.9
Halibut	342	342	4.9	1.6	11.6	60.9
Rockfish	2	8	0.1	0.0	1.4	1.4
Trout	176	251	3.6	1.2	18.8	18.8
Whitefish	215	194	2.8	0.9	17.4	17.4
Marine invertebrate	93	93	1.3	0.5	10.1	31.9
Clam	53	53	0.8	0.3	8.7	23.2
Shrimp	40	40	0.6	0.2	1.4	8.7
Birds						
Total bird and egg	790	424	6.1	2.0	52.2	52.2
Migratory bird	140	99	1.4	0.5	8.7	8.7
Duck	140	99	1.4	0.5	8.7	8.7
Upland game bird	650	325	4.6	1.6	52.2	52.2
Grouse	359	180	2.6	0.9	50.8	50.8
Ptarmigan	291	145	2.9	0.7	17.4	17.4

^a Number of households in sample was 25; number of households in community was 70.

^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.

^c Several types of small land mammals (beaver, coyote, red fox, land otter, marten, mink, muskrat, porcupine, tree squirrel, weasel, wolf, and wolverine) were reported as harvested by certain households, although 0 was reported as total harvested. Because of this inconsistency, these small land mammals were excluded from this table.

Source: ADF&G (2001).

TABLE D-19 Subsistence Harvest Summary, Glennallen in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	46,684 ^b	46,684	274.6	99.5	91.8	100.0
Terrestrial Mammals						
Large land mammal	106	20,053	118.0	42.7	39.3	75.3
Black bear	5	35	0.2	0.1	7.2	7.2
Caribou	68	8,840	52.0	18.8	33.1	56.8
Dall sheep	5	341	2.0	0.7	2.1	3.1
Deer	4	149	0.9	0.3	1.0	1.0
Moose	24	10,688	62.9	22.8	14.0	49.0
Sm. land mammal/furbearer ^c	306	366	2.2	0.8	8.4	8.4
Beaver	22	53	0.3	0.1	1.6	1.6
Coyote ^d	4	— ^e	—	—	1.0	1.0
Fox ^d	4	—	—	—	1.0	1.0
Hare	209	314	1.8	0.7	5.7	5.7
Marten ^d	51	—	—	—	2.6	2.6
Muskrat ^d	12	—	—	—	0.6	0.6
Weasel ^d	6	—	—	—	1.6	1.6
Fishes and Marine Invertebrates						
Total fish	25,287	25,287	148.8	53.9	71.2	95.9
Total salmon	3,785	19,136	112.6	40.8	59.9	94.9
Total non-salmon	6,152	6,152	36.2	13.1	42.4	62.9
Burbot	139	334	2.0	0.7	9.9	11.9
Char	299	335	2.0	0.7	14.0 ^f	14.0 ^f
Grayling	2,119	1,483	8.7	3.2	26.9	37.2
Halibut	1,645	1,645	9.7	3.5	3.1	22.2
Pike	53	147	0.9	0.3	2.1	2.1
Rockfish	110	441	2.6	0.9	2.1	2.1
Trout	1,108	1,575	9.3	3.4	16.0 ^f	16.0 ^f
Whitefish	213	192	1.1	0.4	5.7	5.7
Marine invertebrate	26	26	0.2	0.1	1.0	1.0
Clam ^g	26	26	0.2	0.1	1.0	1.0
Birds						
Total bird and egg	339	174	1.0	0.4	21.2	23.2
Migratory bird	40	25	0.2	0.1	3.1	4.1
Duck	40	25	0.2	0.1	3.1	4.1
Upland game bird	299	150	0.9	0.3	19.1	20.1
Grouse	180	90	0.5	0.2	18.1	19.1
Ptarmigan	119	60	0.4	0.1	5.1	6.2
Bird egg	312	174	1.0	0.4	36.6	37.6

See next page for footnotes.

TABLE D-19 (Cont.)

- a Number of households in sample was 44; number of households in communities was 170.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “–” = 0 or a number that rounds to 0.
- f Data not recorded; value reported is the maximum of those recorded for subcategories.
- g Unit of measure is gallon.

Source: ADF&G (2001).

TABLE D-20 Subsistence Harvest Summary for Gulkana in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	10,237 ^b	10,237	465.3	152.6	90.0	95.0
Terrestrial Mammals						
Large land mammal	13	3,036	138.00	45.25	35.0	70.0
Black bear	1	55	2.5	0.8	5.0	5.0
Caribou	8	1,001	45.5	14.9	30.0	55.0
Moose	4	1,980	90.0	29.5	20.0	55.0
Small land mammal/furbearer ^c	308	527	24.0	7.9	50.0	55.0
Beaver	8	116	5.3	1.7	10.0	15.0
Coyote	6	— ^d	—	—	5.0	5.0
Fox ^e	6	—	—	—	5.0	5.0
Hare	81	122	5.6	1.8	30.0	35.0
Lynx	6	22	1.0	0.3	5.0	5.0
Marten ^e	32	—	—	—	10.0	10.0
Mink ^e	11	—	—	—	5.0	5.0
Muskrat	132	238	10.8	3.6	10.0	15.0
Porcupine	7	30	1.4	0.5	20.0	20.0
Weasel ^e	8	—	—	—	5.0	5.0
Wolf ^e	6	—	—	—	5.0	5.0
Wolverine ^e	6	—	—	—	5.0	5.0
Fishes						
Total fish	6,406	6,406	291.2	95.5	90.0	95.0
Total salmon	1,296	5,777	262.6	86.1	60.0	85.0
Total non-salmon	629	629	28.6	9.4	70.0	70.0
Burbot	67	161	7.3	2.4	15.0	2.0
Char	12	15	0.7	0.2	5.0 ^f	5.0 ^f
Grayling	209	146	6.7	2.2	65.0	65.0
Greenling	4	4	0.2	0.1	5.0	5.0
Halibut	55	55	2.5	0.8	5.0	5.0
Sucker	110	77	3.5	1.2	5.0	5.0
Trout	9	12	0.6	0.2	10.0	10.0
Whitefish	176	158	7.2	2.4	15.0	25.0
Birds						
Total bird and egg	117	92	4.2	1.4	20.0	30.0
Migratory bird	58	63	2.9	0.9	15.0	25.0
Duck	36	36	1.7	0.5	10.0	20.0
Goose	22	28	1.2	0.4	5.0	5.0
Upland game bird	58	29	1.3	0.4	20.0	20.0
Grouse	33	17	0.8	0.3	20.0	20.0
Ptarmigan	25	13	0.6	0.2	10.0	10.0

See next page for footnotes.

TABLE D-20 (Cont.)

- a Number of households in sample was 20; number of households in community was 22.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d “—” = 0 or a number that rounds to 0.
- e Not eaten.
- f Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001).

TABLE D-21 Subsistence Harvest Summary for Kenny Lake in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	43,692 ^b	43,692	469.8	136.3	100.0	100.0
Terrestrial Mammals						
Large land mammal	81	15,257	161.9	47.0	61.1	73.0
Black bear	10	1,749	18.8	5.5	10.6	10.6
Caribou	43	5,578	60.0	17.4	37.4	41.1
Deer	12	517	5.6	1.6	10.6	10.6
Moose	16	7,216	77.6	22.5	17.2	37.4
Small land mammal/furbearer ^c	337	196	2.1	0.6	27.8	27.8
Beaver ^d	2	— ^e	—	—	2.4	2.4
Fox ^d	8	—	—	—	8.2	8.2
Hare	131	196	2.1	0.6	19.3	19.3
Marten ^d	0	—	—	—	7.5	7.5
Muskrat ^d	0	—	—	—	—	2.4
Tree squirrel ^d	27	—	—	—	2.4	2.4
Weasel ^d	8	—	—	—	8.2	8.2
Wolf ^d	0	—	—	—	2.6	2.6
Wolverine ^d	0	—	—	—	2.6	2.6
Fishes						
Total fish	26,609	26,609	286.1	83.0	89.4	97.6
Total salmon	4,315	21,616	232.4	67.4	56.6	64.8
Total non-salmon	4,993	4,993	53.7	15.6	83.4	88.3
Burbot	85	204	2.2	0.6	11.9	11.9
Grayling	996	697	7.5	2.2	72.2	72.2
Trout	231	324	3.5	1.0	23.1	23.1
Whitefish	114	102	1.1	0.3	2.4	2.4
Birds						
Total bird and egg	1,059	548	5.9	1.7	44.2	44.2
Migratory bird	91	64	0.7	0.2	4.9	4.9
Ducks	91	64	0.7	0.2	4.9	4.9
Upland game bird	968	484	5.2	1.5	44.2	44.2
Grouse	418	209	2.3	0.7	34.7	34.7
Ptarmigan	550	275	3.0	0.9	19.4	19.4

See next page for footnotes.

TABLE D-21 (Cont.)

- a Number of households in sample was 35; number of households in communities was 39.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “_” = 0 or a number that rounds to 0.

Source: ADF&G (2001).

TABLE D-22 Subsistence Harvest Summary for Paxson in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	11,236 ^b	11,236	660.9	289.1	92.9	92.9
Terrestrial Mammals						
Large land mammal	23	5,404	317.86	139.1	50.0	85.7
Bison	1	546	32.1	14.1	7.1	21.4
Caribou	10	1,263	74.3	32.5	42.9	57.1
Dall sheep	5	316	18.6	8.1	28.6	28.6
Moose	7	3,279	192.9	84.4	42.9	64.3
Small land mammal/furbearer ^c	406	971	57.1	25.0	57.1	57.1
Beaver	94	838	49.3	21.6	35.7	35.7
Coyote ^d	4	— ^e	—	—	14.3	14.3
Fox ^d	114	—	—	—	28.6	28.6
Hare	38	56	3.3	1.4	28.6	28.6
Land otter ^d	10	—	—	—	21.4	21.4
Marten ^d	67	—	—	—	35.7	35.7
Muskrat ^d	40	—	—	—	14.3	14.3
Weasel ^d	9	—	—	—	14.3	14.3
Wolf ^d	2	—	—	—	7.1	7.1
Fishes						
Total fish	4,163	4,163	244.9	107.1	78.6	85.7
Total salmon	317	1,730	101.8	44.5	42.9	64.3
Total non-salmon	2,432	2,432	143.1	62.6	78.6	78.6
Burbot	83	198	11.7	5.1	42.9	50.0
Char	186	318	18.7	8.2	64.3 ^f	64.3 ^f
Grayling	182	128	7.5	3.3	78.6	78.6
Halibut	80	80	4.7	2.1	14.3	28.6
Pike	18	51	3.0	1.3	7.1	7.1
Sucker	35	86	5.1	2.2	14.3	14.3
Trout	35	73	4.3	1.9	28.6 ^f	28.6 ^f
Whitefish	1,665	1,498	88.1	38.6	28.6	28.6
Birds						
Total bird and egg	778	583	31.3	15.0	71.4	71.4
Migratory bird	425	407	23.9	10.5	42.9	42.9
Duck	396	262	15.4	6.7	42.9	42.9
Goose	7	13	0.8	0.3	14.3	14.3
Upland game bird	353	177	10.4	4.6	71.4	71.4
Grouse	152	76	4.5	2.0	50.0	50.0
Ptarmigan	202	101	5.9	2.6	64.3	64.3

See next page for footnotes.

TABLE D-22 (Cont.)

- a Number of households in sample was 14; number of households in communities was 17.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “–” = 0 or a number that rounds to 0.
- f Data not recorded; value reported is the maximum of those recorded for subcategories.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-23 Subsistence Harvest Summary for Tazlina in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	39,182 ^b	39,182	326.5	107.5	68.9	100.0
Terrestrial Mammals						
Large land mammal	70	15,480	128.0	42.5	29.2	62.2
Bison	2	1,038	8.7	2.9	1.9	1.9
Black bear	5	365	3.0	1.0	3.8	10.1
Brown bear	1	343	2.9	0.9	1.0	1.0
Caribou	41	5,306	44.2	14.6	21.6	37.8
Dall sheep	2	150	1.3	0.4	1.9	12.0
Moose	18	8,278	69.0	22.7	14.4	28.7
Small land mammal/furbearer ^c	544	766	6.4	2.1	22.5	22.5
Beaver ^d	27	— ^e	—	—	1.0	1.0
Coyote ^d	25	—	—	—	5.8	5.8
Fox ^d	29	—	—	—	6.7	6.7
Hare	228	342	2.9	0.9	14.8	16.8
Land otter ^d	2	—	—	—	1.9	1.9
Marten ^d	74	—	—	—	3.8	3.8
Mink ^d	13	—	—	—	1.0	1.0
Muskrat ^d	24	—	—	—	1.0	1.0
Porcupine	94	423	3.5	1.2	10.1	10.1
Tree squirrel ^d	14	—	—	—	1.9	1.9
Weasel ^d	7	—	—	—	1.0	1.0
Wolf ^d	7	—	—	—	1.9	1.9
Fishes and Marine Invertebrates						
Total fish	20,524	20,524	171.0	56.3	62.7	93.8
Total salmon	2,852	13,783	114.9	37.8	38.3	89.9
Total non-salmon	6,741	6,741	56.2	18.5	50.8	51.7
Burbot	265	363	5.3	1.7	11.5	13.4
Char	476	452	3.8	1.2	NA ^f	NA
Grayling	1,434	1,004	8.4	2.8	36.9	36.9
Halibut	3,629	3,629	30.2	10.0	15.3	38.3
Sucker	5	3	—	—	3.8	3.8
Trout	537	758	6.3	2.1	NA	NA
Whitefish	288	259	2.2	0.7	10.6	14.4
Marine invertebrate	368	368	3.1	1.0	12.0	12.0
Clam	368	368	3.1	1.0	12.0	12.0
Birds						
Total bird and egg	501	371	3.1	1.0	39.8	39.8
Migratory bird	96	168	1.4	0.5	6.7	6.7
Duck	66	49	0.4	0.1	6.7	6.7
Crane	16	97	0.8	0.3	1.9	1.9
Goose	14	22	0.2	0.1	1.9	1.9

TABLE D-23 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Upland game bird	406	203	1.7	0.6	37.8	37.8
Grouse	261	130	1.09	0.36	27.8	27.8
Ptarmigan	145	73	0.60	0.20	20.6	20.6

^a Number of households in sample was 31; number of households in community was 120.

^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.

^c Some not eaten.

^d Not eaten.

^e “_” = 0 or a number that rounds to 0.

^f NA = data not available.

Source: ADF&G (2001).

TABLE D-24 Subsistence Harvest Summary for Tonsina in 1987^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	46,310 ^b	46,310	482.4	155.7	91.7	91.7
Terrestrial Mammals						
Large land mammal	123	22,003	229.2	74.0	69.8	90.3
Black bear	7	296	3.1	1.0	4.1	13.8
Brown bear	1	— ^c	—	—	1.4	1.4
Caribou	75	9,743	101.5	32.8	63.7	75.8
Dall sheep	11	691	7.2	2.3	11.1	11.1
Deer	3	141	1.5	0.5	2.4	3.8
Goat	1	95	1.0	0.3	1.4	1.4
Moose	25	11,037	115.0	37.1	24.5	57.1
Small land mammal/furbearer ^d	542	402	4.2	1.4	39.8	39.8
Beaver	12	—	—	—	10.4	10.4
Coyote ^e	15	—	—	—	1.0	2.1
Fox ^e	25	—	—	—	5.9	5.9
Hare	220	330	3.4	1.1	22.9	22.9
Land otter ^e	3	—	—	—	2.4	2.4
Marmot ^e	6	—	—	—	1.0	1.0
Marten ^e	167	—	—	—	8.3	8.3
Mink ^e	27	—	—	—	2.1	2.1
Muskrat ^e	5	—	—	—	1.0	1.0
Porcupine	16	72	0.8	0.2	11.1	11.1
Weasel ^e	14	—	—	—	1.4	1.4
Wolf ^e	14	—	—	—	3.5	3.5
Wolverine ^e	8	—	—	—	1.0	1.0
Fishes and Marine Invertebrates						
Total fish	21,729	21,729	226.4	73.1	83.3	91.7
Total salmon	4,028	19,238	200.4	64.7	63.9	83.3
Total non-salmon	2,492	2,492	26.0	8.4	67.1	69.8
Burbot	52	124	1.3	0.4	3.8	6.5
Char	803	878	9.1	3.0	24.8 ^f	24.8 ^f
Grayling	728	509	5.3	1.7	50.5	51.9
Halibut	536	536	5.6	1.8	3.8	25.9
Smelt	66	16	0.2	0.1	1.4	1.4
Whitefish	54	49	0.5	0.2	2.4	2.4
Marine invertebrate	326 ^g	326 ^g	3.4	1.1	2.1	10.4
Clam	300 ^g	300 ^g	3.1	1.0	1.0	1.0
Crab	21 ^g	21 ^g	0.2	0.1	1.0	1.0
Shrimp	5 ^g	5 ^g	0.1	—	1.0	9.4

TABLE D-24 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Birds						
Total bird and egg	1,055	554	5.8	1.9	43.2	44.6
Migratory bird	105	79	0.8	0.3	9.6	9.6
Duck	103	76	0.8	0.3	9.6	9.6
Goose	3	3	—	—	1.4	1.4
Upland game bird	949	475	4.9	1.6	41.8	43.2
Grouse	762	381	3.7	1.3	41.8	43.2
Ptarmigan	187	94	1.0	0.3	10.6	10.6

- a Number of households in sample was 34; number of households in communities was 96.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c “—” = 0 or a number that rounds to 0.
- d Some not eaten.
- e Not eaten.
- f Data not recorded; data reported is the maximum of those recorded for subcategories.
- g Unit of measure is pound.

Source: ADF&G (2001).

TABLE D-25 Subsistence Harvest Summary for Chenega Bay in 1993^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	27,809 ^b	27,809	993.2	275.2	95.7	100.0
Marine Mammals						
Marine mammal	85	3,528	126.0	34.9	43.5	56.5
Sea otter	6	— ^c	—	—	8.7	13.0
Seal	67	2,531	90.4	25.1	39.1	56.5
Steller sea lion	12	997	35.6	9.9	26.1	43.5
Terrestrial mammals						
Large land mammal	38	1,796	64.2	17.8	47.8	82.6
Black bear	2	141	5.0	1.4	8.7	17.4
Caribou	1	183	6.5	1.8	4.3	8.7
Deer	34	1473	52.6	14.6	47.8	82.6
Small land mammal/furbearer ^d	13	49	1.7	0.5	13.0	13.0
Land otter ^e	7	—	—	—	8.7	8.7
Porcupine	6	49	1.7	0.5	4.3	4.3
Fishes and Marine Invertebrates						
Total fish	19,980	19,980	713.6	197.7	95.7	100.0
Total salmon	2,686	10,985	392.3	108.7	69.9	95.7
Total non-salmon	8,994	8,994	321.2	89.0	56.5	95.7
Char	61	85	3.0	0.8	21.7	21.7
Cod	315	1,005	35.9	10.0	17.4	43.5
Greenling	252	343	12.3	3.4	21.7	26.1
Halibut	82	3,686	131.7	36.5	52.2	91.3
Herring	73 ^f	40	1.4	0.4	8.7	26.1
Herring roe	5 ^f	34	1.2	0.3	4.3	30.4
Rockfish	1,084	3,229	115.3	32.0	4.35	73.9
Sablefish	180	558	19.9	5.5	8.7	26.1
Shark	1	11	0.4	0.1	4.3	4.3
Wolffish	5	2	—	—	8.7	8.7
Marine invertebrate	1,498	1,498	53.5	14.8	73.9	91.3
Chiton	21	83	3.0	1.0	34.8	47.8
Clam	94	283	10.1	2.8	52.2	65.2
Crab	15	23	0.8	0.2	4.3	8.7
Mussel	4	13	0.5	0.1	13.0	13.0
Octopus	255	1,020	36.4	10.1	34.8	60.9
Oyster	1	4	0.1	—	4.3	4.3
Shrimp	36	71	2.5	0.7	17.4	60.9
Birds						
Total bird and egg	168	151	5.4	1.5	43.5	52.2
Migratory bird	85	106	3.8	1.1	26.1	30.4
Duck	72	60	2.2	0.6	26.1	26.1
Goose	13	46	1.6	0.5	8.7	13.0

TABLE D-25 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Upland game bird	63	44	1.6	0.4	26.1	30.4
Grouse	63	44	1.6	0.4	26.1	30.4
Bird eggs	19	1	–	–	4.3	8.7

- a Number of households in sample was 23; number of households in communities was 28.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c “–” = 0 or a number that rounds to 0.
- d Some not eaten.
- e Not eaten.
- f Unit of measure is gallon.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-26 Subsistence Harvest Summary for Cordova in 1997^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	449,841 ^b	449,841	542.0	179.4	89.7	97.6
Marine Mammals						
Marine mammal ^c	391	9,114	11.0	3.6	5.1	11.0
Sea otter ^d	179	— ^e	—	—	3.5	5.5
Seal	212	9,114	11.0	3.6	3.5	8.6
Terrestrial Mammals						
Large land mammal	1,043	131,308	158.2	52.4	47.4	77.1
Black bear	NA ^f	2,473	3.0	1.0	4.7	11.8
Brown bear	26	1,972	2.4	0.8	2.4	2.4
Caribou	13	1,972	2.4	0.8	0.8	7.1
Dall sheep	7	684	0.8	0.3	0.8	4.0
Deer	1,441	62,248	75.0	24.8	40.7	72.7
Elk	26	5,917	7.1	2.4	2.4	2.8
Goat	36	2,860	3.5	1.1	4.0	9.5
Moose	98	53,182	64.1	21.2	10.7	49.4
Small land mammal/furbearer ^c	3,304	5,304	6.4	2.1	26.5	30.0
Beaver	145	345	0.4	0.1	3.2	3.6
Coyote ^d	49	—	—	—	2.8	3.6
Hare	2,443	4,887	5.9	2.0	22.1	24.5
Land otter ^d	118	—	—	—	3.6	3.6
Lynx ^d	3	—	—	—	0.4	0.4
Marten ^d	108	—	—	—	5.1	5.1
Mink ^d	174	—	—	—	4.0	4.7
Muskrat ^d	72	—	—	—	2.4	2.4
Porcupine	7	53	0.1	—	0.8	2.0
Squirrel ^d	118	20	—	—	2.4	2.4
Weasel ^d	59	—	—	—	1.6	1.6
Wolverine ^d	7	—	—	—	0.8	0.8
Terrestrial Mammals						
Total fish	263,712	263,712	317.7	105.2	75.1	93.7
Total salmon	23,061	156,875	189.0	62.6	66.0	88.5
Total non-salmon	106,838	106,838	128.7	42.6	58.5	84.6
Bass	642	642	0.8	0.3	4.4	6.7
Char	1,388	1,943	2.3	0.8	14.2	14.6
Cod	841	2,265	2.7	0.9	11.9	20.2
Grayling	273	191	0.2	0.1	2.8	2.8
Greenling	633	1,202	1.5	0.5	13.4	19.8
Halibut	66,450	66,450	80.1	26.5	44.3	82.6
Herring ^g	831	4,985	6.0	2.0	11.5	13.4
Herring roe ^g	267	1,870	2.3	0.1	4.3	9.1
Rockfish	4,408	12,360	14.9	4.9	22.1	39.5
Sablefish	625	1,936	2.3	0.8	5.1	18.2

TABLE D-26 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Sculpin	85	43	0.1	—	2.4	2.4
Skate	7	33	—	—	0.4	0.4
Smelt ^g	2,889	9,389	11.3	3.7	19.3	31.6
Sole	134	134	0.2	-	3.2	4.0
Sturgeon	7	224	0.3	0.1	0.8	0.8
Trout	2,113	2,958	3.6	1.2	21.3	27.3
Walleye	13	7	—	—	1.6	2.0
Marine invertebrate	13,844	13,844	16.7	5.5	29.2	51.7
Chiton ^g	2	7	—	—	0.8	1.6
Clam ^g	1,503	4,510	5.4	1.8	24.9	38.3
Cockle ^g	5	15	—	—	0.8	1.2
Crab	4,909	7,656	9.2	3.0	7.5	28.4
Geoduck ^g	12	37	—	—	0.4	0.4
Limpet ^g	13	20	—	—	0.8	0.8
Mussel ^g	26	40	—	—	3.2	4.7
Octopus	43	170	0.2	0.1	1.6	12.2
Shrimp	995	995	1.2	0.4	9.1	18.2
Squid	197	394	0.5	0.2	0.8	5.1
Birds and Bird Eggs						
Total bird and egg	7,852	5,593	6.7	2.2	30.4	42.3
Migratory bird	5,091	4,056	4.9	1.6	24.1	36.8
Crane	20	165	0.2	0.1	2.0	3.6
Duck	4,708	3,274	3.9	1.3	22.5	35.2
Goose	269	598	0.7	0.2	6.3	8.3
Seabird and loon	3	10	-	-	0.4	0.4
Shorebird	92	9	-	-	3.2	3.2
Upland game bird	1,830	1,281	1.5	0.5	22.5	24.9
Grouse	1,017	712	0.9	0.3	17.8	19.0
Ptarmigan	813	569	0.7	0.2	14.2	15.4
Bird egg	925	252	0.3	0.1	2.4	4.7

^a Number of households in sample was 152; number of households in communities was 830.

