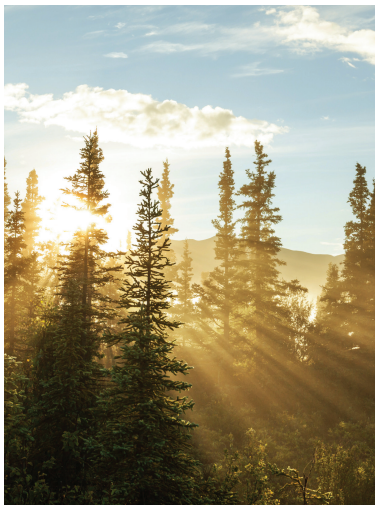
ASAP

Alaska's In-State Gas Pipeline

Environmental Evaluation Document

Alaska Stand Alone Pipeline

January 2016



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ALASKA GASLINE DEVELOPMENT CORP.

GAS FOR ALASKANS

Alaska's In-State Gas Pipeline

ALASKA STAND ALONE PIPELINE/*ASAP* PROJECT

Environmental Evaluation Document

001-C-22-GRD-W-0055

JANUARY 22, 2016

Alaska Gasline Development Corporation | 3201 C Street, Suite 200 | Anchorage, AK 99503 | P 907.330.6300 | F 907.330.6309 | www.agdc.us

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Alaska Gasline Development Corporation
3201 C Street, Suite 200
Anchorage, AK 99503
www.agdc.us
907-330-6300

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REVISION HISTORY

Revision	Date	Comment	Approval	
			Company Preparing Report	AGDC
1	10/17/2014	Initial DRAFT	ASAP	KS / MT
2	06/12/2015	Revised DRAFT	ASAP	KS / MT
3	10/02/2015	Preliminary Final DRAFT	ASAP	KS / MT
4	1/22/2016	Final	ASAP	KS / MT

Approved By: David Haugen, ASAP Senior Project Manager

Date: January 22, 2016

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ACRONYMS AND ABBREVIATIONS

-	not applicable
$	dollar
°F	degree Fahrenheit
µ	micron
24/7	24 Hours a Day and 7 Days a Week
ADA	Alaska Department of Administration
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOLWD	Alaska Department of Labor and Workforce Development
ADOT&PF	Alaska Department of Transportation & Public Facilities
AES	ASRC Energy Services
AFFI	Alaska Freshwater Fish Inventory
AGDC	Alaska Gasline Development Corporation
AHRS	Alaska Heritage Resources Survey
AJD	Approved Jurisdictional Determination
AK LNG	Alaska Liquefied Natural Gas
ANILCA	Alaska National Interest Lands Conservation Act
AP&T	Alaska Power and Telephone Company
APE	Area of Potential Effect
APP	Alaska Pipeline Project
ARR	Alaska Railroad
ARRC	Alaska Railroad Corporation
AS	Alaska Statue
ASAP	Alaska Stand Alone Pipeline
AWC	Anadromous Waters Catalog
BA	Biological Assessment
BACT	Best Available Control Technology
BiOp	Programmatic Biological Opinion
BLM	Bureau of Land Management
BLMRB	Big Lake Maintenance and Response Base
BPXA	BP Exploration (Alaska), Inc.
BTU	British thermal unit
C	Carbon
CARB	California Air Resources Board
CEA	Chugach Electric Association Inc.
CFR	Code of Federal Regulations
CGF	Central Gas Facility
CMT	Culturally Modified Tree
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent

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CWA	Clean Water Act
CY	cubic yard
DEIS	Draft Environmental Impact Statement
DH	Dock Head
DNP	Denali National Park
DNP	Denali National Park
DNR	Department of Natural Resources
DPS	Distinct Population Segment
EED	Environmental Evaluation Document
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENSTAR	ENSTAR Natural Gas Company
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FMRB	Fairbanks Maintenance and Response Base
FNG	Fairbanks Natural Gas LLC
FNSB	Fairbanks North Star Borough
FR	Federal Register
ft	Feet
FTE	Full-time Equivalent
gal	gallon
GCF	Gas Conditioning Facility
GCFMRB	GCF Maintenance and Response Base
GHG	Greenhouse Gas
GIS	Geographic Information System
GVEA	Golden Valley Electric Association
HAP	Hazardous Air Pollutant
HC	Hydrocarbon
HCA	High Consequence Area
HDD	Horizontal Directional Drilling
HEA	Homer Electric Association
HGM	Hydrogeomorphic
HPOI	Hydrologic Point of Interest
HSSEQ	Health, Safety, Security, Environmental, and Quality
IBA	Important Bird Area
ID	Identification
IGU	Interior Gas Utility
IHLC	Iñupiat History, Language and Culture Division
IPaC	Information, Planning, and Conservation System
ISO	International Organization for Standardization
IT	Information Technology
JAfP	Joint Application for Permit
K	Thousand
kW	kilowatt
kWh	kilowatt-hour
Lat.	Latitude
LDC	Local Distribution Company

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LEDPA	Least Environmentally Damaging Practicable Alternative
LHV	Lower Heating Value
LNG	Liquefied Natural Gas
Long.	Longitude
Lower 48	Lower Continental 48 U.S. States
LPG	Liquefied Petroleum Gas
MAA	May Adversely Affect
MAOP	Maximum Allowable Operating Pressure
max	maximum
MBJ	Michael Baker Jr., Inc.
MCF	million cubic ft
MCY	million cubic yards
MEA	Matanuska Electric Association
mi.	mile
min	Minimum
ML&P	Municipal Light and Power
MLBV	Mainline Block Valve
MLLW	mean lower low water
MMBTU	million British thermal units
MMBTU/hr	million British thermal units per hour
MMSCFD	million standard cubic ft per day (gas distribution)
MOVES	Motor Vehicle Emission Simulator
MP	Mile Post
MSB	Matanuska-Susitna Borough
MTRS	Meridian, Township, Range, Section
MW	megawatt
N	Nitrogen
NAM	No Adverse Modification
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGL	Natural Gas Liquids
NGLEP	Natural Gas Liquid Extraction Plant
NHPA	National Historic Preservation Act
NLAA	Not Likely to Adversely Affect
NLAM	Not Likely to Adversely Modify
NLCD	National Land Cover Dataset
NLJE	Not Likely to Jeopardize Existence
NMFS	National Marine Fisheries Service
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen Oxides
NPR-A	National Petroleum Reserve - Alaska
NSB	North Slope Borough
NSPS	New Source Performance Standard
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O&M	Operations and Maintenance
Off-ROW	Off Right-of-Way

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OHA	Office History and Archaeology
P	Phosphorus
PA	Programmatic Agreement
PBU	Prudhoe Bay Unit
PCE	Power Cost Equalization
Perm.	Permanent
PHMSA	Pipeline and Hazardous Materials Safety Administration
PL	Public Law
PLO	Public Land Order
PM	Particulate Matter
PM_{10}	Particulate Matter of 10 µ in diameter or smaller
$PM_{2.5}$	Particulate Matter of 2.5 µ in diameter or smaller
POA	Port of Anchorage
POD	Plan of Development
POS	Port of Seward
ppt	part per trillion
Project	ASAP Project
PSD	Prevention of Significant Deterioration
psig	pound per square inch gauge
PSY	Pipe Storage Yard
Pt.	Point
QA/QC	Quality Assessment/Quality Control
RCA	Regulatory Commission of Alaska
REAA	Regional Educational Attendance Area
RMP	Risk Management Plan
ROI	Region of Interest
ROW	Right-of-Way
RS	Revised Statute
Sag	Sagavanirktok
SB	Senate Bill
SEIS	Supplemental Environmental Impact Statement
SES	Seward Electrical Association
SF	square foot
SGR	State Game Refuge
SHPO	State Historical Preservation Office
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOA	State of Alaska
Southcentral	Southcentral Region
SPCO	State Pipeline Coordinator's Office
SPMT	Self-propelled Modular Transporter
SRA	State Recreation Area
s/tons	short tons
stpy	short tons per year
TAPS	Trans-Alaska Pipeline System
TBD	To Be Determined
TCE	Temporary Construction Easement
Temp.	Temperature

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TEWS	Temporary Extra Workspace
TLUI	Traditional Land Use Inventory
TVSF	Tanana Valley State Forest
U.S.	United States
ULSD	Ultra-low-sulfur Diesel
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V6	ASAP Pipeline Alignment, Version 6
VOC	Volatile Organic Compound
Vol.	Volume
VRM	Visual Resource Management
VSM	Vertical Support Member
WDPS	Western Distinct Population Segment
WOUS	Waters of the United States
WT	Wall Thickness

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Attachment 8. Aquatic Site Assessment

Attachment 9. ADF&G Research Report: 2015 Stream Surveys SF2015-228

Attachment 10. Access Road Habitat Assessment and Fish Study: 2015 Fish Resource Permit SF2015-212 Research Report

Attachment 11. Pipeline Stream Crossing Construction Mode Determination

Attachment 12. Senate Bill 70 - Gas Pipeline Right-of-Way, Parks, and State Recreation Areas

Attachment 13. Interactive Map Viewer User Guide

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1. INTRODUCTION

On December 4, 2009, the U.S. Army Corps of Engineers (USACE), Alaska District initiated the National Environmental Policy Act (NEPA) process for the Alaska Stand Alone Pipeline (ASAP) Project. A Draft Environmental Impact Statement (DEIS) was issued on January 20, 2012 prior to the Final Environmental Impact Statement (FEIS) being issued on October 9, 2012 (USACE, 2012). The FEIS examined the potential impacts of construction and operation of a proposed natural gas pipeline from the North Slope of Alaska to Fairbanks and the Cook Inlet area.

Since the publication of the FEIS, the Alaska Gasline Development Corporation (AGDC) has proposed revisions to the ASAP Project based on several design improvements that will increase efficiency, make gas more accessible or affordable, and reduce environmental impact. AGDC submitted a revised Joint Application for Permit (JAfP) under the USACE jurisdictional authority pursuant to Section 404 of the Clean Water Act (CWA) (33 U.S. Code [USC] 1344) and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC 403) (AGDC, 2015a). AGDC previously provided the USACE with ASAP's Plan of Development (POD) (AGDC, 2015b; 2014). The USACE and the Applicant (AGDC) have initiated the Supplemental Environmental Impact Statement (SEIS) process to evaluate the proposed changes to the ASAP Project. The SEIS is intended to fulfill NEPA compliance responsibilities for the USACE and cooperating agencies.

1.1 PURPOSE OF THIS DOCUMENT

This Environmental Evaluation Document (EED) was prepared by ASAP's Environmental, Regulatory, and Lands division to identify the changes to expected environmental impacts resulting from the most recent ASAP Project design. The EED provides updated engineering design and environmental information, including a revised alignment and project footprint, as well as new baseline environmental data and changes to the federal, state, and local regulatory settings. The EED uses the revised design and additional environmental information to evaluate the change in expected impacts to the physical, biological, and human environment.

The EED's purpose is to identify and evaluate environmental impacts associated with revisions to the ASAP Project. Specifically, this document reports changes in the type and degree of impact between the Project described in the published FEIS (USACE, 2012) and the Project proposed in the revised JAfP (404/10) submitted to the USACE (AGDC, 2015a). This document has been prepared to supplement information provided in the FEIS, to evaluate changes in impacts to the affected environment and environmental consequences through the use of quantitative and qualitative analyses. Many of the refinements to the pipeline route and project footprint included in this EED address comments and recommendations referenced in the USACE's ASAP SEIS Public Scoping Report (USACE, 2014).