^b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.

^c Some not eaten.

^d Not eaten.

^e "—" = 0 or a number that rounds to 0.

^f NA = data not available. Value in data table appears to be incorrect for black bear; total for large land mammals reflects inclusion of this value, but this value is not included under the number of black bears harvested for 1997.

^g Unit of measure is gallon.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-27 Subsistence Harvest Summary for Nanwalek in 1997^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	50,653 ^b	50,653	1,120.9	253.9	100.0	100.0
Marine Mammals						
Marine mammal ^c	69	4,020	105.8	24.0	34.5	89.7
Sea otter ^d	10	— ^e	—	—	6.9	10.3
Seal	53	2,972	78.2	17.7	34.5	89.7
Steller sea lion	5	1,048	27.6	6.3	6.9	27.6
Terrestrial Mammals						
Large land mammal	13	2,023	53.2	12.1	13.8	65.5
Black bear	10	608	16.0	3.6	13.8	65.5
Moose	3	1,415	37.2	8.4	6.9	37.9
Small land mammal/furbearer ^c	14	10	0.3	0.1	6.9	6.9
Land otter ^d	3	—	—	—	3.4	3.4
Porcupine	1	10	0.3	0.1	3.4	3.4
Squirrel ^d	4	—	—	—	3.4	3.4
Weasel ^d	7	—	—	—	6.9	6.9
Fishes and Marine Invertebrates						
Total fish	33,458	33,458	880.5	199.5	100.0	100.0
Total salmon	7,011	26,474	696.7	157.8	100.0	100.0
Total non-salmon	6,984	6,984	183.8	41.6	89.7	93.1
Bass	31	31	0.8	0.2	10.3	13.8
Char	829	1,161	30.6	6.9	65.5	69.0
Cod	719	1,085	28.6	6.5	48.3	69.0
Flounder	3	8	0.2	0.1	3.4	3.4
Greenling	63	94	2.5	0.6	31.0	34.5
Halibut	3,501	3,501	92.1	20.9	55.2	93.1
Herring ^f	8	46	1.2	0.3	10.3	48.3
Herring roe ^f	1	5	0.1	-	3.4	3.4
Rockfish	189	316	8.3	1.9	17.2	24.1
Sablefish	75	232	6.1	1.4	10.3	13.8
Sculpin	38	19	0.5	0.1	10.3	13.8
Shark	1	12	0.3	0.1	3.4	3.4
Skate	1	7	0.2	-	3.4	3.4
Smelt ^f	12	38	1.0	0.2	6.9	51.7
Trout	307	430	11.3	2.6	37.9	48.3
Marine invertebrate	1,512	1,512	39.8	9.0	79.3	82.8
Chiton ^f	221	874	23.0	5.2	58.6	75.9
Clam ^f	59	177	4.7	1.1	17.2	34.5
Limpet ^f	4	6	0.2	-	10.3	10.3
Mussel ^f	34	51	1.3	0.3	34.5	34.5
Octopus	84	335	8.8	2.0	58.6	75.9
Snail ^f	44	66	1.7	0.4	48.3	58.6

TABLE D-27 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
<i>Birds and Bird Eggs</i>						
Total bird and egg	1,106	603	15.9	3.6	44.8	72.4
Migratory bird	430	384	10.1	2.3	34.5	41.4
Crane	3	22	0.6	0.1	3.4	3.4
Ducks	390	331	8.7	2.0	31.0	34.5
Seabird and loon	37	31	0.8	0.2	13.8	17.2
Upland game bird	39	28	0.7	0.2	17.2	17.2
Grouse	39	28	0.7	0.2	17.2	17.2
Bird egg	637	191	5.0	1.1	31.0	62.1

- a Number of households in sample was 29; number of households in communities was 38.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “—” = 0 or a number that rounds to 0.
- f Unit of measure is gallon.

Source: ADF&G 2001 (sums corrected as necessary).

TABLE D-28 Subsistence Harvest Summary for Port Graham in 1997^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	39,548 ^b	39,548	627.8	253.4	97.7	100.0
Marine Mammals						
Marine mammal	46	1,443	22.9	9.3	27.3	81.8
Sea otter	20	— ^c	—	—	11.4	15.9
Seal	26	1,443	22.9	9.3	20.5	77.3
Terrestrial Mammals						
Large land mammal	3	166	2.6	1.1	4.5	43.2
Black bear	3	166	2.6	1.1	4.5	22.7
Small land mammal/furbearer ^d	10	57	0.9	0.4	6.8	6.8
Porcupine	7	57	0.9	0.4	6.8	6.8
Weasel ^e	3	—	—	—	2.3	2.3
Fishes and Marine Invertebrates						
Total fish	34,292	34,292	544.3	219.7	90.9	100
Total salmon	4,825	22,503	357.2	144.2	86.4	100
Total non-salmon	11,789	11,789	187.1	75.5	63.6	93.2
Bass	36	36	0.6	0.2	4.5	9.1
Char	339	475	7.5	3.0	20.5	27.3
Cod	686	674	10.7	4.3	13.6	40.9
Flounder	100	301	4.8	1.9	18.2	29.5
Greenling	62	96	1.5	0.6	6.8	11.4
Halibut	8,286	8,286	131.5	53.1	56.8	84.1
Herring ^f	217	1,302	20.7	8.3	18.2	61.4
Herring roe ^f	7	60	1.0	0.4	4.5	31.8
Rockfish	153	336	5.3	2.2	15.9	22.7
Sablefish	46	142	2.3	0.9	6.8	18.2
Sculpin	7	4	0.1	—	2.3	2.3
Shark	1	13	0.2	0.1	2.3	4.5
Smelt ^f	7	23	0.4	0.2	2.3	36.4
Steelhead	13	18	0.3	0.1	9.1	13.6
Trout	30	42	0.7	0.3	11.4	18.2
Marine invertebrate	1,994	1,994	31.7	12.8	75.0	86.4
Chiton ^f	238	1,240	19.7	8.0	68.2	84.1
Clam ^f	39	118	1.9	0.8	9.1	25.0
Cockle ^f	2	6	0.1	—	4.5	6.8
Crab ^f	6	4	0.1	—	2.3	13.6
Mussel ^f	3	4	0.1	—	2.3	4.5
Octopus	146	584	9.3	3.7	38.6	68.2
Sea urchin ^f	1	—	—	—	2.3	4.5
Snail	23	34	0.5	0.2	22.7	29.5
Whelk	1	2	—	—	2.3	4.5

TABLE D-28 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Birds						
Total bird and egg	223	192	3.1	1.2	25.0	31.8
Migratory bird	203	180	2.9	1.2	20.5	22.7
Duck	203	172	2.7	1.1	20.5	22.7
Seabird and loon	3	9	0.1	0.1	2.3	2.3
Upland game bird	17	12	0.2	0.1	11.4	13.6
Grouse	17	12	0.2	—	11.4	13.6

- a Number of households in sample was 44; number of households in communities was 63.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c “—” = 0 or a number that rounds to 0.
- d Some not eaten.
- e Not eaten.
- f Unit of measure is gallon.

Source: ADF&G (2001) (sums corrected as necessary).

TABLE D-29 Subsistence Harvest Summary for Tatitlek in 1997^a

Subsistence Resource	Units, Total Harvested	Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
All Resources	32,915 ^b	32,915	1,219.1	406.4	87.5	100.0
Marine Mammals						
Marine mammal ^c	248	13,372	495.3	165.1	50.0	93.8
Porpoise	5	304	11.3	3.8	12.5	18.8
Sea otter ^d	57	— ^e	—	—	18.8	18.8
Seal	167	9,356	346.5	115.5	50.0	93.8
Steller sea lion	19	3,712	137.5	45.8	18.8	25.0
Terrestrial Mammals						
Large land mammal	83	3,720	137.8	45.9	62.5	93.8
Deer	78	3,353	124.2	41.0	62.5	93.8
Goat	5	367	13.6	4.5	18.8	37.5
Small land mammal/furbearer ^c	24	—	—	—	12.5	12.5
Land otter ^d	24	—	—	—	12.5	12.5
Fishes and Marine Invertebrates						
Total fish	12,858	12,858	476.2	158.7	75.0	100.0
Total salmon	1,375	7,552	279.7	93.2	68.8	100.0
Total non-salmon	5,306	5,306	196.5	65.5	62.5	81.3
Cod	94	302	11.2	3.7	31.3	31.3
Greenling	4	17	0.6	0.2	6.3	6.3
Halibut	2,008	2,008	74.4	24.8	43.8	68.8
Herring ^f	119	714	26.4	8.8	31.3	50.0
Herring roe ^f	197	1,382	51.2	17.1	43.8	56.3
Rockfish	237	765	28.3	9.5	50.0	50.0
Sablefish	25	78	2.9	1.0	12.5	18.8
Smelt ^g	12	38	1.4	0.5	12.5	31.3
Wolffish	2	1	—	—	6.3	12.5
Marine invertebrate	1,509	1,509	55.9	18.6	62.5	81.3
Chiton ^f	26	104	3.8	1.3	25.0	50.0
Clam ^f	158	474	17.6	5.9	56.3	56.3
Cockle ^f	51	153	5.7	1.9	25.0	25.0
Crab	407	652	24.1	8.1	31.3	68.8
Octopus	14	54	2.0	0.7	12.5	25.0
Oyster ^f	19	56	2.1	0.7	12.5	43.8
Shrimp ^f	17	17	0.6	0.2	6.3	31.3
Birds						
Total bird and egg	1,750	797	29.5	9.8	68.8	81.3
Migratory bird	403	422	15.7	5.2	50.0	62.5
Crane	7	57	2.1	0.7	18.8	18.8
Duck	370	314	11.6	3.9	43.8	62.5
Goose	27	51	1.9	0.7	31.3	37.5

TABLE D-29 (Cont.)

Subsistence Resource	Units, Total Harvested	Edible Pounds Harvested			Percent of Households Surveyed	
		Total	Household Harvest Mean	Per Capita	Households Harvesting	Households Using
Upland game bird	12	8	0.3	0.1	12.5	12.5
Grouse	12	8	0.3	0.1	12.5	12.5
Bird egg	1,335	367	13.6	4.5	56.3	68.8

- a Number of households in sample was 16; number of households in communities was 27.
- b Total given in pounds, which for some resources involved conversion from individual units; as a result, individual units will not sum to total.
- c Some not eaten.
- d Not eaten.
- e “—” = 0 or a number that rounds to 0.
- f Unit of measure is gallon.

Source: ADF&G (2001) (sums corrected as necessary).

Appendix E:
ANILCA Section 810 Analysis of
Subsistence Impacts

Appendix E:

ANILCA Section 810 Analysis of Subsistence Impacts

E.1 Subsistence Evaluation Factors

Section 810(a) of the Alaska National Interest Land Conservation Act (ANILCA) (16 USC Section 3120) requires that an evaluation of subsistence uses and needs be completed as part of any federal agency determination to “withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands.” Subsistence uses are defined in this title as the “customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food . . . [for] handicrafts . . . for barter, or sharing . . . and for customary trade.” As a consequence, an evaluation of potential subsistence impacts under ANILCA Section 810 must be completed for the TAPS ROW Renewal EIS. ANILCA requires that this evaluation include findings related to three specific issues:

1. The effect of such use, occupancy, or disposition on subsistence uses and needs;
2. The availability of other lands for the purposes sought to be achieved; and
3. Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC Section 3120).

If an evaluation of the three issues concludes that an action “would significantly restrict subsistence uses,” ANILCA Section 810 requires the head of the lead federal agency to:

- Notify the appropriate state agency, local committees, and regional councils (established under 16 USC Section 3115);
- Give notice of and hold a hearing in the vicinity of the area involved; and
- Determine that (1) such restriction to subsistence is necessary and consistent with sound management principles for use of

the public lands in question, (2) the proposed activity will involve the minimal amount of public lands necessary to accomplish its purposes, and (3) reasonable steps will be taken to minimize adverse impacts on subsistence uses and resources.

Appendix E contains ANILCA Section 810 evaluations of the proposed action to renew the TAPS right-of-way for 30 years, the less-than-30-year renewal alternative, and the no-action alternative (nonrenewal of the ROW). The cumulative effects, which include the impacts of one of the alternative actions in conjunction with effects of other past, present, and reasonably foreseeable actions, are also assessed. For each alternative and the cumulative case, the assessments consider five possible impact categories that could restrict the use of resources for subsistence:

1. A decline in the population or amount of harvestable resources,
2. Changes in the geographic distribution of subsistence resources,
3. Competition for potential subsistence resources,
4. Disturbance of subsistence activities, and
5. Constraints on access to subsistence resources.

These categories are compatible with those identified in BLM guidance concerning Section 810 analyses (BLM 1986). They were developed in part on the basis of concerns expressed by subsistence users and in part on the basis of observations of researchers who have examined subsistence in Alaska over the past 20 years. They are intended to encompass all key types of impacts to subsistence, and will

be considered individually and in combination in this analysis.

The criteria used to evaluate impacts on subsistence use consider both type and magnitude of effect. Impacts within these categories would fall below the “may” significantly restrict threshold if the action may result in no (or a slight) reduction in the abundance of harvestable resources; no (or occasional) redistribution of these resources; no effect (or slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting sites; and no substantial increase in competition for harvestable resources. Conversely, restrictions would reach the “may” significantly restrict threshold if the action may result in large reductions in the abundance of harvestable resources, major redistributions of those resources, substantial interference with harvester access to active subsistence sites, or a major increase in competition for subsistence resources.

The BLM used a “may” significantly restrict test in the Section 810 analysis for this EIS. This is a lower threshold than found in Section 810 itself, which contains a threshold of “would significantly restrict,” before hearings and determinations are required under Section 810(a)(3)(A), (B), and (C).

Section 3.24 of this FEIS provides background on existing conditions for subsistence in the vicinity of the TAPS. The background information is augmented by a more detailed discussion of existing conditions in Appendix D. Section 4.3.20 evaluates subsistence impacts under the proposed action; Section 4.5.2.20 evaluates them under the less-than-30-year renewal alternative; and Section 4.6.2.20 evaluates them under the no-action alternative. Section 4.7.8.1 contains the evaluation of cumulative impacts on subsistence.

E.2 Evaluation of Impacts

E.2.1 Proposed Action

E.2.1.1 Evaluation

The conclusion reached in Section 4.3.20 is that any negative impacts on subsistence from renewing the TAPS ROW would be very small. This conclusion was based on the effects on subsistence that could definitely be associated with renewing the TAPS. Renewal would result in:

- Continued, but not increasing, limitations on access to (very small) parts of certain traditional subsistence use areas, where these intersect the TAPS, and
- Continued use of the Dalton Highway, along with various access roads and airspace over the TAPS, to maintain TAPS operations and continued human activity around the TAPS resulting in generally minor disruption to the movement of small numbers of terrestrial mammals.

As noted in Section E.1, a significant restriction to subsistence uses could result from five impact categories, either alone or in combination. These impacts can be assessed with regard to the proposed action:

1. *A decline in the population or amount of harvestable resources.* As noted in Sections 3.18 through 3.22, the only evidence of decline in the populations or amounts of harvestable resources as a result of current operation of the TAPS, concerns effects on individual or very small numbers of animals. Evaluations of impacts on biological resources under the proposed action, presented in Sections 4.3.15 through 4.3.18, similarly anticipate no impacts on harvestable resources apart from effects on individual or very small numbers of animals. Caribou, moose, and salmon are given particular attention as important subsistence resources. Although caribou herds on the North Slope have increased in population, moose populations have fluctuated, and key Yukon River salmon runs have shown

significant recent declines. Importantly, it is broad environmental conditions, such as harsh winters, predation, or ocean conditions, that are seen as driving these population dynamics, not impacts associated with the TAPS. As a result, there is no anticipated impact with regard to this impact category.

2. *Changes in the geographic distribution of subsistence resources.* One of the most frequently cited concerns about the current and potential future operation of the TAPS expressed by subsistence users is the adverse impacts on the geographic distribution of subsistence resources, notably terrestrial mammals (see community descriptions in Section 3.24.2 and Appendix D). The implications of such changes would be reduced accessibility, minimally requiring greater travel distances for subsistence users. Thus, even in cases where resource populations are present at levels equal or greater than those in the past, they might not be as accessible for subsistence harvest if they have been displaced to more distant ranges. Available evidence does indicate that caribou, in particular, are sensitive to human activity, including movement on foot or in various types of vehicles (Horejsi 1981; Murphy and Lawhead 2000; Tyler 1991; Wolfe, S. et al. 2000). Moreover, many rural Alaskans contended during public scoping for the TAPS ROW EIS that nonlocal hunters disturb migration patterns by shooting at the lead animals in the migration. However, there is no evidence from scientific studies that the TAPS or activity in the TAPS ROW or on the Dalton Highway in support of the TAPS have affected herd movement at a population level (Sections 4.3.15, 4.3.16, and 4.3.17) (TAPS Owners 2001). Very small numbers of caribou, moose, and other key subsistence resources may alter their movement patterns, and hence possibly their geographic distribution, as a consequence of the continuation of the TAPS and the human activity required to maintain it, but there is no evidence that such changes in behavior would have more than a negligible effect on subsistence activities.
3. *Competition for potential subsistence resources.* Another frequently cited concern about the current and future operation of the TAPS is competition from nonlocals who harvest fish and game that might otherwise be harvested for local subsistence (Section 3.24.2 and Appendix D). One of the causes of this competition is increased access to remote areas, primarily as a consequence of opening the Haul Road/Dalton Highway to the public. TAPS service roads also are cited as providing increased access to remote areas. It is indisputable that opening the Dalton Highway to public use in 1994 provided increased access to a large part of north-central Interior Alaska, leading to increased hunting and fishing in this part of the state (Haynes 2000). However, the decision to open this road was not related to the TAPS and is not attributable to the TAPS.

Since the time of its opening to public use, the Dalton Highway has been owned, operated, and maintained by the State of Alaska, which made the decision to allow public use. Currently there are no indications that ownership of the highway or its availability to public use would change, regardless of the outcome of the decision on whether to renew the TAPS ROW. Service roads are related directly to the TAPS, and their continuation is directly related to the ROW renewal. However, the amount of access they provide to subsistence resources is limited because of their relatively short length, the size of the vast Alaska Interior, and the size and configuration of subsistence use areas (Map 3.24-1). Since May 16, 1983, (48 *Federal Register* 22001) vehicular use of access roads has been restricted. Use of these service roads was further restricted for security purposes following the events of September 11, 2001. Thus, access-related competition with nonlocals for subsistence resources either is not related to the TAPS ROW renewal or is limited. Claims that TAPS employees compete for fish and game in areas they are familiar with as a result of their work on the TAPS could certainly be true, but under federal Grant Stipulation 1.14.1, APSC prohibits

employees from camping, hunting, fishing, and trapping in the right-of-way during their work shifts. There is no evidence to indicate that this source of competition (if present) is large. If competition directly related to the TAPS has an adverse impact on subsistence, the magnitude of this impact likely would be extremely small.

4. *Disturbance of subsistence activities.*

Disturbance of subsistence activities due to the TAPS refers primarily to the presence of TAPS-related activities or nonlocals interfering with subsistence hunting and fishing. This interference could take the form of activities associated with the operation of the TAPS — vehicular or airplane movement, maintenance activities, etc. — interfering with subsistence harvests. It also could involve the presence of other nonlocals whose presence or actions somehow adversely affect subsistence activities. As discussed above (see impact category 2), humans and human activities have been shown, in some instances, to interfere with the behavior of certain types of wildlife. However, TAPS-related sources of such interference are limited to the ROW, which represents a very small portion of the subsistence-use areas concerned; as a consequence, interference would be similarly limited. Although many more people may have access to previously remote portions of Alaska, thereby acting as possible sources of interference with subsistence activities, as discussed above (see impact category 3), most of the increase in access relates to the Dalton Highway. The state decision to open this highway to public use was not linked to the TAPS. There are no indications that this highway would be closed to public use even if TAPS operation were terminated. Disturbance of subsistence activities either appears to be geographically quite limited or is not related to the TAPS. As a consequence, any negative impacts from ROW renewal likely would be negligible.

5. *Constraints on access to subsistence resources.* Continued operation of the TAPS would continue to restrict access to TAPS facilities, such as pump stations. Such

restrictions would affect subsistence activities. However, for many of the communities possibly affected by the TAPS, such restrictions do not involve any of their traditional subsistence use areas (Maps 3.24-1 and D-3 through D-24). For those communities with subsistence areas that include restricted areas (Section 3.24-2), the reduction in access would be extremely small given the size of the harvest regions in question. Note that this evaluation does not include state restrictions to hunting with firearms in the Dalton Highway corridor, defined as the area 5 mi on either side of the Dalton Highway between the Yukon River and the Arctic Ocean, as these restrictions are not due to the TAPS. Moreover, in the federal land portion of the corridor, (i.e., all but the northernmost approximately 110 mi) rural subsistence users from nearby villages are authorized to use firearms for subsistence harvests under the federal subsistence management regulations. The restrictions also do not include state-imposed constraints on harvesting game in the Prudhoe Bay Closed Area, again because they are not due to the TAPS. Thus, although there would be constraints on access to subsistence resources due to continued operation of the TAPS, the impacts of these constraints would likely be very small by virtue of the proportion of subsistence use area affected.

E.2.1.2 Findings

Impacts of the proposed action on subsistence would not reach the threshold of “may” significantly restrict subsistence uses. As discussed in the preceding section, small or slight impacts in all five categories might occur under ROW renewal. The consequences likely related to the TAPS would be (1) reduced access to portions of subsistence use areas and (2) possibly disruptions to the movement of game. However, it is likely that the magnitude of these consequences would be very small, such that neither would significantly restrict subsistence uses.

E.2.2 Less-Than-30-Year Renewal Alternative

E.2.2.1 Evaluation

Anticipated impacts under the less-than-30-year renewal alternative are discussed in Section 4.5.2.20. The evaluation of the less-than-30-year alternative for purposes of ANILCA Section 810 considers the five potential impact categories defined in Section E.1 to determine if this alternative would lead to significant impacts on subsistence uses.

As discussed in Section 4.5.2.20, impacts associated with the less-than-30-year renewal alternative generally would be less than those associated with the proposed action. For the impacts considered in the ANILCA Section 810 evaluation:

1. Any changes in the population of subsistence resources would be smaller.
2. Changes in the geographic distribution of subsistence resources would have less time to accumulate, thereby likely resulting in smaller shifts.
3. Impacts from competition would have less time to accumulate, although the consequences of competition in any given period of time (e.g., year) could be the same as those under the proposed action.
4. Impacts from disturbance would have less time to accumulate, although, once again, the consequences of disturbance in any given period of time could be the same as those under the proposed action.
5. Impacts from constraints on access would have less time to accumulate, although impacts for any particular period could be the same as those under the proposed action.

E.2.2.2 Findings

Impacts of the less-than-30-year renewal alternative on subsistence would not reach the threshold of “may” significantly restrict

subsistence uses. As discussed in the preceding section, although impacts in any of the five categories might occur under ROW renewal, their magnitudes generally would be smaller than they would be under the proposed action. Once again, consequences likely related to the TAPS consist of limiting access to subsistence use areas and possibly disrupting the movement of game. However, the magnitude of both consequences likely would be very small, such that neither would significantly restrict subsistence uses.

E.2.3 No-Action Alternative

E.2.3.1 Evaluation

Section 4.6.2.20 concluded that any impacts to subsistence under the no-action alternative likely would be slightly positive. This conclusion is based upon a qualitative evaluation of possible results from discontinuing the TAPS. On the one hand, the population of Alaska is anticipated to increase slightly under the no-action alternative (although less rapidly than under other alternatives), with much of the increase coming from Alaska Natives (Tables 4.6-12 and 4.6-15), who have traditionally pursued subsistence more than have other groups in Alaska. Economic conditions resulting from discontinuation of the TAPS likely would yield slight declines in personal income (Table 4.6-16), possibly creating a greater economic reliance on subsistence. Declines in personal income might make it more difficult to purchase the modern technology often used in subsistence activities as well as in recreational hunting and fishing, and it might reduce the number of individuals engaged in the latter because of other associated costs. The no-action alternative possibly would remove existing restrictions on subsistence activities associated with the TAPS, depending on the disposition of pump stations. Finally, discontinuing the TAPS would reduce human activity on the Dalton and Richardson Highways, on TAPS access roads, and near various TAPS facilities, which might have a slight effect on the movement of certain subsistence resources (Section 4.3.20).

A consideration of key impact categories set forth in Section E.1 to evaluate the potential for significant restrictions under ANILCA Section 810 similarly yields mixed results:

1. *A decline in the population or amount of harvestable resources.* There is no clear evidence that harvestable resources would decline as a direct consequence of the no-action alternative. It is possible that an increase in the population of Alaska Natives, coupled with increased economic impetus to pursue subsistence, might yield increased pressure on subsistence resources. However, as noted in Sections 3.18 through 3.22, with the exception of certain threatened and endangered species, the populations of fish and game appear to be adequate to sustain themselves and reasonable harvests. Moreover, subsistence activities account for a relatively small amount, on the order of 2% by weight, of the aggregate of all fish and game harvested in Alaska (Wolfe 2000).
2. *Changes in the geographic distribution of subsistence resources.* As noted above, discontinuing the TAPS would eliminate TAPS-related traffic on the Dalton and Richardson Highways, TAPS access roads, and near TAPS facilities, which might have a slight effect on the movement of small numbers of terrestrial mammals important to subsistence. The Dalton Highway itself would remain open for public use. There is no evidence that any disruption to movement at population levels has occurred as a result of TAPS operation; thus, the removal of the TAPS and activities associated with it would likely have only a small positive effect.
3. *Competition for potential subsistence resources.* Under the no-action alternative, it is likely that competition from recreational hunting and fishing would decline slightly. The magnitude of this change probably would be small. Competition from other subsistence users, in turn, likely would increase, in part in response to a reduction in other economic opportunities. The increase in overall subsistence use probably also would be small for the area considered, in part because of participation that already is high for many of the rural communities

examined and in part because much of the seasonal and government employment currently available to supplement subsistence activities would continue.

4. *Disturbance of subsistence activities.* Disturbance of subsistence activities would probably decline under the no-action alternative. This conclusion is based, in part, on (1) an anticipated small decline in personal income in Alaska, which might reduce the number of state residents traveling to remote areas in the state, and (2) a possible decline in the amount of maintenance on the Dalton Highway because of reduced state revenues, which would make it more difficult to use the highway. Moreover, any deterioration in the condition of the Dalton Highway would not affect the potential disruption of subsistence activities in other areas where that transportation link is not a key means of general regional access.
5. *Constraints on access to subsistence resources.* Restrictions to subsistence use areas likely would decline under the no-action alternative. Present TAPS-related restrictions to access pertain to TAPS facilities, such as pump stations. Depending on the disposition of these facilities following the discontinuation of the TAPS, access could be reinstated to these localities (if, for instance, pump stations were removed). However, the total area involved is extremely small in comparison to subsistence use areas, so any improvements in access would be slight.

E.2.3.2 Findings

Impacts of the no-action alternative on subsistence would not reach the threshold of “may” significantly restrict subsistence uses. As discussed in the preceding section, individual impacts are anticipated to be small and likely would be slightly positive overall.

E.2.4 Cumulative Impacts

Section 4.7.8.1 summarizes cumulative impacts to subsistence associated with the

proposed action, less-than-30-year renewal alternative, and no-action alternative. Whereas the individual alternatives refer only to renewal of the TAPS right-of-way, the cumulative effects analysis takes into account past, present, and reasonably foreseeable actions whose impacts might complement those associated with the TAPS. In particular, this brings into the analysis continuing oil field development on the North Slope, and the marine transport component of taking oil from the Valdez Marine Terminal to market. The analysis in the EIS concluded that cumulative effects of the proposed action would include moderate negative impacts on the North Slope, but only minor negative impacts in the Interior Alaska and Prince William Sound-Lower Cook Inlet regions. The anticipated impacts of cumulative impacts associated with the less-than-30-year renewal alternative were judged to be less than those associated with the proposed action, while impacts associated with the no-action alternative were anticipated to be slightly positive. All negative impacts were felt to be small, with the exception of the moderately negative impacts identified for the North Slope region associated with the proposed action and less-than-30-year renewal. This conclusion is based on a qualitative evaluation of likely consequences of past, present, and reasonably foreseeable actions in a broad geographic area affected by the TAPS, organized into the three subregions noted above. In all cases, the contributions from the TAPS to the cumulative impacts appeared to be relatively small when compared with the contributions from other actions.

This section of Appendix E evaluates the cumulative impacts of the TAPS in the context of ANILCA Section 810. The discussion is divided into three subsections dealing with cumulative impacts associated with the proposed action, less-than-30-year renewal alternative, and no-action alternative. The conclusion reached is that cumulative impacts associated with the proposed action may significantly restrict subsistence uses. The specific impacts identified are the same as those identified in Section 4.7.8.1, and so at first glance this conclusion may seem inconsistent with the conclusions presented in the main body of the EIS under cumulative impacts in that section. The difference is that here the specific impacts

are reviewed on the basis of the lower threshold embodied in the phrase “may” significantly restrict.

E.2.4.1 Cumulative Impacts Associated with the Proposed Action

E.2.4.1.1 Evaluation. As discussed in Section E.1, a significant restriction to subsistence uses may result from five categories of impacts, either alone or in combination. These can be assessed with regard to cumulative impacts associated with the proposed action:

1. *A decline in the population or amount of harvestable resources.* As noted in Sections 3.18 through 3.22, there is no evidence that a decline in the populations or amounts of harvestable resources has resulted from current operation of the TAPS and other current actions in the TAPS ROW, apart from effects on individual or very small numbers of animals. Indeed, the populations of certain caribou herds have increased, some substantially, during the period of TAPS operation (TAPS Owners 2001), although this population growth is not necessarily a consequence of pipeline operation. Some of the actions considered as contributing cumulative impacts already are in place and apparently have not led to any population declines in key subsistence resources. Other cumulative actions (e.g., additional oil exploration, development, and production and the construction and operation of a natural gas pipeline), although not yet in place, are similar to those currently in operation and thus are not expected to yield large negative impacts. Exploration and construction activities would have localized and generally short-term effects. As a result, there is no anticipated effect under this impact category.
2. *Changes in the geographic distribution of subsistence resources.* As noted above, one of the most frequently cited concerns about the current and potential future operation of the TAPS expressed by subsistence users is the adverse impact on the geographic distribution of subsistence resources (see

community descriptions in Section 3.24.2 and Appendix D). The implication of such changes would be reduced accessibility. Even though the size of populations of key resources might be equal to or larger than those of the past, they might not be as accessible for harvesting as they were in the past, because of displacement to more distant ranges. Available evidence does indicate that caribou, in particular, are sensitive to human activity, including movement on foot or in various types of vehicles (Horejsi 1981; Murphy and Lawhead 2000; Tyler 1991; Wolfe, S. et al. 2000). There is no evidence from scientific studies that the TAPS or activity in the TAPS ROW or on the Dalton Highway in support of the TAPS has affected herd movement at a population level. Impacts identified are often temporary and confined to a few animals (Sections 4.3.15, 4.3.16, 4.3.17, and E.2.1.1) (TAPS Owners 2001). However, additional activity presumably would add to the disruption of game mobility, particularly on the North Slope, where many of these activities would be concentrated. The amount of disruption cannot be quantified given the present knowledge about locations of specific activities — e.g., it is not known precisely where additional oil fields will be discovered and developed. However, if the cumulative extent of developed lands were to become larger, the effects on the movements of wildlife may become more significant, with potential implications for subsistence. This finding is similar to that reached in the cumulative effects analysis of the Section 810 Findings and Evaluations for the Northeast National Petroleum Reserve Alaska (BLM 1998).

3. *Competition for potential subsistence resources.* Also frequently cited as a concern with regard to both the current and future operation of the TAPS, competition, in this case, involves nonlocals harvesting fish and game that might otherwise be harvested for local subsistence (Section 3.24.2 and Appendix D). One of the causes of this competition is increased access to remote areas, primarily as a consequence of opening the Dalton Highway to public use. Service roads also are cited as providing

increased access to remote areas. Additional service roads would accompany new oil and gas exploration, development, and production on the North Slope and the construction and maintenance of a natural gas pipeline, thereby providing further (but not unrestricted) access. The degree to which TAPS employees compete for fish and game in areas they are familiar with as a result of working on the TAPS is uncertain, but under federal Grant Stipulation 1.14.1, ASPC prohibits employees from camping, hunting, fishing, and trapping in the right-of-way during their work shifts. Furthermore, although more individuals would become familiar with remote parts of Alaska because of their association with these additional activities, their contribution to competition is estimated to be minimal. If cumulative impacts associated with the proposed action were present, their magnitude likely would be small.

4. *Disturbance of subsistence activities.* Disturbance of subsistence activities from cumulative actions refers primarily to the presence of activities or nonlocals interfering with subsistence hunting and fishing. This interference could take the form of activities associated with the construction or operation of the other facilities — use of heavy equipment, vehicular or airplane traffic, maintenance activities, etc. It also could involve the presence of other nonlocals (e.g., tourists, indirect support personnel) whose presence or actions somehow adversely affect subsistence activities. As discussed above (see impact category 2), human activities have been shown to interfere with the behavior of certain animals. Moreover, access to remote areas would likely increase because of reasonably foreseeable actions (see impact category 3). Nevertheless, cumulative impacts in the form of disturbance to subsistence activities likely would be geographically limited to the areas associated with cumulative actions. As a consequence, any negative impacts likely would be small.
5. *Constraints on access to subsistence resources.* The construction and operation of other facilities in addition to the TAPS would

lead to placing limits on access to subsistence areas or placing restrictions on hunting and fishing in certain areas. Such restrictions would provide a means of protecting the personnel and infrastructure associated with the cumulative actions. For most of the communities examined in this document, current and reasonably foreseeable future actions do not and would not involve any of their traditional use areas (Map 3.24-1). However, in some cases, restrictions would affect these areas. Traditional use areas tend to be large, and restricted areas likely would be comparatively small. The Native Village of Eyak has asserted that the closure of oil tanker lanes in the Valdez Arm to Cape Hichinbrook waters, recently adopted for national security reasons, has restricted access to a traditional fishing area. The map of the traditional use area for Cordova residents, does not show these lanes to be a part of the traditional use area (see Maps 3.24-1 and D-22).

Relative impacts from restricted access would be greatest on the North Slope, where activities contributing to cumulative impacts would be most heavily concentrated, and would include the subsistence use areas for Anaktuvuk Pass and Nuiqsut (Maps 3.24-1, D-3, and D-4). Despite the ability of the residents of these two communities to pursue subsistence in other, unrestricted portions of their traditional subsistence use areas, because of their need to pursue game where and when it occurs, in some circumstances cumulative restrictions may significantly restrict subsistence uses. Empirical research at Nuiqsut showed that physical barriers and security measures in oil fields moving closer to the community has resulted in longer detours, avoidance of some areas, and reluctance to use others. Data on caribou harvest locations show displacement: by 1992-1993, "about 80 percent of the communities' annual harvest [of caribou] . . . came from areas distant (16 mi) from development" (Pederson et al. 2000). Nuiqsut was particularly affected by oil field development with the Alpine field just 6 mi to the north and the Tarn field at western edge of Kuparuk some

15 mi away (Pedersen et al. 2000). These fields pre-date the leasing program recently reviewed for the National Petroleum Reserve Alaska, North East, for which the Section 810 Analysis also found that in the cumulative case, restrictions on access reach the "may" significantly restrict threshold. Phillips Petroleum has been working with local communities to reduce the areas restricted for safety and security purposes (see Section 4.1.5), and the National Petroleum Reserve Alaska, North East environmental review identified measures to mitigate impacts on subsistence users due to new exploration and leasing. Nonetheless, this conclusion is consistent with the studies that have examined the impacts of oil development on the North Slope (e.g., BLM 1998; Pedersen et al. 2000), when assessed with the reduced threshold of identifying activities that "may" significantly restrict subsistence.

E.2.4.1.2 Findings. Cumulative impacts associated with the proposed action on subsistence meet the threshold of "may" significantly restrict subsistence uses. As discussed in the preceding section, an increase in potential disruption of subsistence resource movement and an increase in the area closed to subsistence may hamper subsistence activities on the North Slope.

E.2.4.2 Cumulative Impacts Associated with the Less-Than-30-Year Renewal Alternative

E.2.4.2.1 Evaluation. The evaluation of cumulative impacts associated with the less-than-30-year renewal alternative is generally the same as the evaluation of cumulative impacts associated with the proposed action just discussed (Section E.2.4.1.1). This similarity reflects, in part, the relative importance of impacts from other actions when compared with impacts from the TAPS and, in part, the resemblance of subsistence impacts from the TAPS under the entire 30-year and the less-

than-30-year renewal periods. Evaluation of the five categories of impacts is repeated here:

1. *A decline in the population or amount of harvestable resources.* As noted in Sections 3.18 through 3.22, there is no evidence that a decline in the populations or amounts of harvestable resources has resulted from current operation of the TAPS and other current actions in the TAPS ROW, apart from effects on individual or very small numbers of animals. The populations of certain caribou herds have increased, some substantially, during the period of TAPS operation (TAPS Owners 2001), although this population growth is not necessarily a consequence of pipeline operation. Some of the actions considered as contributing cumulative impacts are already in place and apparently have not led to any population declines in key subsistence resources. Other cumulative actions (e.g., additional oil exploration, development, and production and the construction and operation of a natural gas pipeline), although not yet in place, are similar to those currently in operation and thus are not expected to yield large or lasting negative impacts. Localized effects of construction activities would be short-term. As a result, there is no anticipated impact under this impact category.
2. *Changes in the geographic distribution of subsistence resources.* As noted above, one of the most frequently cited concerns about the current and potential future operation of the TAPS expressed by subsistence users is the adverse impact on the geographic distribution of subsistence resources (Section 3.24.2 and Appendix D). The implications of such changes would be reduced accessibility. Even though the size of populations of key resources might be equal to or larger than those of the past, they might no longer be as accessible (because of displacement to more distant ranges) for harvesting as they were in the past. Available evidence does indicate that caribou, in particular, are sensitive to human activity, including movement on foot or in various types of vehicles (Horejsi 1981; Murphy and Lawhead 2000; Tyler 1991; Wolfe, S. et al. 2000). There is no evidence from conventional scientific studies that the TAPS or activity in the TAPS ROW or on the Dalton Highway in support of the TAPS has affected herd movement at a population level. Impacts that have been identified are often temporary and confined to a few animals (Sections 4.3.15, 4.3.16, 4.3.17, and E.2.1.1) (TAPS Owners 2001). However, additional activity presumably would add to the disruption of game mobility, particularly on the North Slope, where many of these activities would be concentrated. The amount of disruption cannot be quantified given the present knowledge about the locations of specific activities. However, if the cumulative extent of developed lands were to become larger, the effects on the movements of wildlife may become more significant, with important implications for subsistence.
3. *Competition for potential subsistence resources.* Also frequently cited as a concern about the current and future operation of the TAPS, competition involves nonlocals harvesting fish and game that might otherwise be harvested for local subsistence (Section 3.24.2 and Appendix D). One of the causes of this competition is increased access to remote areas, primarily as a consequence of opening the Dalton Highway to public use. Service roads also are cited as providing increased access to remote areas. Additional service roads would accompany oil and gas exploration, development, and production on the North Slope and the construction and maintenance of a natural gas pipeline, thereby providing further (although likely limited) access. The degree to which TAPS employees compete for fish and game in areas they are familiar with as a result of working on TAPS is uncertain, but under Federal Grant Stipulation 1.14.1, ASPC prohibits employees from camping, hunting, fishing, and trapping in the right-of-way during their work shifts. Although more individuals would become familiar with remote parts of Alaska because of their association with cumulative actions, their contribution to competition is estimated to be minimal. If cumulative impacts associated

with the less-than-30-year renewal alternative were present, their magnitude likely would be small.

4. *Disturbance of subsistence activities.* Disturbance of subsistence activities from cumulative actions refers primarily to the presence of activities or nonlocals interfering with subsistence hunting and fishing. This interference could take the form of activities associated with the construction or operation of the other facilities — use of heavy equipment, vehicular or airplane traffic, maintenance activities, etc. It also could involve the presence of other nonlocals (e.g., tourists, indirect support personnel) whose presence or actions somehow adversely affect subsistence activities. As discussed above (see impact category 2), humans and human activities have been shown to interfere with the behavior of certain animals. Moreover, access to remote areas would likely increase due to reasonably foreseeable actions (see impact category 3). Nevertheless, cumulative impacts in the form of disturbance to subsistence activities likely would be geographically limited to the areas associated with cumulative actions. As a consequence, any negative impacts likely would be small.
5. *Constraints on access to subsistence resources.* The construction and operation of other facilities in addition to the TAPS could lead to limitations on access to subsistence areas or restrict hunting and fishing in certain areas. Such restrictions would provide a means of protecting personnel and infrastructure associated with the cumulative actions. Although for many of the communities examined in this document, current and reasonably foreseeable future actions do not involve any of their traditional use areas (Map 3.24-1), in some cases, restrictions would affect these areas. Traditional use areas tend to be large, and restricted areas likely would be comparatively small. The Native Village of Eyak has asserted that the closure of oil tanker lanes in the Valdez Arm, recently adopted for national security reasons, has restricted access to a traditional fishing area.

The mapped traditional subsistence use area for Cordova residents does not show these lanes as a part of the traditional use area (see Maps 3.24-1 and D-22). Relative impacts from restricted access would be greatest on the North Slope, where cumulative actions would be most heavily concentrated, and would include the subsistence use areas for Anaktuvuk Pass and Nuiqsut (Maps 3.24-1, D-3, and D-4). Despite the ability of the residents of these two communities to pursue subsistence in other, unrestricted portions of their traditional subsistence use areas, because of their need to pursue game where and when it occurs, in some circumstances, cumulative restrictions “may” significantly restrict subsistence uses. This conclusion is consistent with those reached in other studies that have examined the impacts of oil development on the North Slope (e.g., BLM 1998; Pedersen et al. 2000), combined with the reduced threshold of impact anticipation.

E.2.4.2.2 Findings. Cumulative impacts associated with the less-than-30-year renewal alternative on subsistence meet the threshold of “may” significantly restrict subsistence uses. As discussed in the preceding section, an increase in potential disruption of subsistence resource movement and an increase in the area closed to subsistence may hamper subsistence activities on the North Slope.

E.2.4.3 Cumulative Impacts Associated with the No-Action Alternative

E.2.4.3.1 Evaluation. The mixed impacts of the no-action alternative on subsistence, with some consequences likely positive and others likely negative, also characterizes the cumulative impacts under the no-action alternative. After a brief period of decline following TAPS discontinuation, the population of Alaska is anticipated to increase slightly under the no-action alternative (Tables 4.6-12 and 4.6-15), with much of the increase coming from Alaska Natives, who have

traditionally pursued subsistence more than other groups in the state. Moreover, economic conditions resulting from discontinuation of the TAPS is expected to yield decreases in per capita personal income (Table 4.6-16), probably creating a greater economic reliance on subsistence. Declines in personal income might make it more difficult to purchase the modern technology often used for subsistence activities as well as recreational hunting and fishing, although may also reduce the number of individuals engaged in the latter because of other associated costs. Finally, the no-action alternative would remove some existing restrictions on subsistence activities near the TAPS and reduce human activity on the Dalton Highway, TAPS access roads, and near various TAPS facilities, which have an effect on the movement of small numbers of certain subsistence resources (see Section 4.3.20).

The cumulative case associated with the no-action alternative is different than the no-action alternative by itself. The termination of TAPS operations would have important implications for North Slope oil production, inasmuch as oil production requires transportation of the product to the market to continue. This analysis assumes discontinuation of North Slope operations. Although it makes no particular assumptions about the removal of infrastructure, the discontinuation of production would remove personnel from the North Slope, where some of the largest impacts on subsistence are concentrated. Economic impacts would be the same as presented under the no-action alternative (see Section 4.6.2.19), which evaluated the consequences of shutting down oil production in Alaska as it currently exists.

A consideration of key impacts used to evaluate the presence of significant restrictions under ANILCA Section 810 similarly yields mixed results:

1. *A decline in the population or amount of harvestable resources.* There is no evidence that harvestable resources would decline as a consequence of the no-action alternative. It is possible that an increase in the Alaska Native population, coupled with increased economic impetus to pursue subsistence, may yield increased pressure on subsistence resources. However, as noted

in Sections 3.18 through 3.22, with the exception of certain threatened and endangered species, the populations of fish and game appear to be adequate to sustain themselves and reasonable harvests. Moreover, subsistence activities harvest a relatively small amount, on the order of 2% by weight, of the aggregate of all fish and game harvested in Alaska (Wolfe 2000). Increases in fish and game harvests by the relatively slightly growing population associated with other current and reasonably foreseeable future actions may have little effect on subsistence resource populations.

2. *Changes in the geographic distribution of subsistence resources.* As noted above, discontinuing the TAPS would eliminate TAPS-related traffic on the Dalton and Richardson Highways, TAPS access roads, and near TAPS facilities, which likely has a slight effect on the movement of small numbers of terrestrial mammals important to subsistence. There is no evidence that any disruption to their movement at population levels has resulted from TAPS operations; thus, the removal of the TAPS and activities associated with it likely would have only a small positive effect on subsistence resource migration. In the cumulative case, traffic and activity related to North Slope oil production also would cease. This reduction in traffic includes the Dalton Highway and possibly other public highways. The reduction in traffic and activity also includes the North Slope oil fields. Although little evidence exists to indicate that traffic on the Dalton Highway and the TAPS access roads has had much effect on animal migration, the concentration of infrastructure and activity on the North Slope appears to have had more influence in a localized area. As a result, the slight impacts on animal migration as a consequence of the oil industry is anticipated to decline, which may yield a slight positive impact on subsistence.
3. *Competition for potential subsistence resources.* Under the no-action alternative alone, it is likely that competition from recreational hunting and fishing would decline slightly because of reduced personal

income. The no-action cumulative case likely would see a further decrease in such competition, through a further decline in oil industry personnel. Competition from subsistence users, in turn, is expected to increase under the no-action alternative as other economic alternatives to subsistence decline in number. Although the same would be expected in the cumulative case, the increase in overall subsistence use probably would be small for the area considered. This conclusion is based in part on the observation that subsistence participation that already is high for many of the rural communities in the vicinity of the TAPS and the North Slope oil fields, and in part on a likely continuation of much of the seasonal and government employment currently available to supplement subsistence activities. Both increases and decreases in competition likely would be small. The net effect of the no-action alternative in the cumulative case likely may be positive but small in magnitude.

4. *Disturbance of subsistence activities.* Disturbance of subsistence activities is expected to decline under the no-action alternative, particularly as TAPS operations and maintenance activities decline. This conclusion is based in part on an anticipated small decline in personal income in Alaska, which might reduce the number of state residents traveling to remote areas in the state, and in part on a possible decline in the amount of maintenance on the Dalton Highway because of reduced state revenues, which would make it more difficult to use. The termination of additional oil-related activities under the no-action cumulative case should reduce this disturbance further. Once again, the greatest effects are anticipated on the North Slope, where the greatest concentration of oil activities occur. In addition to the reduction in oil-industry-related personnel and activity along the TAPS and in the North Slope oil fields, deterioration in the condition of the Dalton Highway because of declining revenues likely would reduce travel by non-local hunters and anglers. Overall, the no-action alternative in the cumulative case may have a slight positive impact on

subsistence through reducing possible disturbance to subsistence activities.

5. Constraints on access to subsistence resources. Restrictions to subsistence use areas would decline under the no-action alternative, as most of the few areas inaccessible to subsistence become available once again. When the effects of cumulative actions are considered — notably the termination of North Slope oil production — access restrictions would decline further. The degree of improvement in subsistence access on the North Slope would depend in part on how access would change following cessation of operations, but some improvement should occur. Although changes in access to subsistence resources would be very slight in Interior Alaska, because of the current absence of such constraints, access improvements in the Prince William Sound area likely would accompany the no-action cumulative case. This conclusion is based in part on the assertion by the Native Village of Eyak that the closure of oil tanker lanes in the Valdez Arm of Prince William Sound, recently adopted for national security reasons, has restricted access to a traditional fishing area. That stated, the mapped traditional subsistence use area for Cordova residents does not show these lanes as a part of the traditional subsistence use area (see Maps 3.24-1 and D-22), and this issue currently is being evaluated outside of this EIS. In all, constraints to subsistence resources likely would decline under the no-action alternative combined with cumulative impacts — potentially yielding a net positive effect on subsistence.