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1.2 PURPOSE AND NEED FOR ASAP

The ASAP Project's purpose and need have not changed. The purpose and need of the Project have remained consistent since its inception. The ASAP Project will deliver North Slope natural gas to Fairbanks, Southcentral, and other communities in Alaska. The Project will provide Alaskans with a stable, affordable, long-term supply of natural gas for heating and powering their homes and businesses.

The purpose of the AGDC, the Projet sponsor, is established in Alaska Statute (AS) 31.25.005, which states that the Corporation shall, for the benefit of the state, to the fullest extent possible:

> *…develop and have primary responsibility for developing natural gas pipelines…and other transportation mechanisms to deliver natural gas in-state for the maximum benefit of the people of the state;*
>
> *when developing natural gas pipelines…and other transportation mechanisms to deliver natural gas in-state, provide economic benefits in the state and revenue to the state;*
>
> *assist the Department of Natural Resources and the Department of Revenue to maximize the value of the state's royalty natural gas, natural gas delivered to the state as payment of tax, and other natural gas received by the state;*
>
> *advance an in-state natural gas pipeline…in a safe, prudent, economical, and efficient manner, for the purpose of making natural gas…available to Fairbanks, the Southcentral region of the state, and other communities in the state at the lowest rates possible;*
>
> *…endeavor to develop natural gas pipelines …to deliver natural gas…to public utility and industrial customers in areas of the state to which the natural gas…may be delivered at commercially reasonable rates; and*
>
> *endeavor to develop natural gas pipelines …that offer commercially reasonable rates for shippers and access for shippers who produce natural gas…*

The ASAP Project helps meet the statewide demand for improved access to an energy source that is clean, reliable, and affordable. These demands have intensified to such a level in the Fairbanks area that an interim plan exists to provide some Fairbanks North Star Borough (FNSB) communities with Liquefied Natural Gas (LNG) by truck until an in-state gas pipeline can be developed (AS 44.88.010(a)). Furthermore, Southcentral's energy infrastructure relies almost entirely on natural gas, with three of four residents using it to heat and power their homes and businesses. The Cook Inlet Basin is currently the sole source of natural gas consumed in the Railbelt, but production has generally declined over the past decade, as reported in the Alaska Department of Administration's Alaska Oil and Gas Conservation Commission Monthly Production Reports (ADA, 2014). Existing

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natural gas demands could fail to be met in Southcentral by as early as 2018[1]. Although recent drilling and development activity has occurred in Cook Inlet, new wells remain unproven and may not satisfy the long-term energy demands for residential and commercial use. The ASAP project can supplement or replace the natural gas currently provided by these fields.

Natural gas will help to improve air quality in the Fairbanks area, which is adversely affected by widespread combustion of wood and coal. Fairbanks is currently classified as an air quality Non-attainment Area by the Alaska Department of Environmental Conservation (ADEC) and the U.S. Environmental Protection Agency (USEPA). The Fairbanks air quality Non-attainment is described in detail in documents provided on the ADEC Division of Air Quality website: http://dec.alaska.gov/air/pm2-5_ak.htm. Infrastructure for local gas distribution is currently being developed in and around Fairbanks, and a reliable supply of natural gas will result in cleaner air, as well as more affordable heating and electric power generation.

The ASAP Project will address these needs by providing up to 500 million standard cubic ft per day (MMSCFD) of natural gas from North Slope gas reserves to in-state markets; thereby meeting current and projected future in-state energy demands (AGDC, 2014; Northern Economics, Inc., 2010), as well as helping to improve air quality in the Fairbanks area. Since the ASAP Project will transport natural gas, it will be accessible to communities adjacent to the line that choose to tap into it and develop the required infrastructure for its use. The Project will make expansion of commercial and industrial enterprises possible statewide. It will also provide a substantial number of jobs to Alaskans and economic benefit to the State of Alaska (SOA) through royalties. A stable and reliable supply of natural gas is needed to meet the current and future demand of 500 MMSCFD as follows:

- 200 MMSCFD – Cook Inlet area current demand
- 50 MMSCFD – Cook Inlet area future demand (2030)
- 30 MMSCFD – Fairbanks area future demand (2030)
- 220 MMSCFD – Future commercial and industrial use

The public benefit of the ASAP Project is the potential for delivery of a long-term, reasonably priced supply of natural gas to Southcentral, Fairbanks, and other Alaskan communities for:

- Heating homes, public safety facilities, military bases, and businesses
- Generating electrical energy
- Continuing economic stability and growth by supporting industrial users

[1] 2018 is the first year when gas supply needs for electric utilities and ENSTAR Natural Gas Company (ENSTAR) are not secured by gas purchase contracts in their entirety; whereas, utilities have historically held much longer-term gas supply contracts (10 to 20 years)

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- Accommodating future population growth and increased commercial usage served by the existing ENSTAR's distribution system, and for the Fairbanks–North Pole area and other Railbelt communities
- Improving air quality in the Fairbanks area, which is currently classified as an air quality Non-attainment Area by ADEC and USEPA (see the ADEC Division of Air Quality website: https://dec.alaska.gov/air/PM2-5_AK.htm).
- Promoting Compressed Natural Gas (CNG) as a substitute for gasoline and diesel fuel used by cars and trucks in Fairbanks; for use by communities along the Parks Highway, including tour buses in Denali National Park (DNP); and for use by Anchorage and communities on the Kenai Peninsula
- Providing CNG for distribution to rural Alaska communities via the Yukon and Tanana Rivers and marine barges from Cook Inlet
- Facilitating the development of infrastructure to allow more economic development of mining and oil and gas projects

The geographic majority of Alaska has no long-term source of fuel other than heating oil. Alaska's North Slope has over 30 trillion cubic ft of conventional natural gas reserves. A pipeline is the safest and most efficient way to transfer this energy source and develop it for the maximum benefit of Alaskans. Failed proposals to commercialize Alaska's natural gas reserves have frustrated Alaskans for decades. The economic and commercial conditions have simply never materialized to allow those proposals to advance beyond the feasibility stage. AGDC's Proposed Action meets the goal of providing a stable, long-term supply of clean, affordable energy to both developed and developing markets within Alaska, including Southcentral, Fairbanks, and the Railbelt.

Community, commercial, and industrial development in interior Alaska could be facilitated with a reliable supply of natural gas. ASAP is expected to provide jobs, new business opportunities, and tax revenues for Alaska. Through the ASAP Project, new jobs will become available during both the construction and operational phases. The ASAP pipeline will also provide a clean and affordable energy source that is accessible to residents, businesses, government entities, and natural resource development projects throughout Alaska. The ASAP Project, moreover, continues to refine alignment information so as to minimize and avoid environmental impacts where practicable.

1.3 INTERACTIVE MAP VIEWER

The Alaska Stand Alone Pipeline (ASAP) Interactive Map Viewer is designed to provide the general public with the Project's geographic footprint and design components so that impacts associated with construction and operation of the pipeline can be visualized. The Interactive Map Viewer overlays the entire pipeline route and associated ancillary facilities on aerial photography or topographic maps. It integrates information pertaining to nearby communities, rights-of-way, land status, and wetlands with visual representations of land and waterways. The Map Viewer's accompanying User Guide provides instructions for operation, navigation, and interpretation of symbols and map features (Attachment 13). It can be accessed from AGDC's website (http://asapgas.agdc.us/interactivemap.html) or from the USACE's ASAP SEIS website (http://www.asapeis.com/).

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1.4 SUPPORTING PROJECT DOCUMENTS

ASAP Project documents containing historical and revised engineering design information, routing information, and other details are provided on the Project's website (http://www.asapeis.com/docs.html) and the AGDC website (http://asapgas.agdc.us). Documents pertinent to this EED include:

1. Alaska Gasline Development Corporation (AGDC). 2015a. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.
2. AGDC. 2015b. *Addendum to the 2014 Plan of Development*. October 2015.
3. AGDC. 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.
4. U.S. Army Corps of Engineers (USACE). 2014. *Alaska Stand-Alone Pipeline Project Supplemental Environmental Impact Statement Public Scoping Report*. http://www.asa-peis.com/docs.html. Accessed January 27, 2015.
5. USACE. 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.
6. U.S. Environmental Protection Agency (USEPA). August 18, 2008. *Notice of Intent to designate a portion of the Fairbanks North Star Borough as nonattainment*. (ADEC website http//dec.alaska.gov/air/PM2-5_AK.htm).
7. AGDC. 2016. *Interactive Map Viewer and User Guide*. Web Access at http://asap-gas.agdc.us/interactivemap.html.

Several supporting project documents are attached to this EED for reference. This includes the following:

Attachment 1. Alaska Stand Alone Pipeline Map Book

Attachment 2. State of Alaska Right-of-Way Lease for the Alaska Stand Alone Pipeline – Exhibit A (Stipulations)

Attachment 3. West Dock Dredge and Disposal Plan

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Attachment 10. Access Road Habitat Assessment and Fish Study: 2015 Fish Resource Permit SF2015-212 Research Report

Attachment 11. Pipeline Stream Crossing Construction Mode Determination

Attachment 12. Senate Bill 70 - Gas Pipeline Right-of-Way, Parks, and State Recreation Areas

Attachment 13. Interactive Map Viewer User Guide

1.5 AVOIDANCE AND MINIMIZATION OF IMPACTS

Since the development and publication of the FEIS, continuing refinements have been made to the ASAP pipeline alignment and configuration of off-right-of-way facilities. The June 29, 2011 State of Alaska Right-of-Way Lease for the Alaska Stand Alone Gas Pipeline/ASAP includes a comprehensive list of stipulations (Attachment 2) that require additional plans, procedures, and best management practices to avoid and minimize environmental impacts. The avoidance and minimization of impacts have been key considerations, particularly for wetlands, streams, fish, terrestrial and marine wildlife, threatened and endangered species, subsistence resources, cultural resources, reliability and safety and cumulative effects (see supporting documents and the Project's mitigation statement in AGDC, 2015a). The current design configuration reflects many of these important considerations. The AGDC will continue to refine the project design as more detailed engineering information becomes available to further avoid and minimize impacts.

1.6 REFERENCES

Alaska Department of Administration (ADA). 2014. Alaska Oil and Gas Conservation Commission Monthly Production Reports.

Alaska Gasline Development Corporation (AGDC). 2016. *Interactive Map Viewer and User Guide*. Web Access at http://asapgas.agdc.us/interactivemap.html.

AGDC. 2015a. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

AGDC. 2015b. *Addendum to the 2014 ASAP Plan of Development*. October 2015.

AGDC . 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

Northern Economics Inc. 2010. *In-state Gas Demand Study*. Vol. 1. Prepared for TransCanada Alaska Co. LLC. January.

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USACE. 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

U.S. Environmental Protection Agency. August 18, 2008. *Notice of Intent to designate a portion of the Fairbanks North Star Borough as nonattainment*. (ADEC website http//dec.alaska.gov/air/PM2-5_AK.htm).

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2. PROJECT DESCRIPTION AND REVISIONS

2.1 CURRENT PROJECT OVERVIEW

The Alaska Stand Alone Pipeline (ASAP) Project comprises a Gas Conditioning Facility (GCF) near Prudhoe Bay capable of producing an annual average of 500 million standard cubic ft per day (MMscfd) of natural gas; a buried, 36-inch, 733-mile-long, 1,480-pound per square inch gauge (psig) buried natural gas pipeline connecting the GCF to the existing ENSTAR Natural Gas Company (ENSTAR) pipeline system in the Matanuska-Susitna Borough (MSB); a buried, 12-inch, 30-mile-long, 1,480-psig, lateral line connecting the Mainline to Fairbanks; and associated facilities. The pipeline system will be designed to transport natural gas that will be accessible to and useable by communities, government entities, and natural resource development projects.