E.2.4.3.2 Findings. Cumulative impacts associated with the no-action alternative on subsistence do not meet the threshold of an action that “may” significantly restrict subsistence uses. As discussed in the preceding section, nonrenewal of the TAPS ROW likely would generally improve subsistence, primarily through reducing potential disruption of subsistence resource movement and decreasing the area closed to subsistence activities.

E.3 Notice and Hearings

The ANILCA § 810(a) requires that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds hearing in accordance with paragraphs 810(a)(1) and (2). The BLM published notice in the Federal Register on July 5, 2002, that cumulative impacts “may” significantly restrict subsistence uses. Public hearings, combined with public hearings on the DEIS for TAPS right-of-way renewal, were held in Cordova, Valdez, Glennallen, Anchorage, Fairbanks, Minto, and Barrow, Alaska, between July 26 and August 9, 2002.

Several individuals who attended the public hearings expressed concern about continuing impacts on subsistence of the TAPS, alone and in conjunction with other development (including oil and gas exploration and development). The majority of these concerns focused on competition for subsistence resources by nonlocal hunters and fishermen, disruption of game (particularly caribou) movements, persisting impacts of the Exxon Valdez oil spill on subsistence in Prince William Sound, and potential impacts of any future spill in Prince William Sound or a key river used for subsistence. The comments made by rural Alaskans during the public comment/ANILCA hearings were consistent with those provided during the public scoping period for the TAPS ROW EIS and during government-to-government consultation with federally recognized Tribes that occurred while the EIS was being prepared. Nevertheless, the testimony and comments offered during this more recent period led the BLM to reevaluate impacts on subsistence and to refine the presentation of those impacts (including a reassessment of the no-action cumulative case).

E.4 Subsistence Determinations under Section 810(a)(3)(A), (B), and (C)

The ANILCA Section 810(a) states that no action that would significantly restrict subsistence uses can occur until the responsible federal agency provides required notice and holds a hearing, and conducts evaluations in accordance with ANILCA paragraphs 810(a)(3)(A), (B), and (C). Following the determination that cumulative impacts “may” significantly restrict subsistence uses, the BLM scheduled hearings, as noted above. The following three sections comprise evaluations of ANILCA Section 810(a)(C), providing determinations if:

1. Such restriction to subsistence is necessary and consistent with sound management principles for use of the public lands in question [ANILCA § 810(a)(3)(A)];
2. The proposed activity will involve the minimal amount of public lands necessary to accomplish its purposes; [ANILCA § 810(a)(3)(B)]; and
3. Reasonable steps will be taken to minimize adverse impacts on subsistence uses and resources [ANILCA § 810(a)(3)(C)].

E.4.1 The Proposed Action with the Identified Potential Restriction of Subsistence Uses Is Necessary, Consistent with Sound Management Principles for the Utilization of Public Lands

This analysis concluded that the cumulative effects of the proposed action “may” significantly restrict subsistence, because of physical restrictions on subsistence activities in the TAPS corridor and in the North Slope oil fields. The proposed action and associated cumulative effects are necessary and consistent with sound

management of the federal public lands. Physical restrictions on subsistence uses associated with the proposed action involve components of the TAPS and North Slope oil field infrastructure. For example, subsistence activities are not allowed within the fenced areas occupied by pump stations and related facilities, nor within developed oil fields. Such restrictions are consistent with steps to protect TAPS and oil field operations personnel from injury and infrastructure from damage due to stray bullets.

Federal management of certain land close to the TAPS helps to reduce restrictions on subsistence users. The State of Alaska identifies two areas north of the Yukon River in proximity of the TAPS and North Slope oil fields where hunting with firearms is not allowed (ADF&G 2002). One area is the Dalton Highway corridor, defined as 5 mi on either side of the Dalton Highway between the Yukon River and the Arctic Ocean. The other is the Prudhoe Bay Closed Area, a roughly rectangular area that includes the Prudhoe Bay oil development infrastructure near the coast of the Arctic Ocean. The Federal Subsistence Board, of which the BLM State Director is a voting member, exercises federal subsistence management jurisdiction on the federal lands in the Dalton Highway corridor. The federal lands encompass all but the final (approximately) 110 mi of the corridor. In providing the rural subsistence priority required under ANILCA, the Federal Subsistence Board has revised regulations to allow residents of selected communities (Alatna, Allakaket, Anaktuvuk Pass, Bettles, Evansville, and Stevens Village) and residents living in the corridor to use firearms for subsistence harvests in those portions of the corridor that it manages (Office of Subsistence Management 2001). This relaxation of restrictions for subsistence users enables those individuals to harvest the resources important to their economies, sociocultural systems, and ceremonial activities in the manner they deem most efficient. Continuing state-imposed restrictions on the northern portion of the Dalton Highway corridor and in the Prudhoe Bay Closed Area are not decisions involving federal land, and thus lie outside of this evaluation.

E.4.2 The Proposed Activity Will Involve the Minimal Amount of Public Lands Necessary to Accomplish the Purposes of Such Use, Occupancy, or Other Disposition

The proposed activity evaluated here concerns renewal of the existing TAPS right-of-way and associated infrastructure. The proposed renewal involves only the land required for TAPS infrastructure and maintenance of that infrastructure, and involves the area currently used for that system. The ROW width varies from 54 ft on federal lands where the pipeline is buried and 64 ft on federal lands where the pipeline is above ground to 100 ft on state lands, becoming as broad as 300 ft on certain private lands (TAPS Owners 2001). The proposed activity involves a narrow transect of public land across the State of Alaska, providing the minimum amount required to maintain the TAPS as a functioning system (allowing for possible repairs, which often involve heavy equipment operating on either side of the pipeline).

E.4.3 Reasonable Steps Will be Taken to Minimize Adverse Impacts upon Subsistence Uses and Resources Resulting from Such Actions

During scoping for this EIS, the BLM and the public identified subsistence as one of the most important concerns to be evaluated in the NEPA process. Government-to-government consultations between the BLM and Alaska Native Tribes were initiated, with subsistence inevitably one of the topics discussed. All five public scoping meetings, as well as government-to-government meetings during the scoping period, confirmed the high level of importance attributed to subsistence. As a result, considerable effort was made to examine subsistence concerns and evaluate subsistence impacts under all alternatives considered in the EIS. On federal lands, managers implement the

rural priority to provide for continuation of subsistence practices.

As noted in Section E.2, the greatest impacts to subsistence are likely to occur not solely due to the proposed renewal of the TAPS right-of-way itself, but rather in the form of cumulative impacts. The greatest potential impacts are those that would be indirect consequences of the proposed action and other actions included under cumulative impacts — economic, demographic, and accessibility conditions expected to accompany Alaska economic growth in general. Ultimately, the steps necessary to minimize impacts of the sort anticipated need to be taken by federal and state agencies managing subsistence and sport fish and game harvests.

E.4 References for Appendix E

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Appendix F:
Alaska Native Utilization Agreement
and Implementation Plan

Appendix F: Alaska Native Utilization Agreement and Implementation Plan

This appendix contains copies of (1) the 2001 Alaska Native Utilization Agreement signed by the Authorized Officer and the President and CEO of the Alyeska Pipeline Service Company on behalf of the TAPS Owners and (2) the

January 2002 “Alaska Native Program Implementation Plan for Alaska Native Utilization Agreement.” Both have been reproduced from the best available copies.

F.1 Alaska Native Utilization Agreement

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ALASKA NATIVE UTILIZATION AGREEMENT



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ALASKA NATIVE UTILIZATION AGREEMENT

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Alaska Native Utilization Agreement

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ALASKA NATIVE UTILIZATION AGREEMENT

SECTION 1 INTRODUCTION

Section 29 of the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline (hereafter referred to as "Section 29") states:

29. Training of Alaska Natives

- A. Permittees shall enter into an Agreement with the Secretary regarding recruitment, testing, training, placement, employment, and job counseling of Alaska Natives.
- B. During construction and operation of the Pipeline System, Permittees shall conduct a pre-employment and on-the-job training program for Alaska Natives designed to qualify them for initial employment in connection with the Pipeline System and for advancement to higher paying positions thereafter.
- C. Permittees shall do everything practicable to secure the employment, in connection with the Pipeline System, of those Alaska Natives who successfully complete the Permittees' training program. Permittees shall inform the Authorized Officer of the discharge from such employment of each and every Alaska Native and of the reason therefor, in advance of such discharge wherever possible or, if advance notice is impossible, as soon thereafter as is practicable.
- D. Permittees shall furnish such information and reports concerning Alaska Native employment as the Authorized Officer shall require from time to time.

This Agreement between Alyeska Pipeline Service Company (hereafter referred to as "Alyeska"), as agent for Permittees, and the United States Department of the Interior is made pursuant to Section 29 to establish appropriately funded programs to increase Alaska Native employment, training, and promotional opportunities. This Agreement supersedes all previous agreements and is intended to improve the effectiveness of the program employed by Alyeska to fulfill its obligations under Section 29. This Agreement will remain in force for the duration of pipeline operations or until modified by the mutual agreement of Alyeska and the United States Department of the Interior.

Alyeska and the Department of the Interior agree to review this Agreement at least once every three years to assess the programs and commitments contained herein. The next review will be accomplished on or before December 31, 2004. The existing Agreement will remain in effect unless Alyeska and the United States Department of the Interior (hereafter "DOI") mutually agree to all changes.

Alaska Native Utilization Agreement

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Subsequent reviews will occur on or before December 31 in three-year cycles thereafter. Technical changes between three-year periods can be accomplished by a simple amendment agreement in writing between the President of Alyeska Pipeline Service Company and the Authorized Officer.

This Agreement is intended to further Alyeska's long-standing relationship with Alaska Native organizations, particularly those located in the vicinity of the pipeline corridor. This Agreement continues Alyeska's efforts, beginning prior to construction of the Trans-Alaska Pipeline System (TAPS), to ensure that Alaska Natives benefit from the economic development opportunities afforded by its construction and operation. The programs established by this Agreement are not intended to establish an affirmative action plan or quotas for Alaska Native employment. These programs instead serve to fulfill Alyeska's commitment to the United States, embodied in Section 29, and Alyeska's desire to afford employment opportunities for Alaska Natives, while recognizing the importance of emphasizing employment opportunities for Alaska Natives who are shareholders or direct descendants of shareholders of ANCSA corporations that are in close proximity to the pipeline corridor.

This Agreement will be implemented by plans and procedures appropriate to satisfy the commitments it contains. Thirty days after the execution of this Agreement by Alyeska and the Secretary, Alyeska will prepare and submit to the Authorized Officer, a final Plan for Implementation ("The Plan" hereafter) of this Agreement. The Plan will describe the intended timing of the various programs and commitments in this Agreement. The Plan shall be effective 30 days after it is formally submitted, unless the Authorized Officer objects in writing to all or a portion of the Plan in which case those portions which are not objectionable shall be effective. Review of the Plan by the Authorized Officer shall in no way restrict or impede implementation of any portion of this Agreement. The Plan will be prepared in consultation with the Authorized Officer to assure that Alyeska remains responsible for the details and successful implementation of this Agreement and to assure that appropriate federal resources are available and in place to support realization of positive goals and intentions of this Agreement.

The Plan shall be consistent with the terms and conditions of this Agreement. Approval of the Plan by the DOI shall not be unreasonably withheld and shall not be conditioned on Alyeska agreeing to terms and conditions therein which are not otherwise consistent with this Agreement.

The implementation of programs described by this Agreement will be reviewed and prioritized annually by Alyeska to adjust the program to Alyeska work force requirements and the availability of the Alaska Native work force. The Authorized Officer will periodically review the Plan. Alyeska will maintain the programs described

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for Alaska Native employees for the life of the Agreement and Grant of Right of Way for the Trans-Alaska Pipeline System.

SECTION 2 Employment

In order to facilitate the measurement of the success and improvement of this program, it is the ultimate aspiration of Alyeska to increase its employment of Alaska Natives in regular, full-time positions to a level in the combined TAPS work force of Alyeska and its Designated Contractors (see Section 2.2) that is equivalent to 20%. The Combined TAPS Workforce will be measured per an annual average, based on quarterly totals and reported on December 31 of each year.

The utilization levels described in this Agreement will be reviewed by Alyeska and the Department of the Interior in each three-year review, to decide whether to adjust the numbers in light of then-available information. The review will consider progress made during the period, obstacles to implementation and other factors. The numerical levels, other than the spending commitment in 2.1, adopted in this Agreement or in subsequent review periods are aspirational objectives and not contractual commitments or guarantees.

2.1 ALYESKA

Alyeska will make good faith efforts to achieve the interim utilization levels stated herein. As a measure of Alyeska's good faith efforts to reach these goals, Alyeska agrees that it will spend \$25 million, which includes administrative costs, over the 12-year period (to be spent at a rate of approximately \$2.1 million per year) from 1996 through 2007, in furtherance of Alyeska and its Contractors reaching the desired employment levels of 20% Alaska Natives in the combined TAPS work force. As a part of this spending commitment during the period 1996 to 2007, Alyeska will target scholarship spending on an annual basis at a level of \$750,000. Performance under Section 29 will be measured by the DOI based on an assessment of Alyeska's continuing good faith efforts to meet the Section 29 commitments contained in this Agreement.

Pursuant to the objectives of Section 29, Alyeska adopts interim levels of employment of Alaska Natives as a percentage of the combined TAPS work force, as identified in Exhibit 1:

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EXHIBIT 1

Section 29 Employment Levels by job classification and year

Year	1998	1999	2000	2001	2002*	2003*	2004*
Managers/Supervisors	4%	6%	7%	9%	10-12%	12-14%	14-16%
Professionals	10%	11%	13%	14%	16%	18%	19%
Technicians	11%	13%	15%	16%	18%	19%	21%
Clerical & Administrative	21%	22%	24%	26%	27%	29%	30%
Totals	10%	12%	14%	16%	17%	19%	20%

Note: Upon reaching the 20% employment level, it is expected that Alyeska will maintain these percentages for the life of the Grant of Right-of-Way. Percentages are calculated based on APSC 1998 Long Range Plan Data Exhibit 1 is an extension of these levels of employment through 2004 to indicate higher percentages that might be reached in future years, in pursuit of the overall target. Actual levels in each three-year period will vary on the basis of performance and other factors and will be developed in consultation with the Department of the Interior.

**Changes made to the above chart for the three year period starting in 2001 include an adjustment in the Manager/Supervisor category to provide TAPS employers stretch targets through 2004.*

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2.2 Designated Contractors

For purposes of this Agreement, a contractor shall be a Designated Contractor (which includes its sub contractors) if that Organization provides labor directly to Alyeska Pipeline Service Company, on a continuous basis and has at least 50 employees, engaged full-time (at least, but not limited to, 2,080 hours per employee, per year) in working on TAPS within the State of Alaska. Designated Contractors are required to have complete Section 29 Implementation Plans, approved by Alyeska and subject to Authorized Officer review.

Contractors who are defined as Designated Contractors at the time this Agreement is executed will be required to have an updated Section 29 Implementation Plan approved by Alyeska within ninety (90) days after execution of this Agreement. Future Designated Contractors will be required to have an approved Section 29 Implementation Plan within ninety (90) days after commencing TAPS-related work under contract with Alyeska.

Designated Contractors' Section 29 implementation plans will include average workforce employment levels for each of the employment categories cited in Exhibit 1 for the succeeding three years, and will make good faith efforts to achieve the same overall objectives of employment of Alaska Natives as Alyeska. Alyeska and the Designated Contractors will strive to achieve proportional Alaska Native employment in all job categories. Designated Contractors' Section 29 implementation plans will describe programs they will put in place to encourage success in meeting their employment goals, and may include internships, mentoring, counseling, incentives, or other appropriate programs for Alaska Natives. Designated Contractors will meet the reporting requirements stated in Alyeska's Implementation Plan.

2.3 Reporting Contractors

A contractor or subcontractor shall be a Reporting Contractor if that Organization provides labor directly to Alyeska Pipeline Service Company, on a continuous basis and has at least 15-49 employees, engaged full-time (at least, but not limited to, 2,080 hours per employee, per year) working on TAPS within the State of Alaska. Reporting Contractors are NOT required to provide a Section 29 Implementation Plan, however, they are required to make a good faith effort to meet the goals outlined on page 4 and report to Alyeska the average workforce employment levels for each employment category (based on the Department of Labor employment categories and those cited in Exhibit I of this Agreement).

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2.4 Combined Taps Workforce

The "combined TAPS work force" is defined as the total number of employees on the Alyeska payroll plus the total number of employees on the payrolls of Designated Contractors as defined in the previous Section 2.2 and 2.3.

SECTION 3 RECRUITING AND PLACEMENT

Alyeska will continue to implement a proactive program of recruitment, training, placement and employment to attract Alaska Native candidates to meet the employment levels. This program will match Alaska Native candidates to job vacancies based upon the existing or potential skill levels of the candidates and current organizational needs.

3.1 Recruiting Methods

The Alyeska Human Resources Department will continue to be responsible for the ongoing implementation of a recruiting program. The recruiting program shall utilize both internal and external recruiting efforts to attract qualified candidates.

Alyeska will expand and strengthen existing recruiting sources and establish affiliations with Native entities to improve success in recruiting Alaska Native applicants for job vacancies at Alyeska.

External recruiting efforts and timely vacancy notifications will be expanded to attract Alaska Native candidates with particular focuses in areas having a high degree of exposure to Alaska Natives such as trade and vocational schools; public and private colleges and universities; Alaska Native Regional and Village and nonprofit entities; Alaska Native employment organizations; local, state and federal government agencies; and community sources. External recruiting efforts will be conducted inside and outside of Alaska at Alyeska's discretion.

Alyeska will develop a comprehensive job classification computer database or roster of Alaska Natives qualified for employment in the oil industry. Alyeska will work cooperatively with Designated Contractors to enhance the overall effectiveness of the recruiting effort. To the extent practical, Alyeska and Designated Contractors will share information gained through their respective recruiting sources and assist each other in efforts to identify viable candidates for training and employment.

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3.2 Screening and Evaluations

Alyeska will employ a training, screening and evaluation process to address "testing" referenced in Paragraph A of Section 29. Each applicant may be asked to verify their Alaska Native heritage and will be placed on the job classification computer registry cited above. In addition, applicants will receive a timely response from Alyeska notifying them of current and potential employment or educational opportunities.

3.3 Gateway Program

Alyeska will establish a Gateway framework which will result in expanded opportunities for Alaska Natives to participate in the oil and gas industry in Alaska. Under this innovative concept, Alyeska, Designated and Reporting Contractors agree to provide the needed elements of recruitment, training, placement and cooperation with other oil and gas industry employers to facilitate actual employment of trainees (in job categories which include managerial, technician, professional, and administrative) at other oil and gas companies and their contractors.

To accomplish this objective, Alyeska, Designated, and Reporting Contractors agree to: 1) participate in an industry/training cooperative group for the purposes of identifying and projecting future job opportunities in the oil and gas industry and providing cooperation in placing Alaska Natives; 2) identify and fund appropriate training aimed at providing qualified Alaska Native candidates for openings present and future; 3) undertake an active program to recruit trainees from the Alaska Native community; and 4) place successful trainees with members of the oil and gas industry. It is expected that trainees would be paid while in training.

Under this initiative, the DOI agrees to allow credits toward meeting the employment goals as follows: full (one person) credit for a full-time Alaska Native trainee for the period of on-the-job training. Scholarship recipients will be counted for credit pro-rata for each \$30,000 expended by Alyeska. Alyeska will receive credit equivalent to the length of the training program for any Alaska Native referred through this gateway program and hired by a member of the non-TAPS oil and gas industry or their contractors.

In order to establish the Gateway program, Alyeska will conduct or contract for: internal training programs developed and delivered by Alyeska professional trainers; consultants and professional trainers under contract to Alyeska including qualified Native Training Resources (either profit or nonprofit); external vendors, schools and training institutions including trade schools; or other companies including TAPS contractors, engaged in related work to provide the needed training.

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SECTION 4 TRAINING PROGRAMS

4.1 Types of Training

Alyeska and its Designated Contractors will fund the training programs described in this Agreement by annual cash disbursements projected and budgeted for each year.

Training opportunities will be identified soon after an Alaska Native's initial employment date and will be reviewed and updated annually by the Alaska Native employee in consultation with their supervisor and Alyeska training professionals. Training will be designed to meet the needs of their job or provide skills to encourage advancement and enhance individual or career potential.

Training may be provided to Alaska Natives through internal training programs developed and delivered by Alyeska professional trainers; by consultants and professional trainers under contract to Alyeska including qualified Native Training Resources (either profit or nonprofit); and through external vendors, schools and training institutions for specialty training programs. In addition, Alyeska will implement training programs (similar to the National Apprenticeship Program) in conjunction with its Gateway program to provide technical or vocational training opportunities that either stand alone or supplement Alyeska's existing Technician Progression Program. Designated Contractors who already participate in apprenticeship programs will be encouraged to continue these programs so long as they are a viable method to train Alaska Natives.

In order to establish the Gateway program, Alyeska will conduct or contract for: internal training programs developed and delivered by Alyeska professional trainers; consultants and professional trainers under contract to Alyeska including qualified Native Training Resources (either profit or nonprofit); external vendors, schools and training institutions including trade schools; or other companies including TAPS contractors, engaged in related work to provide the needed training.

Training programs for each Alaska Native employee wishing to participate will be defined by the preparation of a Learning Plan. (See Section 4.2).

4.2 Learning Plan

The identification of the types of training to be provided and the planning and organization of the training curriculum will be accomplished annually through the preparation of a Learning Plan for each Alaska Native employee. The preparation of the Learning Plan is an interactive process involving the employee/trainee, the

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employee's/trainee's supervisor and Alyeska's training professionals, with advice from the employee's/trainees' mentor, as appropriate (as described in Section 6.1).

Each year the Learning Plan will be updated by each participating Alaska Native employee (or trainee) taking into account previous training experience and identifying specific, prioritized training to enhance current job responsibilities and developmental training to allow and encourage professional advancement. An annual schedule of training events will be developed by the Human Resources Department and coordinated with the employee's supervisor to ensure adequate time away from work is available to attend training.

Alaska Native employees (or trainees) are responsible for participation in the preparation of the annual Learning Plan, successful completion of training classes or work assignments and providing feedback to Alyeska concerning the effectiveness of the training received.

4.3 Responsibility for Training Success

The responsibility for the success of the training program will be jointly shared between Alyeska and each Alaska Native employee or trainee participating in the program. Alyeska will plan and organize training curricula to suit the needs of each employee to qualify trainees to assume the responsibilities of the positions to which they and Alyeska agree are appropriate; make appropriate training personnel and facilities available; and supervise, manage, and monitor the training efforts to continuously improve the training process.

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SECTION 5 DEVELOPMENTAL OPPORTUNITIES

In addition to the formal training programs described in Section 4.0, Alyeska will also provide developmental opportunities for Alaska Native employees and prospective Native employees as described below.

5.1 Loanee Program

Loanee Programs for Alaska Native employees (or trainees) may be used to obtain specialized skills, training and unique experiences not available in the Alyeska system.

Targeted placements may include: Native Regional and Village entities, nonprofit corporations, TAPS Contractors, and other petroleum industry companies.

5.2 Building Foundations for Excellence Program

Alyeska Pipeline Service Company (APSC) will continue the Building Foundations for Excellence Program (BFEP) as a workforce development program that was established in 1999. The program focuses on the hiring and development of people into positions at (APSC).

To meet this purpose, the strategy will be to recruit or transfer individuals into internship positions within the APSC workforce. These internships will be designed in anticipation of future needs in areas such as business, environment, safety, and operations. BFEP provides Alaskans, particularly Alaska Natives and other underutilized groups of people, an alternative pathway to enter the TAPS workforce.

Employees in BFEP Intern positions are considered regular employees with all the rights, benefits, and responsibilities of other employees.

5.3 Educational Assistance

Alyeska provides educational assistance that is available to all employees, including Alaska Natives. The educational assistance program will reimburse Alaska Native employees up to 80% of the cost of pre-approved courses. Individuals may seek technical training, advanced degrees, degree completion, or a basic degree.

5.4 Scholarships

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When necessary to provide training or education of Alaska Natives to prepare them for initial employment or advancement to higher positions within Alyeska, Alyeska will provide a limited number of scholarships on an annual basis. Alaska Natives who apply for scholarships must meet minimum requirements and agree to program stipulations. Program stipulations linking expenditure of scholarship monies to prospective employment on TAPS or in the oil and gas industry will be developed by Alyeska and submitted to the Authorized Officer for review within ninety days after each funding cycle reporting. Scholarships will be granted at the sole discretion of Alyeska.

5.5 Education Sabbaticals

Alaska Native employees who have worked for Alyeska for at least two years may apply for unpaid educational sabbaticals to pursue degrees or further their professional development. Sabbaticals will be granted in accordance with Alyeska's Leave of Absence Procedure.

SECTION 6 NATIVE EMPLOYEE SUPPORT

Alyeska and Designated Contractors will provide formal Job Counseling and Mentoring Programs to Alaska Native employees, above and beyond the aforementioned recruiting, training and developmental opportunities.

6.1 Mentoring Program

Alyeska and Designated Contractors will maintain a formal Mentoring Program that provides a mechanism for all interested Alaska Native employees to be paired in a developmental relationship with an Alyeska mentor. The Mentoring Program, will be coordinated with each employee's supervisor, provides written guidelines for personalized educational, professional and career development assistance to Alaska Native employees. The Mentoring Program will be available to Alaska Native employees who elect to participate in the program.

The Human Resources Department will have the primary responsibility for management, administration and implementation of the Mentoring Program.

6.2 Job Counseling

Alyeska and Designated Contractors will provide formal Job Counseling Program designed to assist Alaska Natives and their mentors. The Job Counseling Program will

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be coordinated by the Human Resource Department to provide formal counseling as a means of assisting employees with concerns or problems that may interfere with employment success. Counseling sessions will be documented.

6.3 Diversity Awareness

Alyeska will actively promote diversity in the work environment by providing diversity training to every employee. This training shall include an understanding of Section 29 and Alyeska's long-term relationship with Alaska Natives. Alyeska will promote and integrate positive images of Alaska Native culture in its decor and advertisements and will sponsor diversity awareness activities. APSC will also sponsor, promote or participate in selected traditional Alaska Native cultural activities in the community.

6.4 Nondiscrimination

Alyeska will maintain a work environment that is free from discrimination or harassment. Alyeska will promptly and fairly investigate and respond to allegations of discriminatory or harassing conduct. It remains each supervisor and manager's duty to enforce Alyeska's Code of Conduct.

6.5 Termination/Notification

Alyeska and its contractors will use progressive disciplinary measures to afford Alaska Native employees every reasonable opportunity to correct deficiencies or job performance prior to termination. The Human Resources Department will review, in advance when possible, all proposed disciplinary actions or discharges of employees. No employee of Alyeska will be terminated for cause unless the termination occurs in accordance with Alyeska's Disciplinary Actions Procedure. "Cause" shall have the same meaning as in Alyeska's Disciplinary Action Procedure. Until the established employment goals are achieved, Alyeska will make every reasonable effort to retain, retrain or transfer, rather than lay off, Alaska Native employees during times of reorganization and/or reduction-in-force except those Alaska Natives who choose a retirement or severance package. Nothing in this Agreement shall limit or otherwise affect Alyeska's ability to terminate any employee for cause including poor job performance. Designated Contractors' procedures for discipline and discharge of their employee will be a component of their Section 29 Plan.

Alyeska and Designated Contractors will inform the Authorized Officer in writing of the pending discharge and reason therefore of any Alaska Native employee working on

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TAPS, in advance of notification to the employee if possible. If advance, written notice is not possible, immediate verbal notification will be provided if practicable and will be followed up in writing as soon as possible.

SECTION 7 MEASUREMENT OF PROGRESS

Alyeska is in a declining mode of operations, and it is anticipated, the total work force necessary to effectively operate the system will be growing smaller as time passes. At the same time, the program described by this Agreement will be attempting to place more Alaska Natives into the diminishing work force. As a result, the targeted employment levels and the methods used to measure compliance with these will need to be periodically adjusted to reflect the changing business needs.

Measurement of progress toward the overall intent of this program must recognize many factors and cannot be measured simply by counting the number of Alaska Natives employed at any particular point in time. Although the success of the program will primarily be measured by the number of Alaska Natives employed, success (and credit toward achievement of the employment levels of Section 29) will also be measured by the number of Alaska Natives who may not be currently employed by Alyeska or a Designated or Reporting Contractor but may be enrolled in an educational or training program or hired through Alyeska's Gateway Program. Similarly, the measurement approach must recognize current Alaska Native employees who are on loan to other organizations or are involved in career advancement programs intended to allow the employees to move up to higher job categories.

Measurement must also recognize Alyeska's efforts toward contribution to systemic educational programs. The annual expenditures under this provision will be made with the following priorities in mind: (1) jobs; (2) internships and training; (3) scholarships; and (4) community support.

In recognition of the above considerations, credit toward meeting the overall goals of this program will be measured in terms of employment, training and educational opportunities for Alyeska, Designated, or Reporting Contractor as follows:

1. Each Alaska Native on the payroll during the year will count as a single employment opportunity on a pro-rata basis. Those Alaska Natives employed for less than a full year will be counted based upon the portion of the year for which they are employed. 2,080 hours of (regular work) will be the basis for calculating one full-time equivalent employee.

2. Each Alaska Native not employed but who receives a scholarship funded by Alyeska will be counted as an educational opportunity. Each educational opportunity

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will count (on a pro-rata basis) as one employment opportunity credit for each \$30,000 expended by Alyeska. Credit will be given for the calendar year the individual is enrolled in a training program regardless of whether or not the individual voluntarily resigns from the training program, is dismissed or refuses subsequent employment.

3. Each Alaska Native engaged in paid full-time training will be counted as an employee on a full-time equivalency basis.
4. Each Alaska Native employee on loan to another organization or on sabbatical for purposes of career development or training will count as a single employment opportunity as long as he or she remains an Alyeska or TAPS employee on the agreed date that year.
5. Alaska Natives who are actively employed, and have been identified as candidates for higher job categories, and are participating in a structured training plan to advance to an identified higher job category will be counted as an additional employment opportunity for the portion of the year they are enrolled in the training.
6. Internships (internal and external) will be counted as a single employment opportunity. Summer internships will count as an employment opportunity for the pro rata share of the year that they are working as interns, on a full time equivalency basis.
7. Each scholarship award and other systemic educational programs will be counted as a single employment opportunity in increments of \$30,000 expended by Alyeska or TAPS Contractor. This method of counting will be phased out over the 12 month period following signing of the Agreement for those students who do not have a target position (designated linkage) in the oil and gas industry.

Alyeska will develop a program of internal measurement to determine the effectiveness of the Alaska Native Program, and the Building Foundations for Excellence Program. Data will be recorded and management reports prepared on an annual basis to establish trends in job retention, recruiting, training, counseling, promotions to higher levels, annual performance evaluations, and scholarship effectiveness. These statistics will serve as a measure of success of the overall program and can be modified to meet the changing information needs of Alaska Natives, Alyeska, TAPS Contractors, and the Authorized Officer.

If the three-year level identified in Exhibit 1 above is not reached during the applicable year (i.e., 2002, 2003, and 2004) Alyeska will make funds available during the following calendar year to create the number of additional educational or employment opportunities that would equal this level of employment. Funds expended by Alyeska

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for this purpose will be counted toward Alyeska's overall commitment to spend \$25 million in funding on Section 29 between 1996 and 2007.

SECTION 8 MANAGEMENT/ADMINISTRATION

Alyeska will provide the resources reasonably necessary to implement this Agreement, as provided herein.

SECTION 9 ADVISORY BOARD

Alyeska will continue an Advisory Board to provide advice and counsel regarding the operation of the Section 29 program, assess the program's success in achieving the agreed goals, make recommendations for improvement, and to further report annually to Alyeska management on the overall effectiveness of the program. The Advisory Board membership will include: representatives from Alyeska Management, Alyeska's Human Resources Department, Alyeska Alaska Native employees, representatives from Designated Contractors, and external Alaska Native representatives from appropriate Native Organizations including, but not limited to, Alaska Federation of Natives, Alaska Native Council on Employment and Training and the four Alaska Native Regional Corporations whose lands adjoin the right-of-way.

The Advisory Board will meet on a quarterly basis. The agenda for each meeting will be developed by consensus. Alyeska will provide the Advisory Board with data and reports as required or requested by the Advisory Board to understand the overall progress of the program.

SECTION 10 PARTIES

The sole parties to this Agreement are Alyeska, as agent for Permittees, and the Department of the Interior. The parties hereto do not intend to create any rights under this Agreement that may be enforced by any third parties for their own benefit or for the benefit of others.

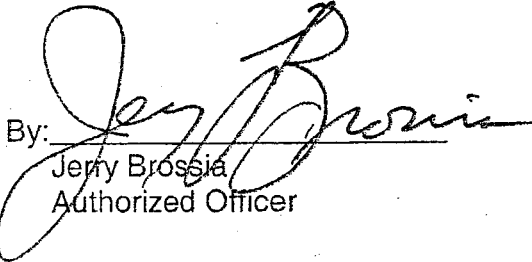
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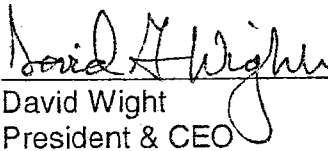
IN WITNESS WHEREOF, The Parties hereto have duly executed this
Agreement as of October 15, 2001.

UNITED STATES OF AMERICA

ALYESKA PIPELINE SERVICE COMPANY
Acting as Agent on behalf of:

**AMERADA HESS PIPELINE CORPORATION
ARCO TRANSPORTATION ALASKA, INC.
BP PIPELINES (ALASKA) INC.
EXXON PIPELINE COMPANY
MOBIL ALASKA PIPELINE COMPANY
PHILLIPS ALASKA PIPELINE CORPORATION
UNOCAL PIPELINE COMPANY**

By: 
Jerry Brosia
Authorized Officer

By: 
David Wight
President & CEO

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APPENDIX

DEFINITIONS

Combined TAPS Workforce

The "combined TAPS work force" is defined as the total number of employees on the Alyeska payroll plus the total number of employees on the payrolls of Designated Contractors which have a minimum of fifty employees performing work for Alyeska in Alaska.

During the six months following the signing of the Agreement, Alyeska and the Authorized Officer will identify and evaluate which subcontractors to Designated Contractors and other contractors providing direct labor to Alyeska in Alaska will be subject to reporting requirements of Alyeska's Implementation Plan.

The Combined TAPS Workforce will be measured as an annual average based on quarterly totals and reported on December 31 of each year. This definition is for programmatic purposes only. Nothing in this definition shall be construed or interpreted as preempting or modifying the Section 29 obligation of the Grant of Right-of-Way, that all TAPS employers, at any tier, are subject to the provisions of Section 29.

Designated Contractor

An Organization that contracts to provide direct labor for Alyeska Pipeline Service Company, on a continuous basis and has at least 50 employees, engaged full-time (at least but not limited to 2,080 hours per employee, per year) in work directly on TAPS within the State of Alaska.

(Regular) Full Time Employee (FTE)

A full time equivalency of a minimum of 2,080 hours, (regular work) within a one year period will be the basis for calculating one full-time equivalent employee. Work may be pro-rated on a basis of 1 FTE = 2,080 hours for employees working less than 2,080 hours.

Transitional (Employment) Training

Alaska Native applicants who do not meet the entry level educational or experience requirements and Alaska Native students who show promise and indicate an interest in Alyeska as an employer may be offered on-the-job training positions. These positions will be designed to provide trainees with on-the-job experience and lead to full-time employment for successful trainees.

On-The-Job Trainee

Any person gaining on-the-job training and experience to meet the entry-level qualifications for a TAPS job.

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Internship

An internship is an opportunity for an individual to gain practical experience, specialized training, or otherwise acquire skills needed to prepare him/her for positions that are related to the jobs available in the petroleum industry in Alaska. Individuals who successfully complete the planned program, will normally become a full-time employee with Alyeska or other entity that works on TAPS.

Seasonal Hires (trainees)

Individuals hired for a specific period of time (such as construction season or summer employment) with no anticipation of continuing employment.

Administrative Cost

Those expenditures that support the program activities necessary to recruit, hire, train, advance, and place Alaska Natives. These are identified in the Implementation Plan.

Gateway Program

Program which expands opportunities for Alaska Natives to participate in the oil and gas industry whereby Alyeska provides the needed elements of recruitment, training, and placement for job positions within Alyeska or its contractors. When Alyeska is unable to place or transfer Section 29 employees, whose current positions are no longer available due to downsizing or reorganization; Alyeska will make reasonable effort to place, in cooperation with other oil and gas industry employers, those Section 29 employees at other oil and gas companies and their contractors in job categories which include managerial, technical, professional, and administrative. This gateway strategy shall also be applicable to those interns or apprentices who have successfully completed training for a targeted position within Alyeska that, for whatever reason, become unavailable at the time the training is completed.

F.2 Alaska Native Program Implementation Plan for the Alaska Native Utilization Agreement

[Reproduced from best available copy.]

Alaska Native Program

Implementation Plan for Alaska Native Utilization Agreement

January 2002

Implementation of the revised Alaska Native Utilization Plan (*Attachment 1*) is an ongoing process of planning, action, assessment and modification. Participants in the process include Alyeska Pipeline Service Company, designated contractors, the Authorized Officer for the Bureau of Land Management on behalf of the DOI and the Section 29 Advisory Board.

This Implementation Plan broadly describes strategies and activities for each section of the Agreement. Details of current items are found in the attachments. Specific activities may change through the process of assessment and modification. In all cases, the requirements of the Agreement shall remain the controlling elements of this plan.

The dynamic process described in this plan will enable Alyeska Pipeline Service Company (APSC) to meet the goals described in the Alaska Native Utilization Agreement, The Alaska Native Program Communication Plan for Section 29, the September 1997 JPO Audit Report, and Section 29 of the Federal Grant of Right of Way for TAPS.

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 1: INTRODUCTION			
COMMUNICATION STRATEGY		Section 29 Manager	
<u>Scope:</u>			
Communication will convey accurate information about Section 29 in order to meet commitments made under the agreement. Information will include available opportunities and how Alaska Natives can obtain training, scholarships and jobs.	Ongoing	Corporate Communications	Authorized Officer
- The external communication tools to be used: - Continue participation in job fairs/ AFN	On Request	Recruitment	
- APSC Website	In-Place/ Ongoing- APSC	Section 29 Staff	
- Utilize administrators of Native higher education scholarship providers to disseminate information including Native Student Services (UAA) and Rural Student Services (UAF) and other vocational and academic institutions to inform recipients about career opportunities under Section 29.	As vacancies occur	External recruiting	Outreach distribution list
- The internal communication tools to be used: - Continue Native cultural awareness through use of a video for new employees	To all new APSC hires	Section 29 Manager	APSC added to new hire orientation; Distribute to contractors for their use
- Periodic meetings with Business Unit Managers Alaska Native Network groups and Human Resource Generalists	Quarterly/ Ongoing	Section 29 Manager	
- Update APSC Executive Leadership Team	Quarterly	VP Human Resources	Executive Leadership Team Authorized Officer
- Regular meetings with designated contractors’ management and staff	Quarterly/ Ongoing	Section 29 Manager / APSC Contract Stewards	
- Notification of Significant Items or Events to: - Alaska Native Organizations - Authorized Officer - APSC Employees - The Public	As needed	Section 29 Manager/ Community Communications in CHQ, FBU, VBU	External Publications

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
<u>Review:</u>			
Verbal and written feedback from target populations will enable us to gauge effectiveness of communication strategy and make improvements.	Annually	Section 29 Advisory Board	APSC VP HR Authorized Officer
REVIEW AGREEMENT ONCE EVERY THREE YEARS			
<u>Scope:</u>			
Review agreement every three years to assess the programs and commitments.	December 31, 2004	Authorized Officer and APSC	DOI
DEVELOP/REVIEW IMPLEMENTATION PLAN			
<u>Scope:</u>			
Implementation plan will describe the intended timing of the programs and commitments in the agreement.	February 01, 2002	Section 29 Manager for approval	APSC provides to Authorized Officer for approval
This review date will be used annually to adjust the Implementation Program using results from the annual employee survey and recommendations from the Advisory Board	January 30 annually, beginning in 2003	APSC, Authorized Officer	

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 2: EMPLOYMENT			
EVALUATE/MEASURE EMPLOYMENT			
<u>Scope:</u>			
Identify and evaluate those reporting Contractors providing direct labor to APSC who will be subject to the reporting requirements of APSC's Implementation Plan.	November 1, 2001 Through February 1, 2002	APSC, Authorized Officer, Contract Steward, Section 29 Manager	APSC & JPO
Measure TAPS Workforce on annual average, based on quarterly totals to be used for assessing progress toward employment goals (<i>Attachment 2</i>).	COB Final Pay Period in a given calendar year.	APSC, HR Associate	Advisory Board Authorized Officer APSC Direct Reports to CEO
2.1 ALYESKA			
<u>Scope:</u>			
- Financial Commitments - APSC will spend \$25 million over the 12 year period (to be spent at a rate of approximately \$2.1 million per year). - These costs will be tracked and accounted for in accordance with established financial guidelines.	1996-2007 Ongoing	APSC; Section 29 Manager and Financial Analysts Section 29 Manager and Financial Analysts	Authorized Officer APSC VP Human Resources Authorized Officer
<u>Reporting (Numbers of AK Natives employed):</u>			
Status report will be used to measure progress of APSC and Designated Contractors Final reports submitted and accepted after review. On file and maintained in Section 29 Office.	Mutually agreed upon reporting formats by JPO and APSC	Section 29 Manager Contract Steward	Authorized Officer

EXHIBIT 1
SECTION 29 EMPLOYMENT LEVELS

YEAR	1998	1999	2000	2001	2002	2003	2004
MANAGERS/ SUPERVISORS	4%	6%	7%	9%	10 – 12%	12 – 14%	14 – 16%
PROFESSIONALS	10%	11%	13%	14%	16%	18%	19%
TECHNICIANS	11%	13%	15%	16%	18%	18%	21%
CLERICAL & ADMINISTRATIVE	21%	22%	24%	26%	27%	29%	30%
TOTALS	10%	12%	14%	16%	17%	19%	20%

Note: All Designated Contractors are required to use the same percentages, as Alyeska's shown above, in their Implementation Plans

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
2.2 DESIGNATED CONTRACTORS			
<u>Scope:</u>			
Designated Contractors with 50 or more employees working on TAPS-related work under contract with APSC on a regular basis will be required to have Section 29 Implementation Plan in place 90 days after signing of ANUA. Currently there are seven (7) Designated Contractors (<i>Attachment 3</i>).	January 25, 2002 or 90 days after commencing TAPS work	Designated Contractor, Contract Steward, Section 29 Manager	APSC Authorized Officer
Reporting Contractors with 15 – 49 employees will need to be notified of ANUA employment goals & reporting requirements	2nd quarter of 2002	Section 29 Manager	
Content of Contractor Implementation Plans is to mirror the format and sections of Alyeska's Implementation Plan	Draft due December 21, 2002; Final Due 1/25/2002	Contract Stewards Section 29 Manager	Section 29 Manager APSC review & approves contractor plans Authorized Officer
<u>Notification</u>			
Notify Contractors regarding compliance requirements	Quarterly review of reports	APSC/ Section 29 Manager/ Contract Stewards/ Section 29 Representative for each contractor	APSC/ Contractors
<u>Reporting</u>			
Final reports submitted and accepted after review. On file in Section 29 Office.	April 15, 2002	Contract Steward/ HR Associate	Advisory Board Authorized Officer
Quarterly progress reports required and submitted with APSC Status Report	Quarterly	APSC/ Section 29 Manager/ Contract Stewards/ Section 29 Representative for each contractor	

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 3: RECRUITING AND PLACEMENT			
- APSC will continue to implement a proactive program of recruitment, placement and employment of Alaska Natives based upon existing or potential candidate skill levels and organizational needs. <u>Scope</u> 3.1 RECRUITING METHODS - APSC will continue to be responsible for the ongoing implementation of a recruitment program and will expand and strengthen existing recruiting sources and establish new affiliations with Native entities. - APSC and contractors will share information gained through their respective recruiting sources. <u>Notification</u> - Alaska Native organizations; External candidates on database; Internal employees, Authorized Officer <u>Review:</u> 3.2 SCREENING AND EVALUATION <u>Scope:</u> - APSC will continue to ask for voluntary EEO forms to identify qualified Alaska Natives <u>Review</u> - Alaska Native applicants will be given an EEO form to voluntarily submit with application At time of employment Section 29 eligibility will be verified by voluntary submission of EEO form, CIB, Tribal Enrollment or Regional Corporation membership.	Ongoing Ongoing Ongoing Ongoing In-Place Ongoing	APSC HR Recruitment Human Resources Recruitment, Contractors, Managers and Supervisors APSC Reporting & Designated Contractors Section 29 Manager, internal, electronic job posting system APSC through the Resume/EEO form procedure APSC Recruiting	Authorized Officer

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
3.3 GATEWAY PROGRAM			
<u>Scope:</u>			
One of the primary methods of training Alaska Natives for jobs with APSC is through the scholarship and internship program.	Ongoing	Section 29 Manager, APSC, Blue Ribbon Panel	APSC Authorized Officer
- APSC will: - Establish a Gateway framework which will result in expanded opportunities for Alaska Natives to participate in the oil and gas industry in Alaska. - Identify and fund, through scholarships, appropriate training aimed at providing qualified Alaska Native candidates for openings present and future.	Ongoing	Section 29 Mgr & Advisory Board	
Place successful trainees with members of the oil and gas industry when there are no appropriate TAPS openings	Annually \$750,000	Grant recipient applications	
<u>Notification:</u>			
- APSC Managers/Supervisors - Alaska Natives - HR Generalists	As needed		
<u>Review:</u>			
- Written reviews of internships are conducted: - By HR on a quarterly basis	Quarterly		Authorized Officer

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 4: TRAINING PROGRAMS			
4.1 TYPES OF TRAINING			
<u>Scope</u> Training opportunities will be identified and made available soon after an Alaska Native's initial employment date and will be reviewed and updated annually.	Annually	Employee/Supervisor	
4.2 LEARNING PLAN			
All APSC employees have a Learning Plan, developed by the employee and their supervisor and are based upon training required for compliance and personal development goals.	Annually	Individual Employee, Supervisor, APSC Training Dept.	
- Learning Plan is updated by each participating Alaska Native employee (or trainee) - Training opportunities are made available continuously, based on employee's and APSC's changing needs	Annually	Individual Employee, Supervisor, APSC Training Dept.	
An annual schedule of training events will be developed by the Training Department	Annually	Individual Employee, Supervisor, APSC Training Dept.	
<u>Notification</u>			
All employees are notified annually of their Learning Plan requirement.	Annually	Supervisors	Generated for the employee
<u>Reporting</u>			
Completed Learning Plan on file with employee and entered into Elite.	Annually	Employee and Supervisor	
4.3 RESPONSIBILITY FOR TRAINING SUCCESS			
- APSC will: - Plan and organize training curricula to suit the needs of each employee to qualify trainees to assume the responsibilities of the positions to which they and APSC agree are appropriate; - Make appropriate training personnel and facilities available; and - Supervise, manage, and monitor the training efforts to improve the process.	Ongoing	Individual Employee, Supervisor, APSC Training Dept.	