The proposed pipeline will typically be buried with a minimum cover of 30 inches and a bottom-of-ditch depth of 6 to 8ft, except at fault crossings, elevated bridge stream crossings, pigging facilities, and block valve locations. The ASAP route will generally parallel the Trans-Alaska Pipeline System (TAPS) and Dalton Highway corridor to near Livengood, northwest of Fairbanks. At Livengood, the route will continue south, to the west of Fairbanks and Nenana. The pipeline will bypass Denali National Park (DNP) to the east and will then generally parallel the Parks Highway corridor to Willow, continuing south to its connection with ENSTAR's distribution system at Mile Post (MP) 39 of the Beluga Pipeline, southwest of Big Lake (Figure 2-1). The Fairbanks Lateral tie-in will be located approximately 2.5 miles south of the Mainline Chatanika River crossing at MP 440 of the Mainline. From the tie-in, the Fairbanks Lateral pipeline will traverse east, following the Murphy Dome and Old Murphy Dome Roads, and then extending southeast into Fairbanks (Figure 2-2).

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Figure 2-1 Alaska Stand Alone Pipeline Route

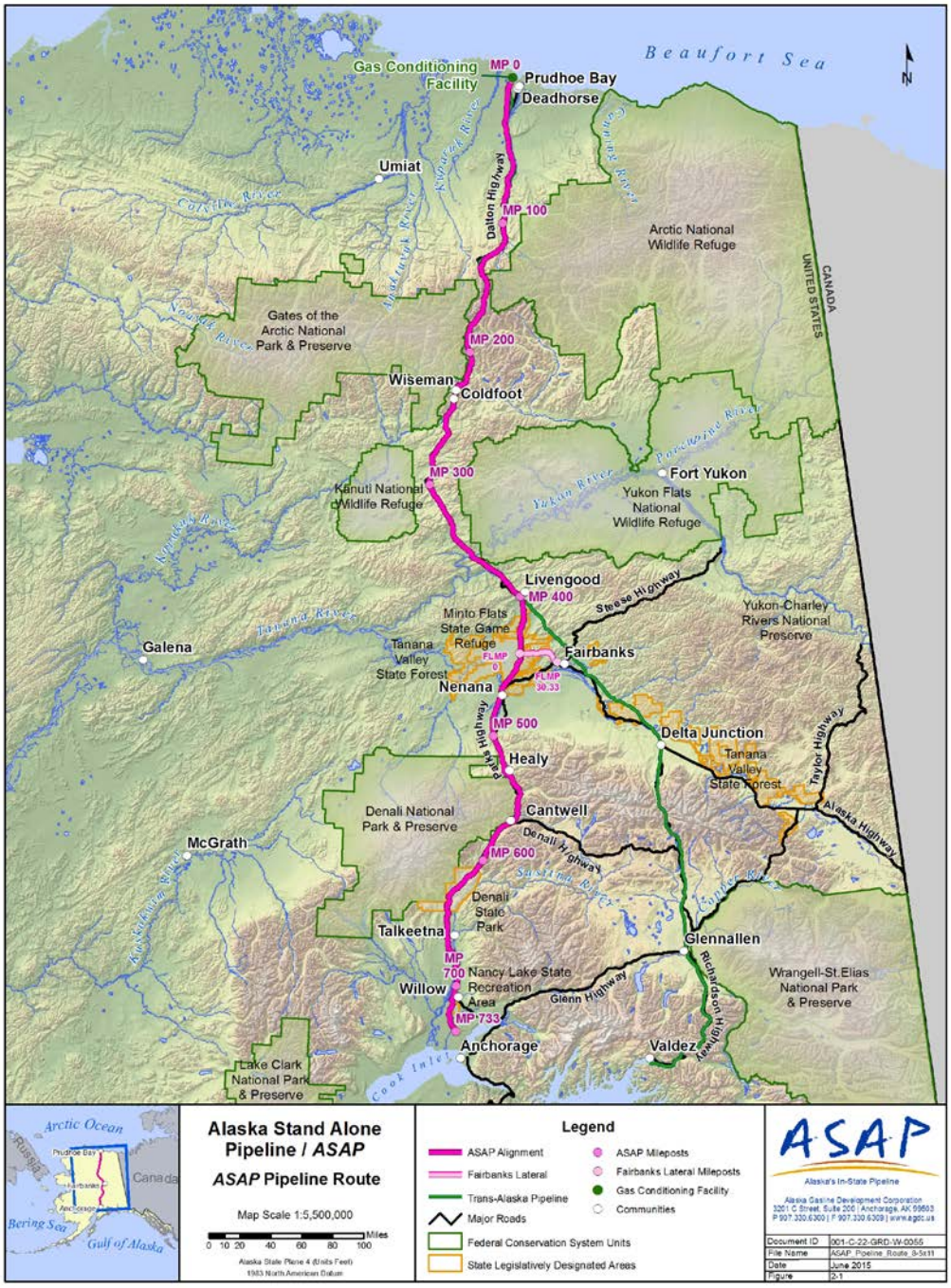

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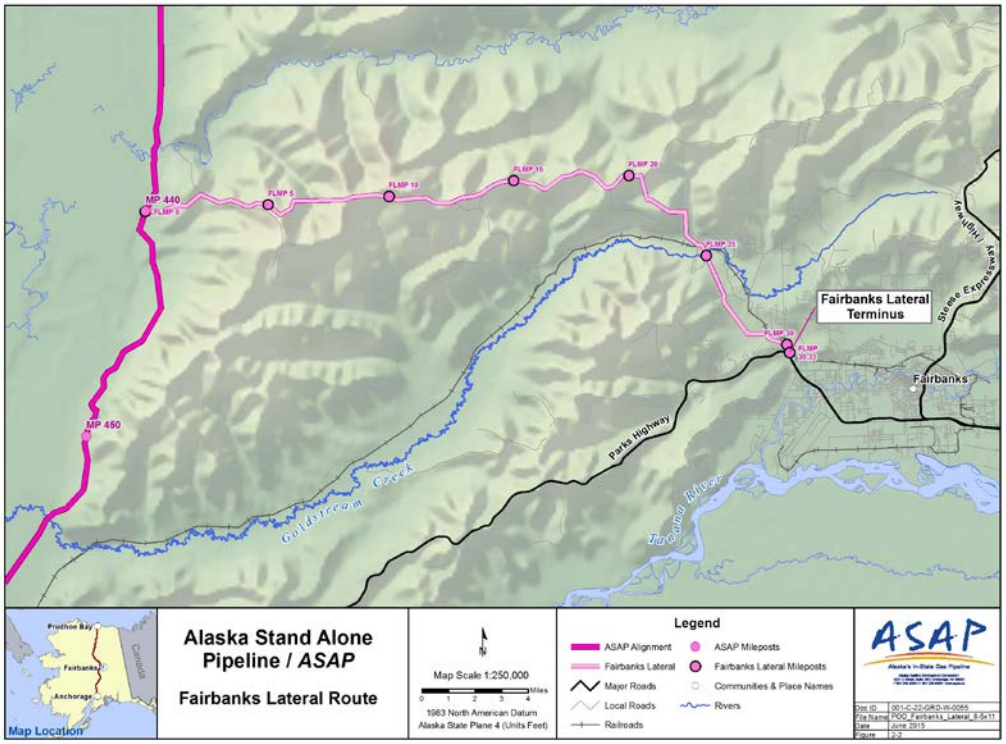
Figure 2-2 Fairbanks Lateral Route



Since the publication of the FEIS (USACE, 2012), changes to the ASAP conceptual design have occurred, and several smaller design refinements have been incorporated into the Project (AGDC, 2015). These conceptual design changes and design refinements are summarized in Table 2-1, below.

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Table 2-1 Summary of ASAP Conceptual Design Changes and Design Refinements

Item	FEIS (USACE, 2012)	Joint Application for Permit (AGDC, 2015)
Conceptual Design Changes		
Gas Composition	**Enriched Natural Gas:** • Contains Natural Gas Liquids (NGLs) • Requires higher-pressure, dense-phase gas pipeline (2,500 psig Maximum Allowable Operating Pressure (MAOP)) • Requires multiple compressor stations • Requires NGL extraction facility to make gas accessible	**Lean Natural Gas (non-enriched):** • 89 mole % methane; No NGLs • Lower pressure pipeline (1,480 psig MAOP) • Transport of preconditioned gas for general use • Does not require additional facilities to make gas accessible
West Dock at Prudhoe Bay	**Modification Undefined:** • 9-barge sealift importing GCF components and materials • Build facility from smaller modular components onsite • Use of West Dock without additional dredging (assumed BPXA would dredge under its permit)	**Modification Defined:** • 23-barge sealift importing prefabricated modules • Winter dredging of a navigation channel and turn basin at West Dock • Nearshore disposal of dredge material on bottomfast sea ice in Prudhoe Bay, landward of Territorial Sea Boundary • Modification to DH3 berths and widening of the causeway road • Temporary bridge composed of two ballasted barges to facilitate offload and transport of large modules (bypass of weight-limited causeway bridge)
Design Refinements		
GCF-CGF Connection	• Two feeder lines (natural gas and NGL) and two return lines (undefined diameter) • Connecting lines were described as a Connected Action • Four lines supported on 17 Vertical Support Members (VSMs) spaced 60 ft apart; approximately 1k ft of line required	• One natural gas feeder line, one 8-inch CO_2 return line, one 3-inch liquid return line, and an interface module • Design has advanced to allow connecting lines to be assimilated into the Project Description • Three lines supported on 171 VSMs, spaced 25 ft apart; approximately 4,200 ft of line required
Mainline Characteristics	• 737 miles • 24-inch diameter • 2,500 pounds per square inch gage (psig) • Right-of-Way corridor, as follows: o Construction: A 100-foot-wide ROW, nominally, for the full length of the pipeline (9.5k acres; includes operational footprint) o Operation and Maintenance: 52-foot-wide ROW on federal lands, and 30-foot-wide ROW elsewhere for the full length of the pipeline (3.3k acres) • Coating and double-jointing in Fairbanks • First 7 miles aboveground; remainder belowground • 29 Mainline Block Valves (MLBVs) • Topsoil layer stripped and replaced when possible	• 733 miles (difference of about -4 miles) • 36-inch diameter • 1,480 psig • Right-of-Way corridor, as follows: o Construction: variable width, 120 ft-wide minimum temporary ROW, plus additional lands out to 350 ft to construct o Operation and Maintenance: A 53 ft-wide minimum permanent ROW, plus additional lands out to 350 ft to maintain land • Coating and double-jointing prior to arrival in Alaska • Buried along entire route, except at elevated bridge crossings, fault crossings, pigging facilities, and valves • 40 MLBVs (location changes) • Topsoil layer stripped; replaced only on agricultural lands • Pipeline largely outside of existing ROWs; alignment shifts include North Slope, Minto