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 5: DEVELOPMENTAL OPPORTUNITIES			
APSC will also provide developmental opportunities for Alaska Native employees.	Ongoing	Employee & Supervisor	
5.1 LOANEE PROGRAM			
<u>Scope:</u>			
Alaska Native employees wishing to gain specialized skills and experience not available at APSC may be placed with another organization to gain such skills.	As appropriate	Employee, Section 29 Manager, HR General, Supervisor, Host Organization	
5.2 INTERN PROGRAM			
<u>Scope:</u>			
- The purpose of the intern program is to provide on-the-job training for Alaska Natives. Internships will: - Create a work experience. - Provide training. - Enable participants to be placed into targeted TAPS jobs. - Be developed by managers/supervisors.	Ongoing	HR Generalists, Section 29 Manager and Managers/ Supervisors	
<u>Notification</u>			
- HR Generalists - Managers/Supervisors - Alaska Natives	Ongoing	Section 29 Manager	
<u>Review:</u>			
- Quarterly written reviews of internships are conducted: - By the supervisor/sponsor. - By Section 29 on a quarterly basis - STATUS REPORT	Monthly Quarterly Quarterly	Supervisors/Sponsor and Section 29 Manager. 	Authorized Officer

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
5.3 EDUCATIONAL ASSISTANCE			
<u>Scope:</u>			
APSC provides educational assistance for its employees. This program provides reimbursement of up to 100% for pre-approved courses.	Ongoing	Employee, Supervisor	
Students must maintain a "C" average and submit grades. Educational courses can be degreed or technical programs.	Each Semester	Employee responsible for submitting copies of transcript	
<u>Notification:</u>			
Provided to each employee during orientation and at the beginning of each calendar year			
<u>Review:</u>			
Annual Learning Contract	Annually	Employee, Supervisor	
<u>Reporting:</u>			
Annual Learning Contract	Annually	Each Employee	Each Employee
5.4 SCHOLARSHIPS			
<u>Scope:</u>			
APSC will provide scholarships through its Scholarship program	Annually	Section 29 Manager Blue Ribbon Panel	Authorized Officer
The scholarship program currently awards up to \$750,000 in accordance with the scholarship guidelines.			
<u>Notification:</u>			
Notices sent in accordance with Communication Strategy.			
<u>Review:</u>			
Proposal guidelines, progress of scholarship recipients will be reviewed by the Blue Ribbon Panel, the Advisory Board and APSC.	Annually	Blue Ribbon Panel, Advisory Board, APSC	
Scholarship recipients will be evaluated once every 12 months to ascertain whether they are meeting RFP expectations	Annually	Section 29 Manager/APSC	Authorized Officer
Changes to improve and strengthen the guidelines or Scholarship Awarding Procedures will be ongoing.	Ongoing	Section 29 Manager	Blue Ribbon Panel/ APSC/ Educational Institutions

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
<u>Reporting</u>			
• Summary of scholarship proposal review process and awards will be documented and kept in internal files.	Annually	Section 29 Manager	ASPC/Public
• Notices of scholarship recipients will be publicly released.	Letters/Website	Section 29 Manager	Authorized Officer
• The number of programs, participants and evaluations will be documented as it relates to job placement. Scholarships are industry related/tied to TAPS	Annually	Section 29 Manager	Authorized Officer
• Reports from grantee organization will track TAPS employment of successful scholarship recipients.			
5.5 EDUCATION SABBATICALS			
<u>Scope:</u>			
• Alaska Native employees who have been with APSC for at least two years are eligible to participate in APSC's Educational Sabbatical Program.	Ongoing	Employee, their Supervisor, Section 29 Manager	
<u>Notification</u>			
• Employees will be notified through appropriate APSC channels.			
<u>Review:</u>			
• Students will be required to submit grades each semester.	Each Semester	Employee, Section 29 Manager	
<u>Reporting:</u>			
• Status Report (internal)	Monthly	Section 29 and Related Manager	

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 6: NATIVE EMPLOYEE SUPPORT			
6.1 MENTORING			
<u>Scope:</u>			
APSC maintains a mentoring program for all employees and encourages Alaska Natives to participate as mentors or mentees.	Ongoing	HR Generalists	Mentor & Mentee
<u>Notification</u>			
Employees will be notified through appropriate APSC channels.			
<u>Review:</u>			
Employees and mentors complete evaluation form for compilation of statistics.	Annually	Section 29 Manager	
<u>Reporting:</u>			
The mentoring program description and guidelines	Ongoing	Section 29 Manager	
Statistics on total number of participants and number of participants by Business Unit	Any time	Organizational Development & Diversity Manager	Authorized Officer
6.2 JOB COUNSELING			
<u>Scope:</u>			
- Human Resource Generalists assigned to each company unit or department provides job counseling for all APSC employees - Counseling includes assisting with concerns and problems on or off the job.	Ongoing	HR Generalists, VP HR, Section 29 Manager, Employee Assistance Program	
<u>Notification</u>			
HRG'S are available to provide referrals to appropriate internal resources for job counseling.	Ongoing	HR, Manager, Supervisor, Mentor, Training Generalist, Organizational Development	
<u>Review</u>			
On a case by case basis.			
<u>Reporting</u>			
Trend Reports (Status & Trends)		Authorized Officer	authorized officer

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
6.3 CROSS CULTURAL AWARENESS			
<u>Scope:</u>			
- APSC will actively promote a cross-cultural work environment by providing cross-cultural training to every employee. - APSC desires to sponsor traditional cultural activities and these will be funded through its Corporate Communication department; proposals are considered individually. - Alaska Native images are utilized in promotional material and in art work at each site.	In-place & Ongoing	Section 29 Manager, Managers, Supervisors	
<u>Notification:</u>			
- Employees will be notified through appropriate APSC channels. - Community contributions will be analyzed on a semi-annual basis.	Ongoing Semi-Annually	Corporate Communication	
<u>Reporting</u>			
- Participation in cross cultural training will be documented through the rosters. - Annual recap of Corporate Contributions.	Semi-Annually	Corporate Communication	
6.4 NONDISCRIMINATION			
<u>Scope:</u>			
- APSC's Code of Conduct and EEO procedure specifically references nondiscrimination practices & is provided to new employees during orientation. - APSC's Human Resources offices provide mechanism for responding to employee concerns, including discrimination.	Ongoing	APSC HR Department	
<u>Notification Procedures:</u>			
- Code of Conduct was distributed to all employees and is provided to each employee during orientation. - Employees are required to attend HIRD refresher training each year.	At time of hire	HR Department	

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
<u>Review:</u>			
• As cases are brought forward by HR Problem Resolution procedure	As needed		
<u>Reporting:</u>			
• Available through HR Problem Resolution reporting system			Resource is the Employee Concern Program
6.5 TERMINATION/NOTIFICATION			
<u>Scope:</u>			
• APSC addresses performance or conduct issues in a progressive manner as outlined in the HR Disciplinary Actions procedure	Ongoing	Supervisors, HR Generalists	
<u>Notification:</u>			
• Permittees shall inform the Authorized Officer of the discharge from such employment of each and every Alaska Native and of the reason therefor, in advance of such discharge wherever possible or, if advance notice is impossible, as soon thereafter as is practicable.	As needed	Section 29 Manager	Authorized Officer
<u>Review:</u>			
• Review on case by case basis			
• Annual evaluation of terminations for trends and lessons learned	Annual	Section 29 Manager	Authorized Officer
<u>Reporting:</u>			
• List maintained in Section 29 office.	Ongoing	Section 29 Manager	DOI notification for each separation

<u>ACTION</u>	<u>TIMING</u>	<u>RESPONSIBILITY OR GENERATED BY</u>	<u>COMMENTS OR GENERATED FOR</u>
SECTION 7: MEASUREMENT OF PROGRESS			
<u>Scope:</u>			
- Section 29 staff measures progress according to the Status Report criteria. - APSC programs will be subject to an internal review process with the goal to continually strengthen the programming so that APSC may recruit and successfully retain more Alaska Natives.	Monthly	Section 29 Manager	
<u>Notification:</u>			
Advisory Board			Authorized Officer
<u>Review:</u>			
Measuring methods to be periodically adjusted to reflect changing business needs.	As needed	Section 29 Manager	
<u>Reporting:</u>			
Status Reports, including Contractor progress and others as developed.	As needed	Section 29 Manager	Authorized Officer
SECTION 8: MANAGEMENT/ADMINISTRATION			
<u>Scope:</u>			
APSC has set goals to provide appropriate Section 29 staff levels.	Annually	Section 29 Manager HR Dept.	Authorized Officer
APSC will provide necessary resources to support the implementation and continuance of this program.	Ongoing	HR Department	Authorized Officer
SECTION 9: ADVISORY BOARD			
<u>Scope:</u>			
- Section 29 staff will continue an Advisory Board to provide advice and counsel regarding program operation and progress. - Board membership will include representatives, representatives from designated contractors, external Alaska Native organizations and others as appropriate and will meet quarterly.	Quarterly	Section 29 Manager	
<u>Reporting:</u>			
Minutes will be taken and reported.	Quarterly	Staff	Advisory Board - Authorized Officer

Appendix G: Special Requirements¹

¹ Reproduced from the best available copies

Appendix G: Special Requirements

Letters Imposing Provisions Under Authority of Stipulations

Letter Number	Date of Letter	Due Date	Subject
01-008-DG	05/08/01	N/A	Earthquake Monitoring System
01-009-FC	02/07/01	N/A	Slope Stability Performance Requirements Pursuant to Stipulation 3.2.1.2
01-010-DG	03/16/01	05/15/01	Stipulation 3.4.2.3. Fault Monitoring, Imposing Special Provisions under Authority of Stipulation 1.3.2
01-011-DG	03/19/01	06/01/01	Stipulation 3.8 Glacier Surges, Imposing Special Provisions under Authority of Stipulation 1.3.2
01-012-CA	01/19/01	N/A	Revised JPO Brushing Policy
01-012-DG	03/22/01	11/01/01	Performance Requirements for Depth of Cover at Buried Mainline Pipe Side-bend and Over-bend Locations, Imposing Special Provisions under Authority of Stipulation 1.3.2
95-073-GD	05/18/95	N/A	Zones of Restricted Activities for Peregrine Falcon and Other Raptors Stipulation 2.5.3
01-110-DG	06/29/01	07/31/01	Aboveground System Additional Requirements pursuant to Stipulation 3.2.1.2
01-111-DG	06/18/01	N/A	Restoration Performance Requirements Pursuant to Stipulation 2.12.1
01-114-DG	06/29/01	N/A	Stipulation 3.2.1 Pipeline System Standards for pipe Curvature, Imposing Special Standards under Authority of Stipulation 3.2.1.2
S.N.-P001-TAPS-3789	2/19/87	N/A	Zones of Restricted Activities Key Fish Areas Stipulation 2.5.3.1.
Agreement (JPO/Alyeaka)	2/28/02	N/A	Agreement between Joint Pipeline Office and Alyeska Pipeline Service Company Stipulation 1.18.1

☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game	☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources	☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor



JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

March 16, 2001

Letter No.: 01-010-DG
File No.: PT 5.40, F1060, D3040
DD.: 5/15/01

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Stipulation 3.4.2.3. Fault Monitoring, Imposing Special Provisions under Authority of Stipulation 1.3.2.

Dear Mr. Shoaf:

Under authority of Stipulation 1.3.2, the Authorized Officer and State Pipeline Coordinator may require Permittees and Lessees make such modification of the pipeline as they deem necessary to protect or maintain integrity of the pipeline. Government Letter P001-TAPS-3853 previously conveyed conditions of fault monitoring to Alyeska from the Authorized Officer. By authority of Stipulation 1.3.2, the requirements of that letter are adopted as a modification of operational requirements of Stipulation 3.4.2.3.

You are authorized to discontinue further annual fault monitoring surveys provided APSC continues annual surveillance of the aboveground pipe at each of the three identified faults and maintains the position of the pipe on the beams to assure design limits of movement are attainable. You are directed to provide photo documentation to show the pipe support is in the operations design limits and report the results annually.

Mr. Robert I. Shoaf

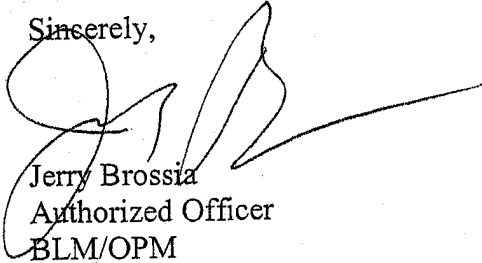
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March 16, 2001

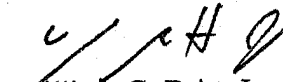
Re: Stipulation 3.4.2.3. Fault Monitoring, Imposing Special Provisions under Authority of Stipulation 1.3.2.

If you have any questions, please contact Doug Lalla of our office at (907) 271-4394.

Sincerely,



Jerry Brossia
Authorized Officer
BLM/OPM



William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

cc:

Gary Reimer, BLM
Colleen McCarthy, BLM
Don Keyes, BLM
Doug Lalla, BLM
Emery (Lee) Monthei, APSC (MS 530-B)
Jim Roddick, APSC (MS-855)
Shelly Martin, APSC (MS542)
Eldon Johnson, APSC (MS 855)
John Ferrell, APSC (MS 855)



☐ AK. Dept. of Environmental Conservation
☐ AK. Dept. of Fish & Game
☐ AK. Dept. of Natural Resources
☐ AK. Division of Governmental Coordination

☐ U.S. Bureau of Land Management
☐ U.S. Environmental Protection Agency
☐ U.S. Dept. of Transportation
☐ AK. Dept. of Labor

JOINT PIPELINE OFFICE

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Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

May 8, 2001

Letter No.: 01-008-DG
File No.: PT 5.40, F1060, D3040
DD.: N/A

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re.: **Earthquake Monitoring System**

Dear Mr. Shoaf:

With this letter the Joint Pipeline Office (JPO) is clarifying and imposing special provisions to the required and approved Earthquake Monitoring System (EMS) and procedures previously developed under the Notice to Proceed issued for Pipeline start-up in 1977.

In 1977 Alyeska contended the entire pipeline was designed to withstand a contingency earthquake without Oil leakage. The Alaska Pipeline Office (APO) in letter S.N. P001-APO-2243 dated May 21, 1977 stated the following in response: "We accept your conclusion based on our design review of total system performance. However, we will continue to require an Earthquake Monitoring System as part of Alyeska's overall Operations Supervisory System. Submittal of the final construction and operational details of this system for review and approval remains a requirement of the Terminal Control System Notice to Proceed TSC-XX-1."

Under authority of Stipulation 1.3.2, the Authorized Officer and State Pipeline Coordinator require the EMS and procedures be in place to protect or maintain integrity of the Pipeline; prevent serious and irreparable harm to the environment; or remove hazards to public health and safety. In addition, the following clarification and special provisions are imposed on the approved EMS:

1. Alyeska will maintain a network of ground-motion detectors capable of continuously monitoring, recording, and instantaneously signaling the occurrence of ground motion (acceleration) in the vicinity of the Pipeline reaching a level of the Design Operating Earthquake (DOE). Ground motions for a DOE is defined as one-half the intensity of a

Mr. Robert I. Shoaf
Re.: Earthquake Monitoring System

2

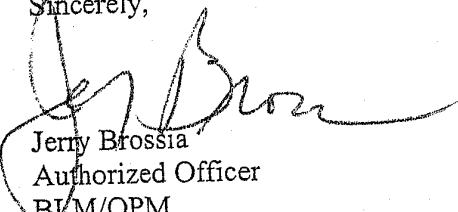
May 8, 2001

Design Contingency Earthquake (DCE). The DCE for each seismic zone is defined in Stipulation 3.4.1.1.

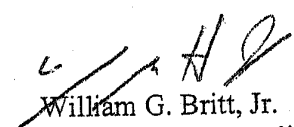
2. The EMS shall initiate a programmed shutdown of the Pipeline when DOE ground motion is reached but is not required for ground motion less than 0.10g. The programmed shutdown shall include the idling of all Pump Stations. The EMS shall alert the pipeline controller by issuing a seismic alarm, when the DOE ground motion level is reached and initiate an automatic Pipeline shutdown in ten minutes. Provided all monitoring instrumentation shows the Pipeline is functioning properly and no indication of a possible leak has been received, the pipeline controller may intervene to allow operation of the Pipeline to continue. The pipeline control system shall provide for automatic shutdown of the pipeline if the pipeline controller fails to acknowledge a seismic alarm within ten minutes.
3. If the leak detection system indicates a possible leak, the Operations Control Center shall initiate a shutdown and close all remote gate valves that will isolate appropriate pipeline segments containing a possible leak. The valves shall be closed in a manner to minimize oil spill volume and to insure the safety and integrity of the pipeline. The appropriate segments include those indicated by the leak alarm and those identified by the EMS as experiencing ground motion at or above the DOE level.
4. The EMS shall determine the segments of the Pipeline experiencing ground motion at or above the DOE level and generate a list of those potentially affected features of the Pipeline. A prompt close inspection of the Pipeline shall occur guided by this list.

If you have any questions, please contact Doug Lalla of our office at (907) 271-4394.

Sincerely,



Jerry Brossia
Authorized Officer
BLM/OPM



William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

cc:

Dan Rice, ADNR
Gary Reimer, BLM
Colleen McCarthy, BLM
Don Keyes, BLM
Doug Lalla, BLM
Mike Joyner, APSC (MS 700)
Emery (Lee) Monthei, APSC (MS 530-B)
Jim Roddick, APSC (MS-855)
Shelly Martin, APSC (MS 542)
Eldon Johnson, APSC (MS 855)



☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
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☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor

JOINT PIPELINE OFFICE

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FAX # (907) 272-0690

February 7, 2001

Letter No.: 01-009-FC
File No.: PT 5.20, F2030 & D1180
DD.: N/A

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Slope Stability Performance Requirements Pursuant to Stipulation 3.2.1.2

Dear Mr. Shoaf:

During the updating of the performance standards for Stipulation 3.5.1, slope stability, we determined that JPO's criteria for evaluating this stipulation should be implemented as a pipeline system standard.

Stipulation 3.1.1 states that the following standards shall be complied with in design, construction, operation, and termination of the pipeline system. Stipulation 3.2.1.1 lists four specific codes and regulations and 3.2.1.2 provides that the Federal Authorized Officer (Grant) and State Pipeline Coordinator (Lease) may impose additional requirements as necessary to reflect the impact of sub-arctic and arctic environments.

The presence of permafrost, which is predominantly a geologic soil condition representative of arctic and sub-arctic environments, and present throughout much of the route of the Trans-Alaska Pipeline requires special geotechnical consideration. Therefore, pursuant to Stipulation 3.2.1.2 of the Agreement and Grant of Right-of-Way, the following standard is to apply to all design criteria for facilities on the Trans-Alaska Pipeline.

Requirement: Slopes with a grade greater than 10% shall have a static factor of safety (Design Basis Appendix A-3.1079, p. 4-18) no less than 1.5 and a dynamic factor of safety (Design Basis

Mr. Robert I. Shoaf

2

February 7, 2001

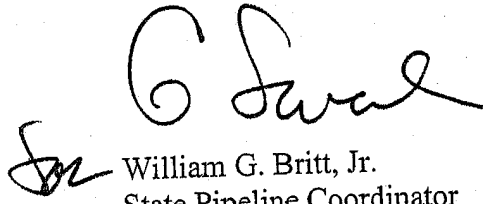
Slope Stability Performance Requirements Pursuant to Stipulation 3.2.1.2

Appendix A-3.1079, p. 4-18) no less than 1.0 or ground displacement no greater than 5 inches unless otherwise approved as a variance by the Authorized Officer and State Pipeline Coordinator.

If you have any questions, please contact Joe Dygas of our office at (907) 271-4452.

Sincerely,


Jerry Brossia
Authorized Officer
BLM/OPM


William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

Enclosure(s):

Factors of Safety

cc:

C.A.Richey, APSC (MS 830)
Lee Monthei, APSC (MS 530-B)
Elden Johnson, APSC (MS 855)
John Ferrell, APSC (MS 855)
Karen Kilty, APSC (MS 542)

☐ AK. Dept. of Environmental Conservation
☐ AK. Dept. of Fish & Game
☐ AK. Dept. of Natural Resources
☐ AK. Division of Governmental Coordination

☐ U.S. Bureau of Land Management
☐ U.S. Environmental Protection Agency
☐ U.S. Dept. of Transportation
☐ AK. Dept. of Labor



JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

March 16, 2001

Letter No.: 01-010-DG
File No.: PT 5.40, F1060, D3040
DD.: 5/15/01

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Stipulation 3.4.2.3. Fault Monitoring, Imposing Special Provisions under Authority of Stipulation 1.3.2.

Dear Mr. Shoaf:

Under authority of Stipulation 1.3.2, the Authorized Officer and State Pipeline Coordinator may require Permittees and Lessees make such modification of the pipeline as they deem necessary to protect or maintain integrity of the pipeline. Government Letter P001-TAPS-3853 previously conveyed conditions of fault monitoring to Alyeska from the Authorized Officer. By authority of Stipulation 1.3.2, the requirements of that letter are adopted as a modification of operational requirements of Stipulation 3.4.2.3.

You are authorized to discontinue further annual fault monitoring surveys provided APSC continues annual surveillance of the aboveground pipe at each of the three identified faults and maintains the position of the pipe on the beams to assure design limits of movement are attainable. You are directed to provide photo documentation to show the pipe support is in the operations design limits and report the results annually.

Mr. Robert I. Shoaf

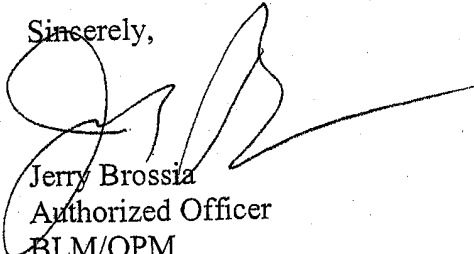
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March 16, 2001

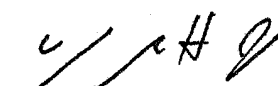
Re: Stipulation 3.4.2.3. Fault Monitoring, Imposing Special Provisions under Authority of Stipulation 1.3.2.

If you have any questions, please contact Doug Lalla of our office at (907) 271-4394.

Sincerely,



Jerry Brossia
Authorized Officer
BLM/OPM



William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

cc:

Gary Reimer, BLM
Colleen McCarthy, BLM
Don Keyes, BLM
Doug Lalla, BLM
Emery (Lee) Monthei, APSC (MS 530-B)
Jim Roddick, APSC (MS-855)
Shelly Martin, APSC (MS542)
Eldon Johnson, APSC (MS 855)
John Ferrell, APSC (MS 855)



☐ AK. Dept. of Environmental Conservation ☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game ☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources ☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination ☐ AK. Dept. of Labor

JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
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(907) 271-5070/271-4336
FAX # (907) 272-0690

March 19, 2001

Letter No.: 01-011-DG
File No.: PT 5.40, F2001, D3080
DD.: 6/1/01

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Stipulation 3.8 Glacier Surges, Imposing Special Provisions under Authority of Stipulation 1.3.2.

Dear Mr. Shoaf:

Under authority of Stipulation 1.3.2, the Authorized Officer and State Pipeline Coordinator may require modification to protect or maintain stability of geologic materials and the integrity of the pipeline. The glaciers along the Trans-Alaska Pipeline route require special geotechnical consideration. Therefore, further requirements are necessary in addition to those provided in Stipulation 3.8 Glacier Surges.

Pursuant to Stipulation 1.3.2 of the Agreement and Grant-of-Way and the State Right-of-Way Lease, the following procedures for monitoring Black Rapids Glacier, Castner Glacier, Fels Glacier, Canwell Glacier, and Worthington Glacier to detect glacier surges and preparing to implement contingency plans should a glacier encroach on the pipeline are required.

1. Prepare a generic contingency plan for glacier surges. The Alyeska risk assessment recommended a contingency plan be prepared for the Black Rapids and Canwell Glacier. We support this recommendation.
2. Aerial photos of the five glaciers shall be taken and analyzed on a five-year cycle. The rate of movement of each glacier is estimated by comparing the terminus location in successive aerial photographs. The next photos are due in year 2004. The evaluation reports will be transmitted to the Joint Pipeline Office.

Mr. Robert I. Shoaf

2

March 19, 2001

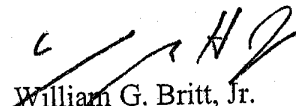
Re: Stipulation 3.8 Glacier Surges, Imposing Special Provisions under Authority of Stipulation 1.3.2..

3. Aerial photographs shall be taken and analyzed once per year for glaciers that are estimated to reach the pipeline within 5-years.
4. Provide semimonthly surveillance of Black Rapids and Canwell Glaciers to assure a glacier surge does not go undetected.
5. Prepare a contingency plan for a glacier that is expected to reach the pipeline in less than 5-years.
6. If the movement analysis indicates a glacier is likely to threaten the pipeline in less than 2-years, a conceptual engineering study shall be completed and measures executed to protect or relocate the pipeline facilities threatened.

If you have any questions, please contact Doug Lalla of our office at (907) 271-4394.

Sincerely,


Jerry Brossia
Authorized Officer
BLM/OPM


William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

cc:

Gary Reimer, BLM
Colleen McCarthy, BLM
Don Keyes, BLM
Doug Lalla, BLM
Emery (Lee) Monthei, APSC (MS 530-B)
Jim Roddick, APSC (MS 855)
Eldon Johnson, APSC (MS 855)
John Ferrell, APSC (MS 855)
Shelly Martin, APSC (MS 542)



January 19, 2001

☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game	☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources	☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor

JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2

Anchorage, Alaska 99501

(907) 271-5070/271-4336

FAX # (907) 272-0690

Letter No.: 01-012-CA

File No.: 51.2.2.2.2, 2.4.1.1,
2.4.3.1, 2.4.3.2, 2.5,
2.7.2.3, 2.7.2.4, 2.7.4.5,
2.8.1, 2.10.1, PT 3.10

DD.: N/A

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Revised JPO Brushing Policy

Dear Mr. Shoaf:

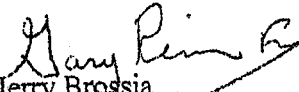
In response to Alyeska's concerns associated with the Joint Pipeline Office ROW Brushing and Undisturbed Buffers Adjacent to Fish Streams dated July 7, 2000, staff from the JPO and Alyeska have worked together to modify the policy (enclosure). This was a cooperative effort to clarify JPO intent and develop standards that can be reasonably implemented. The current policy only cites protection of fish streams and, although important, it does not comprehensively address brushing along the entire right-of-way. In addition to fish related concerns, the revised policy considers other values associated with vegetation protection such as wildlife habitat, erosion control, aesthetic values, and water quality. Meeting participants agreed that vegetation served these important functions and worked to develop a policy that would allow Alyeska to meet its' obligations while minimizing disturbance to vegetation along the entire right-of-way. The working group agreed that the policy should be re-visited periodically to ensure it is functioning as intended.