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Item	FEIS (USACE, 2012)	Joint Application for Permit (AGDC, 2015)
	• Pipeline generally within existing transportation corridor ROWs	Flats / Summer Ridge, Anderson / Clear, and Nancy Lake State Recreation Area
Fairbanks Lateral Characteristics	• 34 miles • Routed through Goldstream Valley along the ARR route • 2 Fairbanks Lateral block valves • ROW corridor as follows: o Construction: A 100-foot-wide ROW, nominally, for the full length of the pipeline (0.4k acres; includes operational footprint) o Operation and Maintenance: A 52-foot-wide ROW on federal lands, and 30-foot-wide elsewhere for the full length of the pipeline (0.1k acres)	• 30 miles (difference of about -4 miles) • Routed along Murphy Dome and Old Murphy Dome Roads • 1 Fairbanks Lateral block valve • ROW corridor, as follows: o Construction: variable width, 100 ft-wide minimum temporary ROW, plus additional lands out to 350 ft to construct o Operation and Maintenance: 30 ft-wide minimum permanent ROW, plus additional lands out to 350 ft to maintain land
Support Facilities	• GCF (69 acres for GCF pad; additional GCF facilities undefined in acreage) • Multiple compressor stations • Straddle Plant at Fairbanks Lateral • NGL extraction facility at Pt. Mackenzie	• GCF Facility Pad & Workspace: 90.6 acres • GCF Camp: 20.2 acres • Compression incorporated into GCF
Stream Crossings[a]	Total Defined Stream Crossings: 515 • Total anadromous waterbodies: 75 • Preferred Alternative for Yukon River Crossing: New Suspension Bridge • Crossing methods: o Horizontal Directional Drilling (HDD) (also called Trenchless Drilling): 41 o Open Cut / Isolated Open Cut: 470 o Bridge: 4 • Access road stream crossings not yet defined	Total Project Stream Crossings: 312 • Centerline Stream Crossings: 272 o 265 Mainline crossings - 50 anadromous - Crossing Modes: ▪ Bridge: 6 ▪ Isolated Open Cut: 155 ▪ Open Cut: 97 ▪ HDD: 7 o 7 Fairbanks Lateral crossings - 0 anadromous - Crossing Modes: ▪ Open Cut: 3 ▪ Isolated Open Cut: 4 • Access Road Stream Crossings: 40 o 14 anadromous o Access Road Crossing Modes - 17 Bridges ▪ 14 Temporary ▪ 3 Permanent - 23 Culverts ▪ 4 Temporary ▪ 19 Permanent
Material Sites and Volume[b]	• 546 existing potential sites • 13.1 Million Cubic Yards (MCY) required for preliminary features and facilities that were defined; expectation that this number will increase as features became defined / quantified	• 91 total material sites required o Development of 89 material sites - Use and expansion of existing sites - Development of new sites - Total of 5,200 acres of lands used for material sites; primarily uplands o Use of 2 existing commercial sites; near Willow and Fairbanks

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Item	FEIS (USACE, 2012)	Joint Application for Permit (AGDC, 2015)
		• Approximately 25 MCY of material needed from gravel sources, project-wide.
Pipe Storage Yards	• 26 PSY locations	• 29 PSY locations
Construction Camps and Workforce [b]	• 15 camp locations (camp capacities in parentheses, if available), including: o Prudhoe Bay o Franklin Bluffs (500) o Happy Valley (500) o Galbraith Lake (500) o Atigun (250) o Chandler (500) o Coldfoot (500) o Old Man (500) o Seven Mile (500) o Livengood (500) o Nenana (500) o Healy (500) o Cantwell (500) o Chulitna Butte (500) o Sunshine (500) • Total camp capacity: 6,750 + Prudhoe Bay (undetermined) o Mainline Construction: 5,500 employees o GCF Construction: 900 employees o Operations: 50-75 employees	• 13 camp locations (camp capacities in parentheses): o GCF/Prudhoe Bay (800) o Franklin Bluffs (600) o Happy Valley (1,000) o Galbraith Lake (1,000) o Dietrich (1,000) o Prospect (600) o Five Mile (1,000) o Livengood (1,000) o Dunbar (600) o Healy (1,000) o Cantwell (600) o Swan Lake (1,000) o Rustic Wilderness (1,000) • Total camp capacity: 11,200 • Mainline Construction: 6,000 employees or contractors at peak construction • GCF Construction: 130+ employees and additional contractors • Operations: 240 employees or contractors • Most camps collocated with a PSY location
Access Roads [b]	• 133 access roads; additional roads not yet defined or quantified in acreage • 91 new roads; additional roads not yet defined or quantified in acreage • 42 existing roads; additional roads not yet defined or quantified in acreage	• 298 new access roads totaling 174.4 miles • 23 temporary ice access roads totaling 22.9 miles
Additional Infrastructure and Facilities	• Not yet determined	• 8 sets of HDD Entry Pads (1.4 acres), Exit Pads (0.5 acres), and False ROWs • Pig Launchers and Receivers o 36" Launcher at GCF o 36" Launcher / Receiver at Coldfoot o 36" Launcher / Receiver at Mainline / Lateral Tie-in o 36" Receiver at Mainline / ENSTAR Tie-in at Big Lake o 12" Launcher at Mainline / Lateral Tie-in o 12" Receiver at Lateral Offtake • 70 Temporary Workspaces (TWs) totaling 74.9 acres (size range of 0.3 to 1.5 acres; TW ROW width out to 800 ft max. width) o 29 TWs partially or fully outside permanent impact areas (57.8 acres) o 41 TWs inside permanent impact areas (17.1 acres) • 9 Rail Sidings • 2 metering stations with terminus facilities o Mainline tie-in at Big Lake o Fairbanks Lateral Terminus at Fairbanks • 2 Marshalling Yards

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Item	FEIS (USACE, 2012)	Joint Application for Permit (AGDC, 2015)
		o Seward o Fairbanks • 3 Operations & Maintenance Response Bases (MRBs) o GCF MRB o Fairbanks MRB o Big Lake MRB • ASAP Headquarters o Anchorage Offices
Transportation and Equipment [b]	• 3,800 rail cars of pipe • 9,000 truckloads of pipe • Standard pipeline construction equipment list	• 6,000 rail cars of pipe • 17,700 truckloads of pipe • Revised equipment list
Project Footprint [b]	**Project Footprint & Impacts Developing** • Permanent Land Impacts For Facilities that were Defined and Quantified at that time: 4.1k acres • Additional Temporary Land Impacts for Facilities Defined and Quantified at that time: 10.9k acres[c] • Note: Material Site Investigation Areas and other facilities not yet defined at that time	**Project Footprint & Impacts Defined** **Wetlands Impacts: 8,907.0 acres** • **Freshwater Wetlands: 8,734.6 acres** o Permanent Impact: 7,573.2 acres o Temporary Impact: 1,161.4 acres o Includes PEM, PSS, PFO, Pond, Lake, Intermittent, Perennial streams • **Intertidal Wetlands: 0.9 acres** o Permanent Impact: 0.8 acres o Temporary Impact: 0.1 acres • **Subtidal Wetlands: 171.5 acres** o Permanent Impact: 171.5 acres o Temporary Impact: 0.0 acres **Upland Impacts:12,330.3 acres** **Total Project Footprint: 21,237.3 acres**

Notes:

a. In addition to the stream crossings identified, ASAP Project engineers and scientists have identified several hydrologic points of interest that, while not meeting the wetlands standard for a stream, do require special consideration for pipeline design

b. The FEIS (USACE, 2012) acknowledged that 2012 information related to these categories was preliminary as some specific components of the Project were developing; current data estimates are more accurate due to project refinement. Area calculations were summarized from geospatial data from the FEIS Geodatabase developed by CardnoEntrix in 2012.

c. The temporary impact defined in the FEIS (USACE, 2012) includes some operational footprint acreage; therefore, some of the FEIS operational impact was also tallied as temporary impact.

ARR - Alaska Railroad
BPXA - British Petroleum Exploration Alaska
CGF - Central Gas Facility
CO_2 - carbon dioxide
DH - Dock Head
GCF - Gas Conditioning Facility
GIS - Geographic Information System
HDD - Horizontal Directionally Drilled
MAOP - maximum allowable operating pressure
MCY - million cubic yards
MLBV - Mainline block valve
NGL - natural gas liquid

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Item	FEIS (USACE, 2012)	Joint Application for Permit (AGDC, 2015)
PEM - palustrine emergent wetland PFO - palustrine forested wetland psig - pounds per square inch gauge PSS - palustrine shrub wetland PSY - pipe storage yard ROW - Right-of-Way VSM - vertical support member		

The same Project design components used in the ASAP 2015 JAfP (AGDC, 2015) were used to analyze and assess impacts in this document. These components are provided in Table 2-2, below.

2.2 GAS COMPOSITION

Table 2-2 describes the chemical composition of natural gas capable of being transported in the revised design. The natural gas is a leaner composition than the enriched gas described in the FEIS (USACE, 2012) in that it doesn't contain high concentrations of the heavier hydrocarbons or NGLs. The lean gas has a composition of approximately 89 mole % methane and will be compatible with the ENSTAR distribution network. It will be accessible to the public without need for costly processing facilities. This is in contrast to an enriched gas scenario in which gas having a higher concentrations of the heavier hydrocarbons would be transported under a much higher pressure, and requiring additional processing facilities to remove them to make the gas useful for the general public. The ASAP Project does not include any local distribution infrastructure.

Table 2-2 Chemical Composition of Gas to be Transported

GAS COMPOSITION	CGF RESIDUE (MOLE %)	PIPELINE GAS AFTER CONDITIONING (MOLE %)
CO_2	12.00	**2.75**
Nitrogen	0.60	**0.67**
Methane	80.13	**88.78**
Ethane	5.35	**5.85**
Propane	1.65	**1.69**
I-butane	0.08	**0.08**
N-butane	0.13	**0.12**
Pentanes +	0.06	**0.06**
Total	100.00	**100.00**
CGF = Central Gas Facility		

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2.3 USE OF WEST DOCK AT PRUDHOE BAY

The GCF will be constructed from 53 prefabricated modules that will be delivered to West Dock in Prudhoe Bay on twenty-three barges in a single-year sealift (Attachment 3). The barges will arrive at a marine marshalling area 3-5 miles offshore from West Dock in two separate groups. Barges will be assisted by shallow-draft tugs into a navigational channel leading up to Dock Head 3, which will accommodate simultaneous offloading of up to three barges. The navigational channel will have been dredged to -9 ft below mean lower low water (MLLW) the previous winter, as the barges will have a maximum payload of 5,500 short tons (s/tons) and a maximum draft of 7.6 ft. Disposal of dredge material will have occurred on bottomfast ice in the nearshore environment in southern Prudhoe Bay. A temporary bridge will be constructed through the use of two barges in the fleet to allow self-propelled modular transporters (SPMTs) to bypass an existing weight-limited bridge spanning the 650 ft gap in the causeway.

Upgrades to dock and causeway infrastructure will be required and will occur primarily in winter. One of the existing dock ramps will be raised to 25 ft to accommodate a taller barge sideshell height, while the other two will remain at a height of 20 ft. Portions of the causeway road will be widened to 60 ft to accommodate module transport. Sheet piling and gravel will be used to develop abutments that will connect the temporary bridge to each side of the causeway gap. Mooring dolphins will be inserted the winter before the sealift to help stabilize the barge bridge.

The first two barges to offload modules at Dock Head 3 will be used in construction of the temporary bridge to facilitate transport of modules off of the causeway. These barges will be moved into place against the mooring dolphins, where they will be ballasted and fastened to the causeway abutments and each other. Ramps will be installed to accommodate smooth transport of the SPMTs over the bridge. Modules will be transported by SPMTs down the causeway and over the temporary bridge to a staging pad at the base of West Dock. From there, they will be moved south over approximately 6 miles of new and existing roads to the GCF construction area and permanent location.

Barges will be demobilized following offload. West Dock modifications will be left in place at the conclusion of module offload, as their removal would result in greater disturbance to the surrounding environment. Mooring dolphin beams will be cut below the sediment surface and removed, and then covered with surrounding sediment.

More specific details of dredging, disposal, dock and causeway construction, and module offload are provided in ASAP's West Dock Dredge and Disposal Plan (Attachment 3). The attachments to this plan describe the screening and selection process for use of West Dock, including rationale for movement away from ASAP's previous plan described in the FEIS of barging in materials and stick-building the GCF on-site. Guidelines for dredge material evaluation are provided in the 2015 Dredged Material Evaluation and Disposal Procedures User Manual, prepared by the Dredged Material Management Office, US Army Corps of Engineers, Seattle District (USACE, 2015).

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2.4 GAS CONDITIONING FACILITY AND CONNECTING LINES

The GCF and an associated workspace will be constructed from modules on a 90.6 acre gravel pad, approximately 1 mile west of the existing Central Gas Facility and five miles south of West Dock. An additional pad area for the GCF camp will require a 20.2 acre pad that will be constructed nearby the GCF. Each GCF module will have a structural steel base and will be mounted on piles driven through the gravel pad. Modules containing process and utility equipment will generally be enclosed and heated during the Operations and Maintenance phase of the Project. Modules will be connected by utilidor modules that provide an enclosed, heated walkway for personnel and small utility trailers, as well as freeze and weather protection for interconnecting utilities and piping.

Site preparation is expected to be completed using gravel from sources in close proximity to the GCF. The GCF will require a construction camp, since lodging facilities in the area cannot accommodate the increased labor force required for GCF construction. The temporary construction camp will be dismantled and removed following completion of GCF construction, commissioning, and startup. A GCF Maintenance and Response Base (MRB) will be developed at the time of GCF construction to house workers and will remain on the site permanently.

Natural gas will be transported from the existing Central Gas Facility to the GCF through the use of a 36-inch, 4,200 ft above-ground transmission pipeline. The transmission line will be supported by vertical support members (VSMs) set 25 ft apart at a height that will allow at least 7ft of clearance beneath it for wildlife passage. The resulting cumulative footprint from the estimated 171 VSMs will be 839 square feet (SF). An 8-inch CO_2 return line and a 3-inch liquid return line will be supported on the same set of VSMs to return wastes to the Central Gas Facility. These connecting lines were not well-defined in the FEIS where they were evaluated as a Connected Action (USACE, 2012), and at that time a natural gas liquids (NGL) supply line was also expected. The Project has progressed since that time with the elimination of NGLs and an associated NGL supply line. The connecting lines in the current project design, described above, have since been assimilated into the Project.

2.5 PIPELINE CHARACTERISTICS

2.5.1 Pipe Diameter, Pressure, and Operating Capacity

The 2012 FEIS described ASAP as a 24-inch high-pressure pipe with a Maximum Allowable Operating Pressure (MAOP) of 2,500 pounds per square inch gauge (psig) (USACE, 2012). The revised ASAP Project will use a conventional pipe diameter of 36 inches for the Mainline operated at an MAOP of 1,480 psig (AGDC, 2015). Pipeline compression will be provided at the GCF; no additional compressor stations will be required. The Fairbanks Lateral will remain a 12-inch-diameter pipe, as was described in the FEIS. Its MAOP will be 1,480 psig (identical to the Mainline).

The Mainline is expected to operate near its MAOP and will transport approximately 500 MMSCFD, up to the Fairbanks Lateral tie-in. The Fairbanks Lateral is expected to transport up to

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30 MMSCFD. Differing weather conditions, seasons, maintenance needs, and other factors could cause day-to-day fluctuations in the gas flow rate.

The changes in pipe diameter and pressure are largely driven by the change to gas composition. Since there is no need to maintain a single dense phase with both methane gas and NGL transported simultaneously, the 500 MMSCFD volume of gas can be transported in a larger pipe with a lower pressure without intermediate compression.

2.5.2 Pipe Wall Thickness

Table 2-3 identifies the pipeline location classes, Wall Thickness (WT), and MAOP for the Mainline pipe, which is 36-inch outer diameter, gradeline pipe. AGDC plans to use American Petroleum Institute X70 for the Mainline pipe and X52 for the Fairbanks Lateral. AGDC will meet applicable U.S. Department of Transportation (USDOT) integrity management (49 Code of Federal Regulations [CFR] 192, Subpart O) and corrosion control requirements (49 CFR 192, Subpart I).

Table 2-3 Mainline Containment Pressure

Location Class	WT (inches)	Maximum Allowable Operating Pressure for the Mainline 36-inch pipe (PSIG)
Location Class 1 (Division 2)	0.527	1,480
Location Class 2	0.632	1,480
Location Class 3	0.758	1,480
Location Class 4	0.957	1,480

2.5.3 Pipe Burial and Temperature

The pipeline will be installed belowground except at specified locations, such as pigging facilities, block valves, fault crossings, and aerial crossings. The ASAP buried line will vary in depth, meeting conditions of 49 CFR 192.327(a), “Cover.” The bottom of the pipe ditch will usually be 6 to 8 feet deep, allowing for bedding, pipe installation, and overburden backfill.

The pipeline is designed to operate as a belowground ambient-temperature pipe that will fluctuate seasonally with ground temperature. The gas will be conditioned to below-freezing temperature at the GCF and will be compatible with ground temperatures expected in the northern e. The pipeline would operate at below-freezing temperatures in predominantly permafrost terrains to protect the thermal stability of the surrounding soil. Similarly, the pipeline would operate at above-freezing temperatures in predominantly thawed settings so as to not create frost-bulbs around the pipe that could lead to frost-heave displacement or adverse hydraulic impacts on drainages. The anticipated pipeline operating temperature will change along the route seasonally and as a function of throughput. The pipeline operating temperature will be governed by the combined influence of Joule-

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Thompson cooling associated with gas pressure drop and pipe-wall heat transfer between the gas pipeline and surrounding soil.

In the FEIS, the first 7 miles of pipe were supported on VSM's aboveground, while the remaining 730 miles of Mainline and 34 miles of Fairbanks Lateral were belowground, except at the specified locations described above (USACE, 2012). The current proposal is a refined design in which the first 7 miles are buried. The north-to-south configuration of the pipeline means that pipe buried beneath wetlands on the North Slope will run parallel to the direction of sheet water flow that is directed by the downward elevation gradient from the Brooks Range foothills north towards the Beaufort Sea. The north-south alignment of a buried pipe through wetlands will minimize impediments to the general direction of North Slope sheet water flow, and additional constructed mitigation measures, such as ditch plugs, will be used to avoid a French drain effect. The design aims to minimize impacts to wetlands and promote slow regrowth of vegetation over time. Crowning, contouring and stabilization will also occur to avoid negative impacts, such as long, linear open-water trenches.

Burying the first 7 miles of pipeline from the GCF will reduce impacts to wildlife migration and movement, particularly caribou, which occur extensively on the North Slope (Smith and Cameron, 1992; Lawhead et al., 2006). An additional aboveground feature on the North Slope, in the same vicinity of TAPS and the Dalton Highway could potentially impact caribou behavior and movement. Subsistence users have previously commented on the issue of aboveground features on the North Slope. Transcripts from the TAPS renewal DEIS Public Hearing in Barrow Alaska (Bureau of Land Management [BLM], 2002) recorded North Slope Borough (NSB) Mayor George Ahmaogak's public testimony, as he spoke on behalf of the NSB in regard to his concern about additional aboveground features that could impact wildlife on the North Slope:

> "Caribou migration patterns were altered, changed by construction of the Trans-Alaska Pipeline system and the associated Dalton Highway. Studies, scientific studies utilizing radio collars on caribou indicated that to a great extent, these obstacles continue to impede the free movement of the affected North Slope herds… Subsistence users in our communities of Nuiqsut and Anaktuvuk Pass have long noted these changes and they have to cope with the absence of game in traditional harvest areas." (BLM, 2002)

During the original ASAP NEPA process the USACE collected comments from the public following availability of the Draft EIS (DEIS), on which the Center for Biological Diversity expressed concern that the aboveground portion of the pipeline on the North Slope could "delay caribou movements" and that it might disturb herds or individuals. Further, the group stated in reference to the seven miles of the aboveground portion of the ASAP pipeline that,

> "The Bureau of Land Management has identified numerous potential adverse effects of less extensive pipelines and also indicates that onshore gas activities, especially roads, can displace caribou and reduce caribou densities for miles. Snow drifts under a pipeline can block or interrupt caribou movements." (see comment section of ASAP's DEIS).

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Another mammal that uses the terrestrial environment on the North Slope is the polar bear, which also has 'Threatened' status as an ESA-listed species. Permanent aboveground construction could impact polar bear movement in a manner similar to caribou. Ultimately, the belowground design is likely to result in minimal negative environmental impacts and would be more beneficial to wildlife than an aboveground configuration.

2.6 PIPELINE RIGHT-OF-WAY

The ASAP Project was designed with consideration of cross slope, terrain type, and avoidance and minimization of impacts to environmental resources where possible. The ASAP Project will require a variable-width temporary construction right-of-way (ROW) that matches the project footprint. The mainline construction ROW will range from a 120' easement at its narrowest point to a 350' easement at its widest point, which includes temporary workspaces and other lands required for constructing the pipeline. The Fairbanks Lateral construction ROW will range from a 100' easement at its narrowest point to a 350' easement at its widest point. Temporary Workspaces and HDD False Rights-of-Way used during construction will require up to an 800-ft wide easement.

The ASAP Project will require a permanent operational ROW that will range from a 53' easement at its narrowest point to a 350' easement at its widest point; this maximum distance will be required during the Operations and Maintenance phase of the Project to maintain certain side slope cuts performed during the Construction Phase of the Project. The Fairbanks Lateral Operational ROW will range from a 30ft easement at its narrowest point to 350' easement at its widest point to access and maintain the land.

Security and surveillance along the ROW will require approximately 10 Full-time Equivalent (FTE) management positions; clearing and maintaining the ROW will require approximately 3 FTE management positions after year 5 of operational activity.

2.7 ROUTE ALIGNMENT

Route refinements have been made to the Mainline and Fairbanks Lateral alignments evaluated in the FEIS. This section highlights the major differences between the route alignment in the FEIS and the alignment proposed in the 2015 JAfP submitted to the USACE.

2.7.1 A Shorter, Straighter Route

The revised ASAP alignment is shown in Figure 1. Through optimization, the ASAP Mainline decreased in length from 737 miles to 733 miles (-4 miles). The Fairbanks Lateral decreased in length from 34 to 30 miles (-4 miles). The result of this route refinement is a shorter, straighter pipeline that is reduced by 8 miles in total length (763 miles [AGDC, 2015], as opposed to the 771 miles reported in the FEIS [USACE, 2012]).

The ASAP Pipeline route will continue to generally parallel the TAPS and Dalton Highway corridor to near Livengood, northwest of Fairbanks. The revised ASAP route is still captured within the

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established federal utility corridor managed by the Bureau of Land Management (BLM) under Public Land Order (PLO) 5150. At Livengood, the revised Mainline route will continue south, to the west of Fairbanks and Nenana. The pipeline will bypass DNP to the east and will then generally parallel the Parks Highway corridor to Willow, continuing south to its connection into ENSTAR's distribution system at MP 39 of the Beluga Pipeline southwest of Big Lake (Figure 2-1).