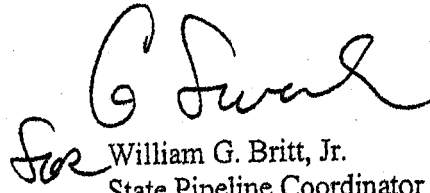
The revised policy is for routine brushing along the TAPS right-of-way. Brushing restrictions for other activities including oil spill containment sites, harvest of willows for revegetation purposes, and harvesting danger trees shall be controlled by their respective authorizations.

Mr. Robert I. Shoaf
Revised JPO Brushing Policy

The attached policy supercedes all previous right-of-way brushing directives. If you have any questions please contact Mike Thompson at 271-4346.

Sincerely,


Jerry Brossia
Authorized Officer
BLM/OPM


William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

Enclosure:

JPO BRUSHING POLICY (2 pp)

cc:

John Globig, APSC
Ken Wilson, APSC
Dave Schmidt, APSC
Pete Nagel, APSC
Tom Arminski, APSC
Alan Richey, APSC
Susan Harvey, ADEC
Gary Reimer, JPO
Mike Thompson, JPO
Tony Braden, JPO
Colleen McCarthy, JPO
Al Samet, JPO
Don Study, JPO
Mike Kasterin, JPO
Bonnie Friedman, JPO
Carl Laughtenberger, JPO
Mike Wrabetz, JPO
Phil Brna, JPO
Jim Ducker, JPO

☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game	☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources	☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor



JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

March 22, 2001

Letter No.: 01-012-DG
File No.: PT 5.20, F2030, D1180
DD.: 11/1/01

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Performance Requirements for Depth of Cover at Buried Mainline Pipe Side-bend and Over-bend Locations, Imposing Special Provisions under Authority of Stipulation 1.3.2.

Dear Mr. Shoaf:

We concur with Alyeska (Letter No. 00-16547) that Stipulation 3.3 in JPO's Letter No. 00-077-JH is for the construction phase only. Structural overfills were required to provide pipe restraint and soil stability above the level of the pipe axis at side-bends and over-bends to compensate for insufficient burial depth.

Under authority of Stipulation 1.3.2 the Authorized Officer and State Pipeline Coordinator may require Permittees and Lessees to make such modification of the pipeline as they deem necessary to protect or maintain integrity of the pipeline. It has been determined that the following operational requirements are necessary to protect and maintain the integrity of the pipeline.

Structural overfills shall be monitored and maintained throughout the life of the pipeline unless it can be shown that conditions have changed. In this event, Alyeska will provide a detailed analysis to show that pipe rupture will not occur from pipe or soil instability. This analysis shall consider the pipeline operation at full capacity.

Specifications for monitoring and maintenance are:

- (1) Structural overfills are to be maintained in thickness, length and width to ensure pipe stability,
- (2) APSC Drawings AL-00-G100, Sheets 1-143 shall show limits of structural overfills,
- (3) Cross drainage will be provided, where appropriate, at structural overfills,

Mr. Robert I. Shoaf

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March 22, 2001

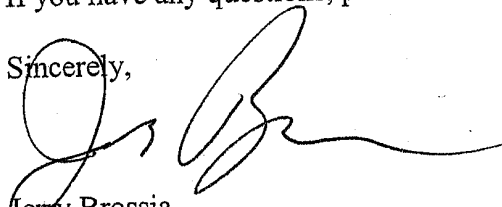
Re: Performance Requirements for Depth of Cover at Buried Mainline Pipe Side-bend and Over-bend Locations,
Imposing Special Provisions under Authority of Stipulation 1.3.2.

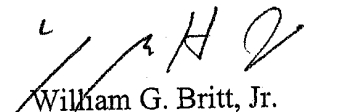
- (4) Structural overfills shall be protected with riprap, when necessary in floodplain areas, and
- (5) Signs will be maintained at structural overfill locations.

In addition, Alyeska is directed to conduct surveillance of the structural overfills at 22 locations, as listed in Appendix E of MS-31, Third Edition, Rev. 1, dated September 15, 2000 and evaluate instrumented pig data at structural overfill locations to detect the approach to operational tolerance levels for the pipe. Results of surveillance and pig data analysis shall be submitted to JPO by the due date indicated above.

If you have any questions, please contact Joe Dygas of our office at (907) 271-4452.

Sincerely,


Jerry Brossia
Authorized Officer
BLM/OPM


William G. Britt, Jr.
State Pipeline Coordinator
ADNR/SPCO

cc:

Gary Reimer, BLM
Joe Dygas, BLM
C.A. Richey, APSC (MS 830)
Lee Monthei, APSC (MS 530-B)
Elden Johnson, APSC (MS 855)
John Ferrell, APSC (MS 855)
Shelly Martin, APSC (MS 542)
Jim Roddick, APSC (MS 855)

**AGREEMENT
BETWEEN
JOINT PIPELINE OFFICE
AND
ALYESKA PIPELINE SERVICE COMPANY**

February 28, 2002

In the matter of continuous improvement
Of the Alyeska compliance systems, quality program, change management
And corrective action processes.

Whereas, the Alyeska Pipeline Service Company (APSC), as agent of the Owners of the Trans Alaska Pipeline System (TAPS), operates the pipeline system subject to an agreement and grant of right of way entered into between the pipeline owners and the Department of Interior, effective January 23, 1974 under authority of Trans-Alaska Pipeline Authorization Act, 87 Stat, 853 (1973) ("TAPAA"), the Mineral Leasing Act, § 185. the TAPS ROW;

Whereas, the pipeline is subject to the State of Alaska ROW Lease issued May 1974 under AS.38.35, issued for a thirty-year term;

Whereas, certain Federal and State of Alaska agencies have created a joint pipeline oversight office, hereafter called Joint Pipeline Office (JPO);

Whereas, the Department of Interior, through the Authorized Officer, and the State of Alaska, through the State Pipeline Coordinator, through the JPO, are required to make decisions regarding the safe operation of the pipeline system;

Whereas, to meet its business objectives and its commitment in Sections 9 and 16 of the Grant and Lease respectively, Alyeska maintains a Quality program (QA 36) and has recently obtained approval from the JPO for Revision 10;

Whereas, this document identifies corrective and preventive actions that will address, resolve and close Grant and Lease deficiencies concerning timeliness of document revision (Stipulations 1.18.3) and adequacy of change management (Stipulation 1.21.1) cited in the Operations and Maintenance CMP Reports of 1999 and 2001.

Whereas, numerous JPO oversight processes and Alyeska assessment processes (including but not limited to the closure process for AAI 1955 and the JPO's Comprehensive Monitoring Program) have identified a need to improve the quality program, change management, corrective action processes and other management processes that pertain to Grant and Lease compliance;

Whereas, the parties to this agreement wish to consolidate Alyeska's response to these oversight and assessment processes and to identify a single path forward, using continuous improvement;

Whereas, Alyeska has incorporated language in QA 36 Revision 10 to clarify the role for the quality program in grant and lease compliance, change management and corrective actions;

Whereas, Alyeska has made significant progress improving these processes and is committed to continuing that improvement;

Whereas, the parties agree that the JPO has approved QA 36 Rev. 10 and will close AAI 1955 in reliance on the commitments made in this agreement:

Therefore, to accomplish these results, and in particular to maintain compliance and improve the systems and processes Alyeska uses to assure compliance, the parties (JPO and APSC) agree as follows:

On December 14, 2001, the JPO approved Revision 10 of QA 36. Revision 10 clarifies the role of the Quality Program in assuring Grant and Lease compliance, including but not limited to effective change management and an effective corrective action program.

The Bureau of Land Management and the Alaska Department of Natural Resources provided Alyeska with their interpretations of the Grant and Lease requirements by February 28, 2002. Alyeska will complete and publish its Grant and Lease compliance manual ("GL 2") and an associated compliance process by April 15, 2002. Alyeska will train appropriate Alyeska and contractor personnel in GL2 and the compliance process by August 1, 2002.

By the end of December 2001 an Alyeska systems renewal team identified improvements to the TAPS regulatory compliance process. By March 31, 2002 Alyeska will review with the JPO Alyeska's improvement plan that results from this team's recommendations. By April, Alyeska will provide the JPO its final plan for improvement actions and schedule.

In order to create a basis for closing AAI 1955 and identifying future continuous improvement activities related to those issues, during November and December 2001 and January 2002 the parties conducted a joint audit of the results of Alyeska's processes that manage change of TAPS hardware. At the present time, the JPO has determined that the Stipulation 1.18.3 compliance standard for timely update of drawings and documents for critical systems is 180 days. If, based on data from the audit, Alyeska believes that a different standard is appropriate, Alyeska will request the JPO to agree to a change in the compliance standard.

By April 15, 2002, an Alyeska Systems Renewal Team will review Alyeska's corrective action process and identify additional improvements that will increase the efficiency and effectiveness of the current process. These improvements will also support closure of the two remaining findings from the March 9, 2000, Alyeska special review on the Corrective Action Process, SR# 00-03.

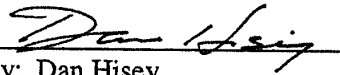
Following identification of these improvements, Alyeska will use its best efforts to obtain JPO agreement with the improvement plan and implementation schedule, as it relates to compliance with Stipulation 1.18.1 of the Grant and Lease for the TAPS Right of Way. Alyeska agrees that:

- The corrective action process will use a risk-based prioritization standard (including Grant and Lease compliance and risks to safety, the environment and TAPS integrity) that will appropriately distinguish deficiencies and focus management attention on timely implementation of corrective actions.
- The corrective action process will be compatible with other key work processes developed by Systems Renewal.
- The process will include trending of corrective actions.
- The process will use categorization methods that are compatible with the Grant and Lease of ROW agreements.
- The process will include JPO notification twice per year of corrective actions on critical items (as defined by the interpretation for Stipulation 1.18.1) that are either deferred beyond their initial due date or are not funded.

Until development and implementation of the improvements that relate to compliance with Stipulation 1.18.1, Alyeska agrees that it will notify the JPO if a funded corrective action on a system (as defined in the draft Interpretation for Stipulation 1.18.1) becomes unfunded. Alyeska also agrees that the standardized prioritization developed during this effort will be applied to the 2003 budget.

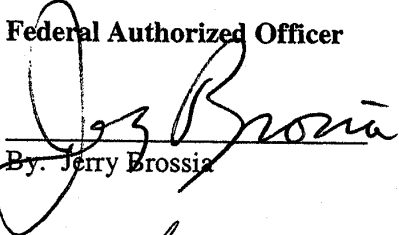
The interface between the Management of Improvement and Corrective Actions and budgeting processes is included in the scope of the effort. The budgeting process itself will be addressed later as part of ongoing system renewal work.

Alyeska Pipeline Service Company


By: Dan Hisey
Chief Operating Officer

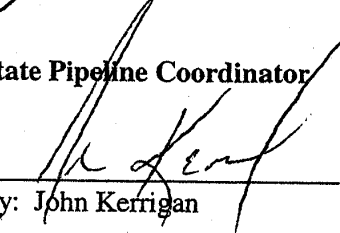
2/28/02
Date

Federal Authorized Officer


By: Jerry Brossia

030602
Date

State Pipeline Coordinator


By: John Kerrigan

3/6/02
Date



- ☐ Ak. Dept. of Environmental Conservation
- ☐ Ak. Dept. of Fish & Game
- ☐ Ak. Dept. of Labor
- ☐ Ak. Dept. of Natural Resources
- ☐ Ak. Division of Governmental Coordination

- ☐ U.S. Bureau of Land Management
- ☐ U.S. Dept. of Transportation
- ☐ U.S. Environmental Protection Agency

JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
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 (907) 271-5070/278-8594/258-5400
 FAX # (907) 272-0690

May 18, 1995

Letter No.: 95-073-GD
 File No.: (51) 2.5.1
 DD.: N/A

Mr. Douglas M. Webb
 Sr. Vice President, Corporate Affairs
 Alyeska Pipeline Service Company
 1835 South Bragaw Street (MS-542)
 Anchorage, Alaska 99512

Re: Zones of Restricted Activities for Peregrine Falcon and Other Raptors

Dear Mr. Webb:

Enclosed are the Trans-Alaska Pipeline System (TAPS) Peregrine Falcon and Raptor Protective Restrictions issued under the authority of Stipulation 2.5.3, Zones of Restricted Activities, in the Federal Agreement and Grant of Right-of-Way, State Right-of-Way Lease, and in compliance with Section 7 of the Endangered Species Act, as amended. These restrictions follow guidelines developed in consultation with the U.S. Fish and Wildlife Service (USFWS). Please note that these restrictions have been changed since last issued in April, 1994. Included are protective restrictions for the delisted arctic peregrine falcon and other raptors nesting near TAPS north of the Brooks Range.

USFWS removed the arctic peregrine (*falco peregrinus tundrius*) from the list of endangered and threatened wildlife October 5, 1994 (Federal Register Vol. 59, No. 192, 10/5/94). This subspecies is found in the Sagavanirktok River drainage. Section 4 (g) of the Endangered Species Act requires USFWS to monitor recovered species for five years following de-listing. The American Peregrine (*f. p. anatum*) has not been delisted. This subspecies generally occurs south of the Brooks Range.

Effective immediately, JPO is changing the area within Zones of Restricted Activities at Franklin Bluffs, Sagwon Bluffs, Slope Mountain, Grapefruit Rocks, and Yukon River. Each of these three areas remain important nesting and rearing locales for not only peregrine falcons, but gyrfalcons and rough-legged hawks.

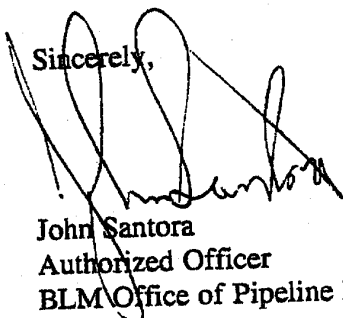
Douglas M. Webb

2

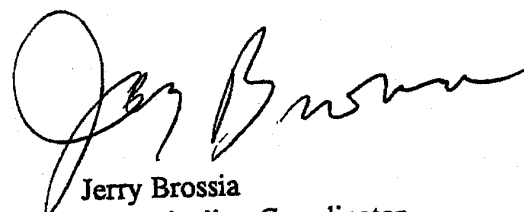
May 18, 1995

All activities within the Zones of Restricted Activities must comply with the attached restrictions and approved variances. Other variances may be approved by JPO on a case by case basis. A copy of the Federal Register publication presenting the USFWS ruling affecting the arctic peregrine is also attached. If you or your staff have questions, please contact Mike Kasterin at 271-4459.

Sincerely,



John Santora
Authorized Officer
BLM Office of Pipeline Monitoring



Jerry Brossia
State Pipeline Coordinator

Enclosures:

Federal Register, Vol. 59, No. 192, October 5, 1994, 50 CFR Part 17, Endangered and Threatened Wildlife and Plants; Final Rule

Trans-Alaska Pipeline System Protective Restrictions For Peregrine Falcons And Other Raptors, with 5 maps, 5/16/95

cc: Skip Ambrose, USFWS
Dee Ritchie, BLM, FBKS
Phil Brna, BLM/JPO
Michael Thompson, ADF&G/JPO
M. F. Smith, APSC (MS 569)
Dennis Prendeville, APSC (MS 596)
David Trudgen, APSC (MS 538)

w/o encl:

Carl Lautenberger, EPA/JPO
Tom Chapple, ADEC/JPO
Don Keyes, BLM/JPO
Gary Reimer, BLM/JPO
Greg Swank, ADNRR/JPO
Tony Braden, ADNRR/JPO
John Strawn, ADOT/JPO

☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game	☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources	☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor



JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

June 29, 2001

Letter No.: 01-110-DG
File No.: PT 5.20, F2030 & D1180
DD.: 7/31/01

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Aboveground System Additional Requirements Pursuant to Stipulation 3.2.1.2

Dear Mr. Shoaf:

Stipulation 3.2.1.2 provides that the Federal Authorized Officer and State Pipeline Coordinator may impose additional requirements as necessary to reflect the impact of sub-arctic and arctic environments. Permafrost is present throughout much of the route of the Trans-Alaska Pipeline and requires special geotechnical consideration.

Pursuant to Stipulation 3.2.1.2 of the Agreement and Grant of Right-of-Way, the following operations standard shall apply to the Trans-Alaska Pipeline Aboveground System. The aboveground system shall be maintained to perform under the effects of seismic and hydraulic events and unstable soils under changing environmental conditions according to approved inservice criteria, factors of safety, and current and future environmental conditions.

Stipulation 3.9.1 of the Agreement and Grant of Right-of-Way indicates in part that thermal changes be avoided or minimized, and that any degradation of the permafrost not jeopardize pipeline foundations. Where degradation of permafrost could jeopardize pipeline foundations and reduce their ability to perform as designed during a seismic or hydraulic event, then timely engineering evaluation and corrective maintenance intervention is required. Appropriate corrective maintenance intervention shall be consistent with design criteria. For example, where a Vertical Support Member (VSM) no longer meets vertical or lateral load design criteria, then intervention is required after appropriate engineering evaluation. Maintenance is required where a critical aboveground component or foundation condition can not perform as designed or meet design criteria. A critical component (VSMs, Shoes, Anchors, Heat Pipes) or environmental condition (VSM depressions) is one whose failure could lead to a failure of mainline pipe, non-

Mr. Robert I. Shoaf

2

June 29, 2001

Aboveground System Additional Requirements Pursuant to Stipulation 3.2.1.2

compliance with design basis or code requirements for the mainline pipe under either static or dynamic conditions.

In order to maintain the aboveground system in a condition capable of performing within the limits or criteria as it was designed, timely corrective maintenance is necessary. Therefore, where a critical hardware component or foundation condition is identified as being not in compliance with design criteria, appropriate engineering evaluation and maintenance intervention shall occur within a year of discovery, but no later than one year after discovery unless approved.

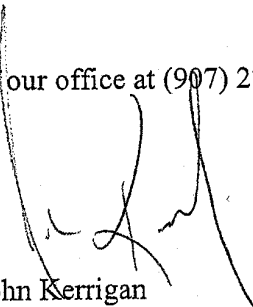
Changes or variances from standing aboveground system design or inservice criteria for unusual or changing foundation conditions will require approval by the Authorized Officer and State Pipeline Coordinator.

Therefore, given the above requirements, we are requesting an updated corrective maintenance schedule of those aboveground components or conditions and their locations that will receive corrective maintenance annually.

If you have any questions, please contact Joe Dygas of our office at (907) 271-4452.

Sincerely,


Jerry Brossia
Authorized Officer
BLM/OPM


John Kerrigan
State Pipeline Coordinator
ADNR/SPCO

cc:

C.A.Richey, APSC (MS 830)
Lee Monthei, APSC (MS 530-B)
Elden Johnson, APSC (MS 855)
Steve Sorensen, APSC (MS 855)
John Ferrell, APSC (MS 855)
Shelley Martin, APSC (MS 542)



☐ AK. Dept. of Environmental Conservation	☐ U.S. Bureau of Land Management
☐ AK. Dept. of Fish & Game	☐ U.S. Environmental Protection Agency
☐ AK. Dept. of Natural Resources	☐ U.S. Dept. of Transportation
☐ AK. Division of Governmental Coordination	☐ AK. Dept. of Labor

JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

June 18, 2001

Letter No.: 01-111-DG
File No.: N/A
DD.: N/A

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Restoration Performance Requirements Pursuant to Stipulation 2.12.1

Dear Mr. Shoaf:

The following special requirement is to establish criteria to evaluate Alyeska Pipeline Service Company (APSC) compliance with stipulation 2.12.1. The stipulation requires that (under federal authority), "Areas disturbed by Permittees shall be restored by Permittees to the satisfaction of the Authorized Officer as stated in writing" and (under state authority) "Areas on State Land disturbed by Lessees shall be restored to the satisfaction of the Pipeline Coordinator as stated in writing."

For the purpose of this stipulation, a "disturbed area" is defined as one in which there has been "a departure or change from original natural conditions which can be attributed to direct or indirect effects of Permittees' or Lessees' activities or the Pipeline System." Restoration is defined as "returning a disturbed site (excluding routine workpad maintenance activities e.g. brushing, corrosion or valve excavation unless it affects critical habitat or drive lane maintenance activities) to its original or normal physical condition and natural biological productivity and diversity by means of best practicable protection, stabilization, erosion control, habitat reconstruction, and revegetation techniques with the intent of reestablishing native plant and animal species."

The Joint Pipeline Office (JPO) further requires that disturbed area restoration be completed as soon as practical after the disturbance; and, in the case of work pads, access roads, dikes, and similar long-term earthen structures, upon completion of use.

Mr. Robert I. Shoaf
Restoration Performance Requirements Pursuant to Stipulation 2.12.1

2

June 18, 2001

Therefore, pursuant to Stipulation 2.12.1 of the federal Agreement and Grant of Right-of-Way and the state Right-of-Way Lease, successful restoration will be evaluated by the Authorized Officer and Pipeline Coordinator on a site-specific basis considering whether the following restoration measures have been taken:

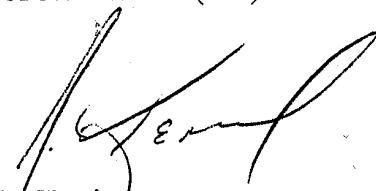
1. Remove all contaminated material;
2. To the extent possible, return a disturbed site to its original or normal physical condition and natural biological productivity and diversity with reestablishment of native plant and animal species;
3. Prevent erosion;
4. Conform to the adjoining land forms and approximate the original land contours;
5. Maintain pipeline system integrity;
6. Remove improvements as required by the appropriate authority; and
7. Provide for public safety.

Please be advised that JPO approval of Alyeska manual "EP 106, Erosion Control for Maintenance Operations" is hereby rescinded. Current JPO policy is to evaluate compliance based on stipulation specific performance standards independent of Alyeska manuals such as EP-106.

If you have any questions, please contact Gary Reimer of our office at (907) 271-4481.

Sincerely,


Jerry Braggia
Authorized Officer
BLM/OPM


John Kerrigan
State Pipeline Coordinator
ADNR/SPCO

cc:

Alan Richey, APSC (MS 830)
Jim Sweeney, APSC (MS 542)
Ken Wilson, APSC (MS 223 P-D)
Tony Braden, JPO



A.K. Dept. of Environmental Conservation
A.K. Dept. of Fish & Game
A.K. Dept. of Natural Resources
A.K. Division of Governmental Coordination

U.S. Bureau of Land Management
U.S. Environmental Protection Agency
U.S. Dept. of Transportation
A.K. Dept. of Labor

JOINT PIPELINE OFFICE

411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501
(907) 271-5070/271-4336
FAX # (907) 272-0690

June 29, 2001

Letter No.: 01-114-DG
File No.: PT 5.40, F2030, D3030
DD.: N/A

Mr. Robert I. Shoaf
Vice President
Alyeska Pipeline Service Company
1835 South Bragaw Street, MS 528
Anchorage, AK 99512

Re: Stipulation 3.2.1 Pipeline System Standards for Pipe Curvature, Imposing Special Standards under Authority of Stipulation 3.2.1.2.

Dear Mr. Shoaf:

Stipulation 3.2.1.2 provides that the Federal Authorized Officer and State Pipeline Coordinator may impose additional requirements as necessary to reflect the impact of sub-arctic and arctic environments. Permafrost is present throughout much of the route of the Trans-Alaska Pipeline and requires special geotechnical consideration.

Therefore, pursuant to Stipulation 3.2.1.2 of the Agreement and Grant of Right-of-Way, the following operations standard shall apply to the Trans-Alaska Pipeline mainline 48-inch diameter pipe. The intervention criteria used to determine when corrective maintenance is required shall include:

1. If the pipe curvature increases more than 20% as a result of pipe movement in comparison to the 1992 NOWSCO Curvature Pig data and the cumulative curvature is greater than 85% Critical Buckling Curvature, or
2. Deformation data showing the formation of a 0.25-inch "waveform" or bulge indicating the onset of wrinkling combined with other evidence showing pipe instability shall require corrective maintenance.

Reliability Centered Maintenance, Risk Assessment or other suitable and documented analysis will determine the optimal pigging schedule. Should TAPS throughput exceed 1.6 MM Bbls. per day (the throughput in 1992 when the baseline data pig run was completed), the curvature pig

Mr. Robert I. Shoaf

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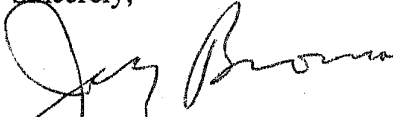
June 29, 2001

Stipulation 3.2.1 Pipeline System Standards for Pipe Curvature, Imposing Special Standards under Authority of Stipulation 3.2.1.2.

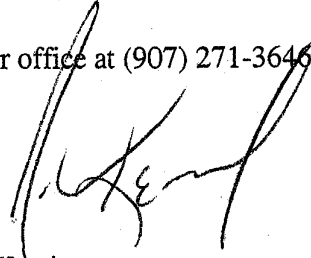
schedule shall be evaluated, as increasing temperatures will affect the stress in areas of high curvature.

If you have any questions, please contact Don Keyes of our office at (907) 271-3646.

Sincerely,



Jerry Brossia
Authorized Officer
BLM/OPM



John Kerrigan
State Pipeline Coordinator
ADNR/SPCO

cc:

Gary Reimer, BLM
Dave Norton, APSC (MS 568)
Dan Rice, ADNR
Colleen McCarthy, BLM
Don Keyes, BLM
Doug Lalla, BLM
Emery (Lee) Monthei, APSC (MS 530-B)
Jim Roddick, APSC (MS 855)
Eldon Johnson, APSC (MS 855)
Shelly Martin, APSC (MS 542)
David Hackney, APSC (MS 855)

ZONES OF RESTRICTED ACTIVITY FOR PROTECTION OF KEY FISH AREAS
ALONG TAPS ON FEDERALLY ADMINISTERED LANDS

APRIL 1, 1987

P001.12030201

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ALASKA STATE OFFICE - DIVISION OF MINERALS
BRANCH OF PIPELINE MONITORING
ANCHORAGE, ALASKA



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Alaska State Office
701 C Street, Box 30
Anchorage, Alaska 99513

IN REPLY REFER TO

P001.120302 (983)
.0102

FEB 19 1987

Mr. Theo L. Polasek
Vice President, Operations
Alyeska Pipeline Service Company
1835 South Bragaw Street
Anchorage, Alaska 99512

In reply refer to:
S.N.-P001-TAPS-3789
Zones of Restricted Activities
Key Fish Areas

Dear Mr. Polasek:

In consideration of the Agreement and Grant of Right-of-Way, Stipulation 2.5.3.1 concerning zones of restricted activity, a corrected listing of key fish areas has been compiled following discussions between our respective staffs and field investigations. This enclosed listing is entitled "Zones of Restricted Activity for Protection of Key Fish Areas Along TAPS on Federally Administered Lands," dated April 1, 1987. With regard to Federal interests, the enclosed document supercedes a similar listing entitled "Zones of Restricted Activity for the Protection of Fishery Habitats on Federally Administered Portions of the Trans-Alaska Pipeline System," dated January 1, 1986.

Please insure pipeline operation and maintenance activities are conducted so as to accomplish the work with minimum intrusion into the areas and periods of concern.

Sincerely,

Chief, Branch of
Pipeline Monitoring

Enclosure - 1

cc: B. Hilliker (538)w/Encl.

PREFACE

The Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, BP Pipelines Inc., Exxon Pipeline Company, Mobil Alaska Company, Phillips Petroleum Company, SOHIO Pipe Line Company, and Union Alaska Pipeline Company. Stipulation 2.5.3. Zones of Restricted Activities states:

"2.5.3.1. Permittees' activities in connection with the Pipeline System in key fish and wildlife areas may be restricted by the Authorized Officer during periods of fish and wildlife breeding, nesting, spawning, lambing or calving activity and during major migrations of fish and wildlife. The Authorized Officer shall give Permittees written notice of such restrictive action. From time to time, the Authorized Officer shall furnish Permittees a list of areas where such actions may be required, together with the anticipated dates of restriction."

This document is the Federal Authorized Officer's list described, as above. As the Federal Authorized Officer's list, it includes only sensitive fishery habitats on Federally administered portions of the pipeline.

Sensitive fish streams listed in this report have been identified from another Branch of Pipeline Monitoring report titled: "OPEN FILE REPORT - TAPS FISH STREAMS" (April 1, 1987) which lists fish streams along TAPS mentioned in recent literature.

This list will be updated from time to time with any additions or corrections resulting from further State, Federal, Alyeska Pipeline Service Company or other study of pipeline streams. Please direct all correspondence concerning this report to :

James K. Gilliam, Ecologist
U.S. Bureau of Land Management
Branch of Pipeline Monitoring
701 C Street, Box 30 (AK-983)
Anchorage, AK 99513
(907) 267-1266

PAGE ii of iv

FISH SPECIES Codes
(Adapted from Johnson and Rockwell, 1981)

? = Fish Present?

AB = Alaska blackfish	: <u>Dallia pectoralis</u>
AC = Arctic char	: <u>Salvelinus alpinus</u>
AL = Arctic lamprey	: <u>Lampetra japonica</u>
AS = American shad	: <u>Alosa sapidissima</u>
BB = Burbot	: <u>Lota lota</u>
BC = Bering cisco	: <u>Coregonus laurettae</u>
BL = American brook lamprey	: <u>Lampetra</u> sp.
BW = Broad whitefish	: <u>Coregonus nasus</u>
CA = Arctic cisco	: <u>Coregonus autumnalis</u>
CD = Sculpin	: <u>Family Cottidae</u>
CI = Cisco	: <u>Coregonus</u> sp.
CN = Slimy sculpin	: <u>Cottus cognatus</u>
CS = Least cisco	: <u>Coregonus sardinella</u>
CT = Cutthroat trout	: <u>Salmo clarki</u>
DS = Dog (Chum) salmon	: <u>Oncorhynchus keta</u>
DV = Dolly varden	: <u>Salvelinus malma</u>
GR = Grayling	: <u>Thymallus arcticus</u>
HO = Pond smelt	: <u>Hypomesus olidus</u>
HW = Humpback whitefish	: <u>Coregonus pidschian</u>
IN = Inconnu (Sheefish)	: <u>Stenodus leucichthys</u>
KO = Kokanee	: <u>Oncorhynchus nerka</u>
KS = King (Chinook) salmon	: <u>Oncorhynchus tshawytscha</u>
LC = Lake chub	: <u>Couesius plumbeus</u>
LS = Longnose sucker	: <u>Catostomus catostomus</u>
LT = Lake trout	: <u>Salvelinus namaycush</u>
LW = Lake whitefish	: <u>Coregonus clupeaformis</u>
NP = Northern pike	: <u>Esox lucius</u>
OM = Rainbow smelt	: <u>Osmerus mordax</u>
PS = Pink (Humpback) salmon	: <u>Oncorhynchus gorbuscha</u>
PW = Pygmy whitefish	: <u>Prosopium coulteri</u>
RB = Rainbow trout	: <u>Salmo gairdner</u>
RS = Red (Sockeye) salmon	: <u>Oncorhynchus nerka</u>
RW = Round whitefish	: <u>Prosopium cylindraceum</u>
SB = Stickleback	: <u>Family Gasterosteidae</u>
S9 = Ninespine stickleback	: <u>Pungitius pungitius</u>
SH = Steelhead trout	: <u>Salmo gairdneri</u>
SK = Sucker	: <u>Family Catostomidae</u>
SS = Coho (Silver) salmon	: <u>Oncorhynchus kisutch</u>
TP = Trout-Perch	: <u>Percopsis omiscomaycus</u>
WF = Whitefish	: <u>Coregonus</u> sp.

SELECTED REFERENCES

- (A) Alaska Pipeline Office. 1977. Interim report on zones of restricted activity for fish and wildlife along the Trans-Alaska Pipeline. U.S. Dept. of the Interior. Anchorage, AK. (February 16, 1977;37pp).
- (B) ~~Johnson, Richard L. and Julius Rockwell, Jr. (Revised by J. Rockwell, Jr.). 1981. List of streams and other water bodies along the Trans-Alaska oil pipeline route (Fourth Revision:Draft). U.S. Dept. of the Interior, Alaska Pipeline Office, Anchorage, AK. (May 1, 1981).~~
- (C) Elliott, George V. 1980. First interim report on the evaluation of stream crossings and effects of channel modifications on fishery resources along the route of the trans-Alaska pipeline. U.S. Fish and Wildlife Service, Anchorage, AK (June, 1980:77pp).
- (D) Elliott, George V. 1982. Final report on the evaluation of stream crossings and effects of channel modifications on fishery resources along the route of the trans-Alaska pipeline. U.S. Fish and Wildlife Service, Anchorage, AK (March 1982;110pp).
- (E) Office of Special Projects. 1982. [no title]. U.S. Bureau of Land Management, Anchorage, AK. (May 6, 1982).
[This list is commonly referred to as Ken Hunt's list and includes comments from the Alaska Dept. of Fish and Game].
- (F) Office of the Federal Inspector for ANGTS. 1984. List of fish stream data. Anchorage, AK (February 13, 1984;50pp).
- (G) DenBeste, J. and P. McCart. 1984. Catalog of streams associated with the Trans Alaska Pipeline System in the northern district. Volume IV. Prepared for Alyeska Pipeline Service Company by Aquatic Environments Inc., Anchorage, AK. (April 1984;67pp).
- (H) Roberson, Kenneth. 1985 (letter of 12/18). [Comments on First Edition of 1/1/86]. Alaska Dept. of Fish and Game, Glenallen, AK.
- (I) Alyeska Pipeline Service Co. 1986 (letter of May 12, No. 86-3642). [Comments on First Edition of 1/1/86]. Anchorage, AK.
- Anadromous Fishes
Alaska Department of Fish and Game, Habitat Division. 1985. Catalog of waters important for spawning, rearing or migration of anadromous fishes, as revised March 29, 1985 effective May 19, 1985: Regions II, V and VI. Juneau, AK.

PAGE iv of iv

EXPLANATION OF HEADINGS

A&G STIP. 2.5.3 ZONES OF RESTRICTED ACTIVITIES-KEY FISH AREAS 04/01/87 PAGE 00 of 00

MP	STREAM NAME(s)	FISH	A:JaFeMrApMaJuJlAuSeOcNoDe	FIELD	MER:REFER:
A/S	Comments	SPECIES:D	PERIOD OF SENSITIVITY	STATION:T	-ENCE:
4.12:	(Edge) Lakes			21736:U	:AB E:
137	TAPS A/G;Causeway			21796:10N:F	:
				1550+00:14E:	:
				1541+70:20	:
277.14:	PROSPECT CREEK	:CN;GR;KS:Y	:CCCCCCCCCCCCCCCCCCCC	1463150:F	:AB E:
		:LS;NP;RW:E:		1463408:22N:FG	:
91	TAPS A/G;BLOCKPOINT	:S:		1590+00:14W:	:
				31	:
*790.9:	(Grey Stream)	:DV;SS	:CCCCSSSSSSSjlauCCCCCCCC	4176212:C	:AB E:
				09S:	:
2	TAPS B/G;CMP			506+06:05W:	:
				28	:

SECTION 00 = Section 01 is Pump Sta. 1 to Pump Sta. 2; Section 10 is Pump Sta. 10 to Pump Station 11.

MP = The distance in miles from Pump Sta. 1; * Prefix denotes extrapolated mileage not field checked.

AS = Alyeska Pipeline Service Company (G-100 as-builts) alignment sheet number.

STREAM NAME = Adapted from Johnson and Rockwell, 1981; For example: YUKON RIVER denotes a name recognized by the U.S. Geological Survey; (Small or Jackie's CK) denotes a non-USGS recognized popular name; [Snowpad CK] denotes a new name used in this list.

COMMENTS = TAPS A/G denotes above-ground pipe mode; TAPS B/G denotes below-ground mode; CMP is a corrugated-metal-pipe or culvert; LWC is a low water crossing; BLOCKPOINT is a physical barrier to vehicle passage; CAUSEWAY, BRIDGE and PARALLEL are self-explanatory;

FISH SPECIES = see Page ii of iv for explanation of codes.

ADAD = "YES" denotes anadromous fish stream designated by Alaska Dept. Fish and Game.

PERIOD OF SENSITIVITY = C denotes Critical period of fish usage; S denotes Sensitive period of fish usage.

FIELD STATION = Distance in feet from Pump Station No. 1 as estimated in field; * Prefix denotes an extrapolated stationing not field checked.

G-5 = Obtained from selected references (see Page iii of iv) and refers to construction drawings.

MER = Meridian - U is Umiat; F is Fairbanks; C is Copper River.

T = Tier or Township; R = Range; Sec = Section.

REFERENCE = see page iii of iv

Appendix H: Example of Guaranty¹

¹ Reproduced from the best available copy.

GUARANTY

1. FOR VALUE RECEIVED and in order to induce the UNITED STATES OF AMERICA, hereinafter the "United States", to consent to a transfer of right, title and interest in and to the AGREEMENT AND GRANT OF RIGHT-OF-WAY FOR THE TRANS-ALASKA PIPELINE dated January 23, 1974, hereinafter the "Agreement", from SOHIO PIPE LINE COMPANY to BP PIPELINES INC., a Delaware corporation, hereinafter the "Guaranteed Party", the undersigned, THE BRITISH PETROLEUM COMPANY LIMITED, an English corporation, hereinafter the "Guarantor", agrees and does hereby unconditionally guarantee the full and timely payment of the liabilities and obligations of the Guaranteed Party to the United States under said Agreement. For the purposes of determining the liability of the Guarantor, the undivided interest of the Guaranteed Party shall be such undivided interest as the Guaranteed Party may have under the Agreement or from time to time based upon transfers approved in accordance with Section 22 of the Agreement. This Guaranty is provided in accordance with the demand of the Secretary of the Interior of the United States (hereinafter "The Secretary") that Guaranteed Party cause this Guaranty instrument to be delivered to the Secretary pursuant to the terms of Section 15 of the Agreement.

2. This Guaranty shall extend to the Guaranteed Party's performance of all terms and conditions of the Agreement and Guarantor shall be liable for any and every breach of the terms and conditons of the Agreement for which monetary damages to the United States are ascertainable, whether by the terms of the Agreement or otherwise. If there is any breach of a term or condition of the Agreement compensable in accordance with the preceding sentence or under the terms of the Agreement and the Guaranteed Party has failed or refused to pay the United States any sum due on that account, the Guarantor, immediately upon the written demand of the United States, shall pay to the United States the amount due and unpaid, without right of setoff, counterclaim or deduction, in like manner as if such amount constituted the direct and primary obligation of the Guarantor. No other notice of any breach shall be required of the United States insofar as this Guarantor is concerned. Except as provided in the Agreement, the United States shall not be required, prior to any such demand on or payment by the Guarantor, to pursue any rights or remedies which it may have against the Guaranteed Party or against any other Permittee (as that term is defined in said Agreement), person, party, guarantor or security. Unless precluded by circumstances or operation of law, the Guaranteed Party will be joined in any suit against the Guarantor under this Guaranty. The Guarantor shall have no right of subrogation whatsoever with respect to any, or arising out of any, particular claim or demand

- 2 -

by the United States against the Guarantor or the Guaranteed Party or against any security the United States may have obtained from the Guaranteed Party or others until the United States shall have received full satisfaction by the Guarantor of such claim or demand.

3. The obligations of the Guarantor herein shall not be released, discharged or in any way affected by (a) any extension of time or forbearance granted the Guaranteed Party, the other Permittees, or any of them, or to any other person, (b) any waiver, failure to enforce, or any compromise on the part of the United States as to any term, covenant, condition, agreement or obligation under or in connection with the Agreement or any term or provision of any pleading, stipulation, motion, paper, or other document, order, judgment, or decree prepared or filed in connection with any administrative or judicial proceeding to which this Guarantor or its Guaranteed Party is not a party, whether or not the foregoing shall relate in any way to the rights and obligations of the Guaranteed Party, the other Permittees, or any of them under the Agreement, or in connection with the Trans-Alaska Pipeline System, or the Federal Lands on which or in the vicinity of which the Pipeline System is located, (c) the release or substitution of other guarantors or the release of any security or the taking of additional security of any kind covering the obligations of the Guaranteed Party, the other Permittees, or any of them, except as provided in Section 22 of the Agreement, (d) the dissolution, termination of business activity, insolvency or bankruptcy of the Guaranteed Party, any other Permittee, guarantor or other party whatsoever, or (e) any assignment, transfer by operation of law, hypothecation, or other disposition or incumbrance, whether in whole or in part, of the Agreement or any right or interest therein, or granted thereby, except as provided in Section 22 of the Agreement.

4. Any reference herein to the "Agreement" shall be deemed to include any and all additions, amendments, supplements, extensions or renewals thereof entered into after the effective date hereof and, whenever it is not unreasonable or inappropriate to do so, the word "Agreement", or any reference thereto, shall be construed to include any right or privilege that may be granted pursuant to or by virtue of the Agreement. In accordance with Section 15 of the Agreement, the term the "Agreement" shall also include any other agreement, permit or authorization to be issued or granted to the Guaranteed Party by the Secretary and that relates in whole or in part to all or any part of the Pipeline System, unless a substitute guarantor acceptable to the Secretary is provided by the Guaranteed Party. This Guaranty shall be binding upon the Guarantor and its successors and assigns, immediate and remote, and shall inure to the benefit of the United

- 3 -

States. The expression "successors and assigns" shall include but shall not be limited to any person or entity to whom all or substantially all of the assets of the Guarantor have been transferred by operation of law or otherwise. This Guaranty cannot be waived, discharged, cancelled, revoked, or amended except as provided in this paragraph and Section 22 of the Agreement.

5. Any payment to be made by the Guarantor pursuant hereto shall be effected by a good and valid check of the Guarantor made payable to the order of the United States of America. Said check shall not be a third-party check and shall not contain any endorsements or notations. Such payments will be accepted by the United States, subject to collection, at the address listed in Paragraph 6 of this Guaranty or at such other address as may be specified in accordance with that Paragraph.

6. Any notice or demand that may be given or made under or pursuant to this Guaranty shall be in writing and, until further notice, shall be addressed, in the case of the United States, as follows:

The Secretary of the Interior
Room No. 6151
Department of the Interior Building
18th and C Streets, N.W.
Washington, D.C. 20240

Until further notice such notices and demands pursuant to this Guaranty shall be addressed to the Guarantor as follows:

Secretary
The British Petroleum Company Limited
Britannic House
Moor Lane
London E.C.2., England.

The Guarantor hereby appoints the following agent who may accept service of legal process in accordance with the requirements of Section 15E of the Agreement and who may be served at the following address:

CT Corporation System
200 Bank of Alaska Building
Juneau, Alaska 99801

- 4 -

Either the United States or the Guarantor, by written notice addressed in accordance with this Paragraph, may notify the other of the change of its address for the receipt of notices and demands. Subject to the requirements of Paragraph 15 of the Agreement, the Guarantor may substitute a different agent for acceptance of service of legal process by written notice addressed in accordance with this Paragraph.

7. This Guaranty shall be effective contemporaneously with the execution of the Agreement.

IN WITNESS WHEREOF, the undersigned has set its hand hereto by its Attorney-in-fact duly authorized as of the 1st day of August, 1974.

THE BRITISH PETROLEUM COMPANY LIMITED

By: Peter G. Cazalet
Attorney-in-Fact

STATE OF NEW YORK)
) SS:
COUNTY OF NEW YORK)

BEFORE ME the undersigned, a Notary Public in and for the State of New York, County of New York, on this day personally appeared Peter G. Cazalet known to me to be the person whose name is subscribed to the foregoing instrument, who being duly sworn, acknowledged to me that he executed said instrument as his free act and deed in his capacity as the duly appointed Attorney-in-Fact of The British Petroleum Company Limited.

GIVEN under my hand and seal of office this 4th day of August, A.D. 1974.

DANIEL M. VINNIK
Notary Public, State of New York
No. 60-9469012
Qualified in Westchester County
Certificate filed in New York County
Commission Expires March 30, 1976

ACCEPTED FOR THE UNITED STATES OF AMERICA, this day of 1974.

Secretary of the Interior

ASSIGNMENT

This Agreement made as of this 9th day of August, 1974, by and between Sohio Pipe Line Company, a Delaware corporation ("Assignor") and BP Pipelines Inc., a Delaware corporation ("Assignee"),

WITNESSETH:

Whereas, by agreement dated August 27, 1970, Assignor, Amerada Hess Corporation, a Delaware corporation, ARCO Pipe Line Company, a Delaware corporation, Exxon Pipeline Company, a Delaware corporation, Mobil Alaska Pipeline Company, a Delaware corporation, Phillips Petroleum Company, a Delaware corporation, and Union Alaska Pipeline Company, a California corporation or their predecessors in interest entered into the Trans Alaska Pipeline System Agreement, as amended and supplemented (herein called the "TAPS Agreement"); and

Whereas, the parties to the TAPS Agreement incorporated and subscribed to certain shares of stock of Alyeska Pipeline Service Company, a Delaware corporation, and of Alyeska Investment Company, a Delaware corporation, the former having been designated as Contractor in a certain Design and Construction Agreement

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for the Trans Alaska Pipeline System, such project being herein called the "System"; and

Whereas, the parties to the TAPS Agreement or their predecessors in interest as shareholders of Alyeska Pipeline Service Company and Alyeska Investment Company entered into Agreements ("Shareholders' Agreements") with respect to their ownership of shares of capital stock of such corporations; and

Whereas, The British Petroleum Company Limited and The Standard Oil Company (Ohio), parent corporations respectively, of Assignee and Assignor, have entered into an Agreement effective as of July 8, 1974, with respect to the acquisition by Assignee of that part of the right title and interest of Assignor in and to the System after Assignor shall have acquired a certain share of the System's First Expansion as that term is defined on such July 8, 1974 Agreement so as to vest in Assignee a 15.84% interest in the System and in the agreements and assets relating thereto;

Now Therefore, in consideration of the premises and of the payment to Assignor by Assignee of \$108,269,209.00 and of the mutual undertakings of the parties herein contained, Assignor and Assignee agree that:

1. Assignor hereby assigns and transfers to Assignee (a) effective as of July 17, 1974, that part of Assignor's right title and interest in and to the System, the TAPS Agreement, the above-mentioned Design and Construction Agreement, and any and all other agreements relating to the System including but not limited to the Agreement and Grant of Right-of-Way for Trans Alaska Pipeline dated January 23, 1974, and other governmental authorizations to which Assignor is a party together with the other parties to the TAPS Agreement, and any real or personal property in which Assignor has acquired an interest pursuant to such Agreements and other agreements and (b) effective as of July 17, 1974, that part of Assignor's right, title and interest, as a shareholder, in and to said Alyeska Pipeline Service Company and Alyeska Investment Company so as to vest in Assignee an interest, in all of items (a) and (b) in this paragraph, equivalent to 15.84% of the entirety of such items as they exist after the First Expansion of the System.

2. Assignee hereby assumes and agrees to be responsible in the place and stead of the Assignor, for the obligations and liabilities chargeable or

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charged against Assignor's interest hereby assigned. Assignee agrees to execute such amendments to the Agreement and Grant of Right-of-Way for Trans Alaska Pipeline as may be necessary fully to effect the assignment of such 15.84% interest, and to assume the liabilities and obligations (accrued, contingent or otherwise) to the United States under such Agreement. Such obligations and liabilities shall include, whether one or more, those:

(a) heretofore or hereafter incurred under the TAPS Agreement, the Construction Agreement and all other agreements heretofore entered into relating to the design and construction of the System to which Assignor and the other signatories to the TAPS Agreement are parties and all commitments made pursuant to such Agreements and other agreements and all obligations, liabilities, costs and expenses heretofore or hereafter attributable to the System, other than those costs and expenses for which reimbursement has been made in the form of consideration for this Assignment including real and personal property acquired for the System;

(b) heretofore or hereafter incurred under the Shareholders' Agreements or in connection with the

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organization, staffing and operation of Alyeska Pipeline Service Company and Alyeska Investment Company.

3. This Agreement may be executed and any consent or approval hereto may be given in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

4. The parties shall from time to time and at all times do all such further acts and execute and deliver all such further assignments, including assumption agreements, deeds and documents as shall be reasonably required in order fully to perform and carry out the terms of this Agreement.

This Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and permitted assigns.

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IN TESTIMONY WHEREOF, this Agreement is
executed in several counterparts, each of which shall
be considered an original as of the day and year
first above written.

Assignor: SOHIO PIPE LINE COMPANY

By 
President

Assignee: BP PIPELINES INC.

By 
Chairman of the Board

The foregoing Agreement is hereby consented
to and approved as of this 9th day of August, 1974.

ALYESKA PIPELINE SERVICE COMPANY

By 
EJ
Patton