The Fairbanks Lateral tie-in will be located approximately 2.5 miles south of the Chatanika River at MP 440 of the Mainline. From the Mainline tie-in point, the Fairbanks Lateral pipeline will traverse east over Murphy Dome, following the Murphy Dome and Old Murphy Dome Roads, and then extend southeast into Fairbanks (Figure 2-2).

ASAP will meet the standards of 49 CFR 192, Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards. Construction outside of the highway ROW corridors accommodates a pipeline that is durable, safe, and economical and that meets USDOT and PHMSA regulations.

2.7.2 North Slope Routing Shifts (MP 0 to MP 175)

The GCF will be located approximately 5,500 ft northwest of the location in the FEIS (USACE, 2012), (Umiat Meridian, Township 11 N; Range 14 East; Sections 11 and 14 [U011N014E11 and U011N014E14]). The northernmost section of the Mainline also shifted west of the previous alignment described in the FEIS (MP 0 to MP 29).

At approximately MP 28 the current alignment and the alignment in the FEIS rejoin and generally follow the Dalton Highway alignment east of the Sagavanirktok River to approximately MP 129. Within this segment the current alignment generally deviates from the alignment in the FEIS by following higher elevation contours with greater separation from the Sagavanirktok River and Dalton Highway.

At MP 129 the revised alignment shifts to the east from the alignment in the FEIS and runs southwest where it crosses TAPS and the Dalton Highway at approximately MP 136.5. This route refinement straightens and shortens the alignment by over 2 miles. From MP 136.5 to MP 219 the revised route generally follows that same alignment as proposed in the FEIS.

2.7.3 Brooks Range to Yukon River (MP 175 to MP 356)

The revised route generally follows the FEIS alignment adjacent to the Dalton Highway from MP 175 to MP 356. Deviations within this segment are generally where the revised route follows a straighter and shorter route in relatively close proximity to the FEIS route and Dalton Highway. From MP 219 to MP 228 the route is shifted to the east to avoid three river crossings and a Native Allotment.

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2.7.4 Yukon River to Fairbanks Lateral (MP 356 to MP 440)

The revised route and the route evaluated in the FEIS generally follow a common alignment from the Yukon River to approximately MP 402. From MP 402 to MP 435 the revised route begins a significant departure to higher elevation contours east of the FEIS route. Moving southward, the revised route climbs the crest of the ridge lying east of Minto Flats (“Summer Ridge") to the junction with the Fairbanks Lateral at MP 440, approximately 2.5 miles south of the Mainline Chatanika River crossing. In this segment of the Project the FEIS route previously followed an alignment at a lower elevation through the Minto Flats region. However, this was changed to avoid wetlands and improve constructability. Both the FEIS route and the current route utilized lands in the Minto Flats State Game Refuge and Tanana Valley State Forest.

2.7.5 Fairbanks Lateral (MP 0 to MP 30.33)

The revised Fairbanks Lateral alignment is a significant departure from the previous route in the FEIS, which followed the Alaska Railroad transportation corridor adjacent to Goldstream Creek for a total length of 34.4 miles. The revised route is approximately 4 miles shorter and traverses east from the Mainline at MP 440 along the higher elevation of Murphy Dome, generally following the Old Murphy Dome Road and existing power lines, avoiding Department of Defense property and private property where possible.

2.7.6 Fairbanks Lateral to Cantwell (MP 440 to MP 566)

The revised route diverges from the FEIS route at approximately MP 440.8, moving upslope to the east of the FEIS alignment to traverse over drier terrain and avoid crossing Native Allotments and private lands. The revised alignment continues southwest, parallel to the FEIS route until MP 470 where the current and historic routes overlap.

At approximately MP 471.5 the revised route shifts to the west side of the Nenana River rather than following the Alaska Railroad Right-of-Way on the east side of the Nenana River and through the City of Nenana and Clear Air Force Base. The two routes cross at MP 497.5 with the FEIS alignment following the Parks Highway Right-of-Way, and the revised alignment shifting east closer to the Tanana River to avoid crossing Native Allotments and private lands. The historic and current routes again overlap between MP 511 and MP 521.

From MP 521 to MP 529, the revised route shifts west to avoid Native Allotments and private property around the town of Healy. The historic and current routes again overlap between MP 529 and MP 559.

Between MP 559 and 569, the revised route shifts to the east of the FEIS route along the Parks Highway to avoid Native Allotments and private lands in the Cantwell area.

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2.7.7 Cantwell to Willow (MP 566 to MP 707)

Between MP 566 and MP 587 the revised route generally follows the FEIS route alignment. Between MP 587 and MP 605 the revised route moves upslope and east of the FEIS route alignment to relatively drier ground, avoiding crossings of private land and minimizing stream impacts.

The revised route generally follows the FEIS route between MP 605 and MP 638. Within this segment the FEIS closely follows the Parks Highway Right-of-Way. The revised route deviates from the FEIS alignment in this segment to cross drier ground and minimize impacts to wetlands.

At MP 638 the revised route crosses the Chulitna River and moves south on the west side of the river to avoid private land crossed by the FEIS route on the east side of the river. The revised route rejoins the FEIS route at MP 646 and both follow a generally common alignment to MP 658. Between MP 658 and MP 732, several segments of the revised route shift less than a mile away from the FEIS route to minimize impacts to wetlands and avoid private property.

Between MP 666.5 and 707 the revised route generally follows the FEIS with minor deviations to avoid crossing sensitive habitat areas, Native Allotments, the Montana Creek State Recreational Area, and private property.

2.7.8 Willow to Southern Terminus (MP 707 to MP 733)

Between MP 707 and MP 733 the revised route generally follows the FEIS route with minor deviations to straighten and shorten the alignment and avoid crossing sensitive habitat areas. The final one mile segment of the revised route is the same as the FEIS route.

2.8 FACILITIES

The change in gas composition resulted in design refinements that eliminate the need for compressor stations, a straddle and offtake facility at the Fairbanks Lateral tie-in, and the NGLEP at Cook Inlet. These facilities are no longer included in the Project Description.

Off-ROW facilities will be collocated together where possible to avoid and minimize disturbance to environmental resources. A summary of facilities is provided above in Table 2-1.

2.8.1 Access Roads

Roads are necessary for transporting equipment, materials, and personnel to access the pipeline ROW, MLBVs, camps, pipe storage yards, material sites, and water sources from existing roads. The Project requires use of 298 new access roads totaling 174.4 miles and 23 ice access roads totaling 22.9 miles.

Public roads will be used to transport equipment, materials, and personnel to the greatest extent possible where marine and rail transport are not available. The Elliot and Dalton Highways will be

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used north of Fairbanks, whereas the Parks Highway will be used between Fairbanks and the southern terminus of the pipeline. Other public access roads will be used to the greatest extent practicable to reduce the construction of temporary access roads.

GCF module offload and construction will require road improvements between West Dock and the GCF pad, as well as new road construction from K-Pad at Prudhoe Bay to the GCF. Access roads will also be constructed from the GCF pad to material sites and from the GCF pad to the CGF.

Vehicles using the access roads during construction include semi-trailer trucks with lowboy flatbed trailers hauling tracked equipment, pipe trucks, dump trucks, crew buses, and heavy-duty passenger vehicles, such as pickup trucks or sport-utility vehicles.

Typical standard drawings for gravel access roads and culverts can be found in the JAfP (AGDC, 2015). All access roads are considered permanent project features.

2.8.2 Material Sites

The number of potential material sites under investigation in the FEIS was 546, and all were expected to be existing sites (USACE, 2012). This number has since been refined to 89 developed material sites totaling 5,200 acres that will be developed for the Project (Table 2-4), along with plans to purchase material from two commercial sites. Several existing sites will be used and expanded, while other new sites will be developed. Approximately 25 million cubic yards (MCY) of material will be required for construction. The volume of material quoted in the FEIS was only for known components of the Project at that time (USACE, 2012); all Project material needs have since been defined and determined.

Table 2-4 ASAP Material Site Locations and Characteristics

ID	MP	Longitude	Latitude	Material Site Status[a]	Area of Total Land Use (Acres)	Volume of Material[b] (MCY)	MTRS	Land Status
MS 1A-A	0.3	-148.544697	70.309997	New	136.89	2.00	U011N014E15	State of Alaska
MS 1B-F	18.0	-148.539313	70.078687	New	75.15	0.28	U008N014E01	State of Alaska
MS 1B-D	40.4	-148.684205	69.766051	New	174.29	0.28	U005N014E20, 29	State of Alaska
MS 1B-G	54.8	-148.600831	69.575232	New	138.29	0.28	U003N014E25, 26, 36	State of Alaska
MS 1C-A	65.1	-148.701147	69.422829	Existing	42.75	0.28	U001N014E21, 22	State of Alaska
MS 1C-H	77.9	-148.776117	69.261600	New	72.33	0.28	U002S014E16, 21	State of Alaska
MS 1C-G	85.2	-148.820412	69.148368	Existing	55.28	0.28	U003S014E29, 30, 32	State of Alaska
MS 1C-D	90.8	-148.759031	69.081046	New	225.34	0.28	U004S014E21	State of Alaska
MS 1C-E	109.5	-148.836168	68.825889	New	92.80	0.28	U007S014E17, 20, 21	State of Alaska

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MS 1C-F	113.6	-148.867843	68.782051	New	104.96	0.28	U007S014E32, U008S014E05, 06	State of Alaska
MS 1D-A	113.8	-148.854805	68.763279	Existing	146.40	0.28	U008S014E07, 08, 17	State of Alaska
MS 1D-C	130.2	-149.299688	68.619315	Existing	67.35	0.28	U009S012E33, 34	Federal
MS 1D-E	142.4	-149.480209	68.464213	Existing	147.77	0.28	U011S011E26	Federal
MS 1D-F	148.5	-149.334396	68.407421	Existing	74.79	0.28	U012S012E09, 16	Federal
MS 1D-H	155.8	-149.352454	68.305227	Existing	36.86	0.28	U013S012E21, 22	Federal
MS 1D-I	160.0	-149.415268	68.248182	New	38.43	0.28	U014S012E08	Federal
MS 1D-J	162.4	-149.396799	68.216568	Existing	84.25	0.28	U014S012E20	Federal
MS 1F-A	173.5	-149.563347	68.087328	Existing	30.85	0.28	U016S011E03	Federal
MS 2A-B	194.1	-149.824627	67.843388	New	46.85	0.28	F035N010W21	Federal
MS 2A-L	201.8	-149.752990	67.734562	New	36.83	0.28	F034N010W26, 35	Federal
MS 2A-C	207.6	-149.714403	67.656297	New	40.48	0.28	F033N010W25	Federal
MS 2A-D	218.8	-149.838538	67.514883	Existing	78.55	0.28	F031N010W17, 18	Federal
MS 2A-G	229.6	-150.070519	67.411314	Existing	87.54	0.28	F030N011W19, 20	Federal
MS 2A-H	230.4	-150.087273	67.397520	Existing	25.87	0.21	F030N011W30	Federal
MS 2A-I	236.1	-150.135873	67.319658	Existing	40.22	0.28	F029N012W24	Federal, State of Alaska
MS 2A-J	238.3	-150.169371	67.287148	Existing	60.01	0.28	F028N012W03, F029N012W35	State of Alaska
MS 2B-A	241.4	-150.144967	67.240991	New	36.06	0.28	F028N012W22, 23	Federal, State of Alaska
MS 2B-B	243.2	-150.203720	67.226911	Existing	21.38	0.26	F028N012W28	Federal
MS 2B-C	250.8	-150.340342	67.141927	Existing	57.44	0.28	F027N013W23, 26	Federal
MS 2B-D	255.3	-150.385741	67.079274	Existing	142.31	0.40	F026N013W14, 15, 16	Federal
MS 2B-F	260.3	-150.286470	67.020505	New	56.08	0.28	F025N012W06, F025N013W01	Federal
MS 2B-G	262.3	-150.289430	66.993983	Existing	32.40	0.28	F025N012W18, F025N013W13	Federal
MS 2B-H	271.7	-150.530553	66.895572	Existing	84.95	0.28	F024N014W23	Federal
MS 2B-I	276.4	-150.574902	66.827252	New	16.88	0.27	F023N014W10, 15	Federal
MS 2B-J	278.9	-150.610877	66.800723	New	86.87	0.10	F023N014W20, 21	Federal
MS 2B-K	283.5	-150.681221	66.744947	New	30.70	0.28	F022N014W07	Federal
MS 2C-A	287.2	-150.650208	66.694953	New	47.81	0.28	F022N014W29, 31, 32	Federal
MS 2C-B	289.2	-150.660772	66.663136	Existing	71.95	0.39	F021N014W05, 07, 08	Federal
MS 2C-D	296.3	-150.747595	66.577978	Existing	30.93	0.28	F020N015W10	Federal

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MS 2C-E	299.6	-150.716397	66.531480	New	27.22	0.28	F020N015W26	Federal
MS 2C-F	305.1	-150.661075	66.460074	New	42.85	0.28	F019N015W24	Federal
MS 2C-G	312.3	-150.522091	66.383637	New	28.91	0.28	F018N014W15	Federal
MS 2C-H	315.8	-150.463032	66.338026	New	52.12	0.28	F018N014W36	Federal
MS 2C-J	324.3	-150.285142	66.243338	Existing	41.48	0.28	F016N013W03	Federal
MS 3A-A	336.6	-150.157471	66.082295	Existing	29.32	0.28	F015N012W31	Federal
MS 3A-B	337.4	-150.171158	66.064577	New	22.63	0.15	F014N012W06	Federal
MS 3A-C	341.0	-150.112304	66.026910	New	63.24	0.28	F014N012W20, 21	Federal
MS 3A-E	348.2	-149.920959	65.967745	Existing	182.91	0.30	F013N011W08	Federal
MS 3A-F	353.1	-149.776086	65.929522	New	33.26	0.28	F013N011W25	Federal
MS 3A-G	364.3	-149.519053	65.815925	Existing	120.34	0.28	F011N009W06, F011N010W01, F012N009W31, F012N010W36	State of Alaska
MS 3A-I	371.2	-149.353792	65.748497	Existing	25.09	0.19	F011N009W25, 26	State of Alaska
MS 3A-J	377.3	-149.190524	65.692424	New	35.49	0.28	F010N008W15	State of Alaska
MS 3A-M	383.6	-149.025229	65.643456	New	24.83	0.28	F009N007W04, F010N007W33	State of Alaska
MS 3A-N	387.9	-148.928425	65.606682	New	34.97	0.28	F009N007W13, 14	State of Alaska
MS 3A-O	393.7	-148.844180	65.529508	Existing	91.22	0.28	F008N006W07, 08, 17, 18	State of Alaska
MS 3A-R	400.8	-148.657454	65.458220	New	79.92	0.28	F007N005W06, 07	State of Alaska
MS 3C-B	456.0	-148.798944	64.728168	New	79.26	0.28	F002S006W20	Native Corporation
MS 3C-C	469.3	-149.112816	64.606949	New	41.14	0.28	F003S008W34, 35	Native Corporation
MS 3C-E	477.4	-149.149615	64.489172	New	10.44	0.15	F005S008W09	State of Alaska
MS 3D-A	497.5	-149.294392	64.220461	New	41.08	0.28	F008S009W14, 15	State of Alaska, Municipal/ Borough
MS 3D-B	502.0	-149.282523	64.152088	New	53.06	0.28	F009S009W03, 10, 11	State of Alaska, Private
MS 3D-C	508.4	-149.205363	64.073629	Existing	31.92	0.28	F010S008W06	State of Alaska
MS 3D-D	513.6	-149.125952	64.006984	New	25.94	0.28	F010S008W33	University of Alaska
MS 3D-I	520.6	-149.072893	63.912278	Existing	37.23	0.10	F011S008W35, F012S008W02	State of Alaska, Municipal/ Borough
MS 3D-G	527.8	-149.003689	63.835396	Existing	38.17	0.27	F012S007W31	Alaska Railroad

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MS 3D-H	529.1	-148.975519	63.819953	New	27.03	0.10	F013S007W06	State of Alaska, Municipal/ Borough
MS 3F-A	538.1	-148.849368	63.712916	New	43.48	0.28	F014S007W11	Municipal/ Borough
MS 3F-B	541.3	-148.771808	63.685401	New	9.37	0.10	F014S006W20	State of Alaska
MS 4A-A	543.6	-148.767239	63.655951	Existing	107.11	0.29	F014S006W32, F014S007W36	State of Alaska, Municipal/ Borough
MS 4A-B	546.8	-148.778585	63.616503	Existing	28.71	0.27	F015S006W18	Native Corporation
MS 4A-C	549.9	-148.816635	63.571302	Existing	40.97	0.28	F015S007W36	Native Corporation
MS 4A-E	557.8	-148.806960	63.469219	Existing	43.25	0.28	F017S007W01	Native Corporation
MS 4A-G	564.0	-148.883027	63.391399	New	20.68	0.28	F017S007W34, F018S007W03	State of Alaska
MS 4A-H	571.3	-149.089082	63.354486	New	20.25	0.28	F018S008W16	Federal
MS 4A-I	580.0	-149.235975	63.251625	New	40.70	0.28	F019S009W22, 23	Native Corporation, University of Alaska
MS 4A-J	584.2	-149.327252	63.209380	New	17.64	0.25	F020S009W05	State of Alaska, Alaska Railroad
MS 4A-L	591.9	-149.451709	63.123939	Existing	43.44	0.28	F021S010W03	State of Alaska, MHTA
MS 4B-A	609.5	-149.716144	62.914789	Existing	77.22	0.28	S033N002W30, 31	State of Alaska
MS 4B-C	622.7	-149.981260	62.783593	New	104.46	0.28	S031N004W11, 14, 15	State of Alaska
MS 4B-G	645.7	-150.245613	62.540322	Existing	87.38	0.28	S028N005W05, 08	State of Alaska, Municipal/ Borough
MS 4B-H	653.7	-150.252446	62.435380	New	11.68	0.10	S027N005W08, 17	State of Alaska, Municipal/ Borough
MS 4C-B	670.3	-150.214461	62.205282	Existing	27.79	0.28	S024N005W04, S025N005W33	State of Alaska
MS 4C-C	676.8	-150.105847	62.144321	New	49.48	0.28	S024N005W25	State of Alaska
MS 4C-F	689.7	-150.057076	61.986673	Existing	14.08	0.06	S022N004W20	State of Alaska
MS 4D-E	714.5	-150.189453	61.660838	New	77.61	0.28	S018N005W09	Municipal/ Borough
MS 4D-F	720.9	-150.216807	61.574564	New	51.13	0.28	S017N005W08	Municipal/ Borough
MS 4D-G	725.7	-150.199532	61.509953	New	49.50	0.28	S016N005W04, 05	Municipal/ Borough
MS 4D-H	733.5	-150.014566	61.399770	New	20.63	0.28	S015N004W09	Municipal/ Borough

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MS FL-A	FL 8.6	-148.428471	64.951825	New	15.31	0.25	F002N004W31	State of Alaska
TOTALS					**5,199.82**	**25.25**		

Notes:

a. Material Site Status was denoted as 'New' if the area of existing disturbance at the site was estimated to be < 1 acre.

b. 89 Material sites are shown. It is expected that some additional material will be purchased from 2 commercial sites.

2.8.3 Camps and Pipe Storage Yards

AGDC proposes to establish 13 stationary construction camps (12 Mainline + 1 at GCF) and 29 pipe storage yards to support construction (Figure 2-3, below; AGDC, 2015). Most of the stationary construction camp locations will be collocated within a mile of a PSY. The PSYs and stationary construction camps will primarily be located in previously-disturbed areas that were used for construction of TAPS, Alaska Railroad Corporation (ARRC) facilities, or public events. The PSYs will require manpower of approximately 18 FTE management positions over 2.5 years; an additional 8 FTE management positions are also expected for supply warehousing at this time.

Stationary construction camps will house project personnel, including construction workers, management, agency staff, and support service personnel. Further, stationary construction camps will be used for fuel and equipment storage yards. These camps can house between approximately 600 and 1,000 workers and will range in size from 15 to 40 acres. Further, approximately 800 workers may be housed in the GCF construction camp in Prudhoe Bay. The Project will require approximately 130+ employees or contractors for the GCF over 3.5 years and 6,000 employees or contractors for the pipeline over 2.5 years.

Mobile construction camps will be used during the construction preparation phase, or preconstruction. These mobile camps will be 8.5 to 10 acres in size and will exist at different locations for short durations. Stationary construction camps will be erected along the proposed Mainline pipeline. Where possible, mobile construction camps will be located within previously cleared and disturbed areas. The use of mobile camps will be primarily limited to the construction preparation phase prior to the establishment of stationary construction camps.

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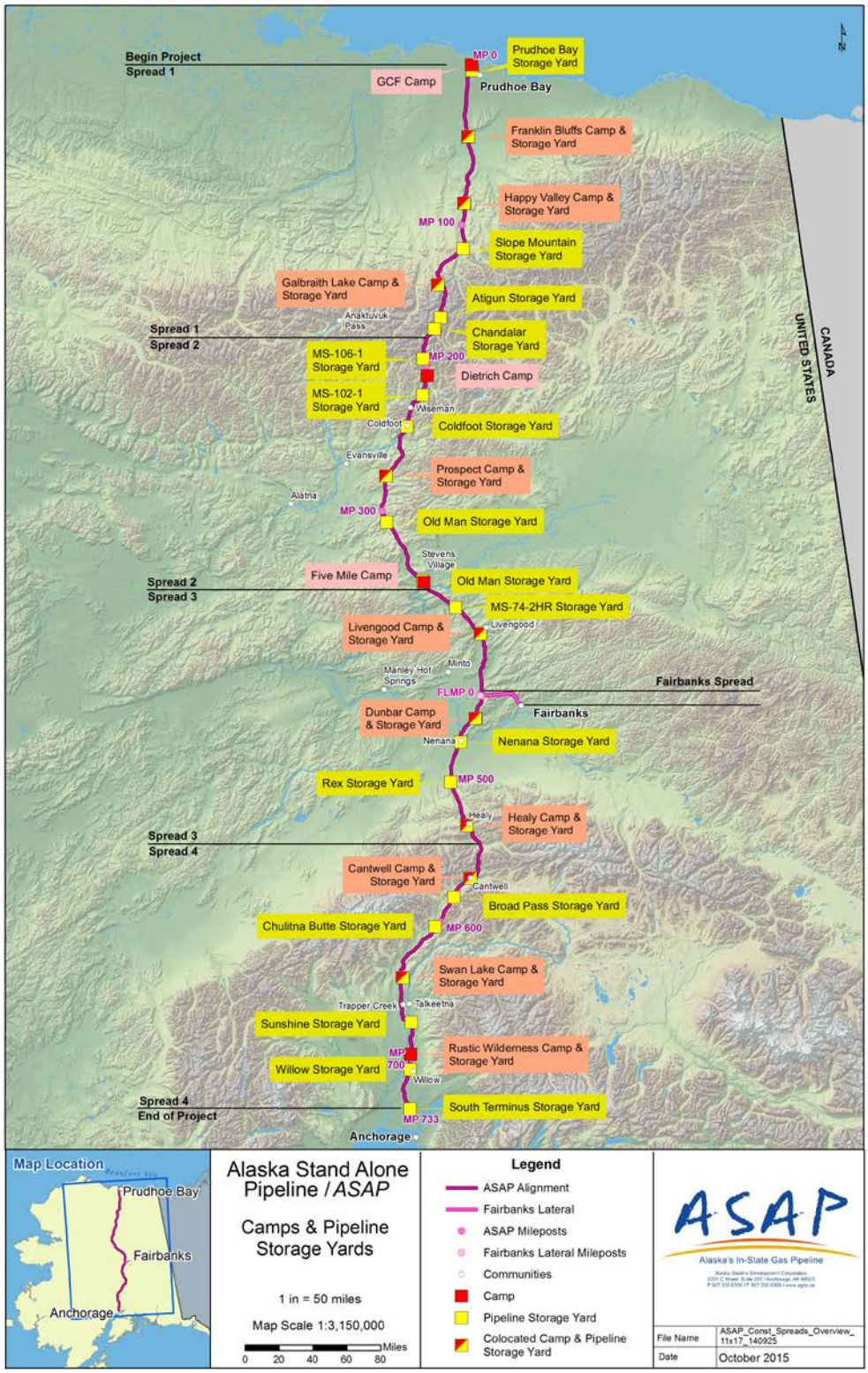
Figure 2-3 Stationary Construction Camps and Pipe Storage Yards



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2.8.4 Block Valves

The Project will install and maintain 40 Mainline block valves (MLBVs) and 1 Fairbanks Lateral block valve. By regulation, these MLBVs will be aboveground features, with one valve at least every 20 miles. Siting of exact locations was dependent upon on suitability of terrain.

2.8.5 Pig Launchers and Receivers

Pig launchers will be used to inspect and maintain operability and compliance of the pipe. Pig launchers for the 36-inch Mainline will be at the GCF, Coldfoot and the Fairbanks Lateral Tie-in, while receivers will be located at Coldfoot, the Fairbanks Lateral Tie-in, and the Mainline ENSTAR Tie-in (Table 2-1). Launchers and receivers will be collocated at Coldfoot and the Lateral Tie-in. The launcher for the 12-inch pipe will be collocated on the same pad with the 36-inch launcher / receiver at the Fairbanks Lateral Tie-in location, while the receiver will be at the Fairbanks offtake location.

2.8.6 Metering Stations and Offtake Facilities

Metering stations and offtake facilities will be located at the end of the Mainline and the Fairbanks Lateral where gas flow will be monitored and recorded. The Mainline will tie directly into an existing local distribution system for southcentral Alaska (ENSTAR). The Fairbanks Lateral will tie-in to a local distribution system to be determined later.

2.8.7 Temporary Workspaces, HDD Pads, and False Right-of-Ways

Areas of supplemental use will be needed for the ASAP Project during the construction phase of the Project, including Temporary Workspaces (TWs), Horizontal Directional Drilling (HDD) Entry and Exit Pads, and HDD False ROWs. The Project requires use of 70 TWs and eight sets of HDD Entry / Exit Pads and False ROWs.

2.8.8 Marshalling Yards

Marshalling yards will consist of workspace and a pipe storage system for the safe, efficient, and secure storage and distribution of line pipe as it transitions between ocean and/or railway transit systems to PSYs. Marshalling yard gravel pads will be constructed and operational several months prior to initial pipeline construction. Each yard will be approximately 21 acres and will have the capacity to store 40,000 tons of pipe. The yards will be located in Seward and Fairbanks and will be sited within existing rail yards or adjacent to railways to reduce the time and effort spent handling and hauling pipe.

Each marshalling yard will have an equipment storage area and an office, at which staff can work out of mobile units. There will be office space for site management, administrative, logistical, quality assessment/quality control (QA/QC), and operational staff. The marshalling yard office / equipment storage areas will be surrounded by a chain-link fence with three 20 ft gates. This fence will

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serve a dual purpose to secure equipment and materials and to keep foot traffic safely segregated from the material haul routes associated with the pipe storage area. Areas have been identified for storing snow during the winter months. Office trailers, portable toilets, dumpsters, generators with accompanying fuel storage systems, an 80 ft x 120 ft cold storage / equipment maintenance facility, and secure lockable storage containers will be rented and temporary in nature. Marshalling Yards will require approximately 24 FTE management positions over 2.5 years.

2.8.8.1 Seward Marshalling Yard

The Seward Marshalling Yard will be located near the Seward Harbor and the Alaska Railroad terminus. Pipe will arrive by barge and will be transported directly to the Seward Marshalling Yard or placed on railcars. The Seward Marshalling Yard will be required for 30 months, which allows for 4 months to coordinate mobilization activities and 2 months at the conclusion of pipe distribution operations for demobilization. It is assumed that pipe will be delivered to the Port of Seward and transferred to the Seward Marshalling Yard over a 24 month period, with each ship requiring 7 to 10 days to fully discharge the load. During the ship offload cycles, operations will proceed for 12 hours each day with multiple crews.

2.8.8.2 Fairbanks Marshalling Yard

The Fairbanks Marshalling Yard will be located in Fairbanks, adjacent to Alaska Railroad tracks. The pipe will arrive by rail and will be stored and sorted before moving it to smaller PSYs. The Fairbanks Marshalling Yard will be operational for approximately 30 months. Personnel will be tasked with a 6 day x 60 hour work week. The staff assigned to the Fairbanks Marshalling Yard will provide management oversight for the rail siding near the Fairbanks Lateral tie-in to the Mainline. This siding is planned to be utilized as a direct offload point from the Alaska Railroad to truck pipe to PSYs.

2.8.9 Maintenance and Response Bases

Approximately 240 employees and contractors will be required to staff the Project during its Operations and Maintenance Phase. Work at the Project's three Maintenance and Response Bases will require a total of 24 FTE management positions. Some of these roles are noted in the facility descriptions, below.

2.8.9.1 GCF / GCF Maintenance and Response Base (GCFMRB)

The GCF complex and the integrated GCF Maintenance and Response Base (GCFMRB) will be located within the Prudhoe Bay Unit and will be a stand-alone modular facility for gas processing, support (e.g., office, storage, shop, and equipment) and camp facilities. Its purpose is to:

1. Provide self-sustaining utilities, power, and housing for the GCF complex

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2. Reliably process and provide conditioned gas for intra-state shipping via the pipeline to Fairbanks and to the ENSTAR Natural Gas Company (ENSTAR)-operated Beluga Pipeline near Big Lake
3. Serve as the 24-hours a day, 7 days a week (24/7) center of operations for ASAP, including the GCF, the pipeline, and the Fairbanks and Big Lake gas offtake facilities
4. Support maintenance and emergency response activities for the GCF complex and the pipeline right-of-way from Mile Post (MP) 0 through MP 183.

A high degree of reliability and prompt response times are required of staff at this facility. The physical size of the overall GCF complex demands a high volume and variety of maintenance activities for the physical facilities. The ASAP infrastructure that will be developed compliments the existing utilities and services available nearby.

Key operational functions of the GCF complex and the GCFMRB will be:

- GCF process facilities operations
- GCF camp operation
- 24/7-staffed control room (GCF and pipeline)
- Upstream gas coordination (PBU)
- GCF metering and chain-of-custody
- Mainline pipeline pressure and overpressure control
- Valve position remote monitoring
- Leak detection remote monitoring
- Corrosion protection remote monitoring
- River crossing remote (camera and sensor) monitoring
- Unmanned security systems monitoring and alarms
- Fairbanks Lateral remote metering
- Fairbanks utility delivery rates and pressures
- Fairbanks utility remote metering and chain-of-custody
- Downstream Fairbanks utilities coordination
- Beluga utility delivery rates and pressures
- Beluga utility remote metering and chain-of-custody
- Downstream Beluga utilities coordination (ENSTAR)
- Security crew
- Control and coordination of line-wide maintenance activities

Maintenance activities on the ROW between MP 0 and MP 183 will be primarily supported from the GCFMRB. These activities will be performed under a manager and a support team, which will be housed, deployed, and provided equipment and facilities support from the GCF complex. Their activities will be:

- Pig launching/receiving
- Valve maintenance

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- Cathodic protection system maintenance
- Communications system maintenance
- Supervisory Control and Data Acquisition Systems maintenance
- Civil infrastructure maintenance (for example, bridge, access road, slope erosion, vegetation control, and flood damage)
- ROW monitoring: ground
- ROW monitoring: aerial

A security crew will be based at the GCF. Emergency response for the GCF complex and the pipeline ROW from MP 0 through MP 183 will be managed from the GCF and supported by the GCFMRB. To provide first response, the GCF complex will have 24/7 staffing of security and emergency response-trained personnel capable of delivering first response emergency services and contacting appropriate backup support.

Current plans are to staff the GCF complex with qualified operators for control room and module operations, and with qualified maintenance personnel to perform maintenance activities at the GCF complex and on the pipeline ROW from MP 0 to MP 183, as described in earlier sections. Consistent with traditional North Slope scheduling protocol, personnel assigned to the GCF complex are planned to work a 2-week-on/2-week-off schedule. Personnel based at the GCF will be housed at the permanent GCF camp.

The GCFMRB will require approximately 10 FTE management positions stationed onsite that will function in roles of administration, staff supervision, management, and technical services. All GCFMRB staff will be housed on-site in 2-week on, 2-week off rotational shifts.

2.8.9.2 Fairbanks Maintenance and Response Base (FMRB)

The Fairbanks Lateral is the offtake point from which gas will be shipped to Fairbanks for end-user utility consumption. Fairbanks is located at approximately the midpoint along the entire ASAP corridor and possesses existing commercial and industrial infrastructure. It will serve as a major coordination center for pipeline maintenance and response activities. The Fairbanks Maintenance and Response Base (FMRB) is planned to be an urban industrial facility located in Fairbanks near the Fairbanks offtake facilities. ASAP facilities and equipment that will be operated and primarily maintained from the FMRB are:

- Fairbanks Lateral ROW
- Mainline pipeline ROW MP 183 to MP 529
- FMRB facilities, including administrative, storage, warehouse, and equipment facilities
- Backup Control Room

The key maintenance activities supported at the FMRB are:

- FMRB administrative, storage, warehouse, and equipment facilities maintenance
- FMRB Backup Control Room facility maintenance

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- FMRB roads and pads
- Original Equipment Manufacturer maintenance
- Rolling-stock equipment O&M

Maintenance activities on the ROW between MP 183 and MP 529 will be primarily supported from the FMRB. These activities will be performed under a manager and team which will be deployed and provided equipment and facilities support from the FMRB. Their activities will include:

- Pig launching/receiving
- Valve maintenance
- Cathodic protection system maintenance
- Communication system maintenance
- Supervisory Control and Data Acquisition Systems maintenance
- Civil infrastructure maintenance (e.g., bridge, access road, slope erosion, vegetation
- control, and flood damage)
- ROW monitoring: ground
- ROW monitoring: aerial

A security crew will be based at the FMRB. Emergency response for the pipeline from MP 183 through MP 529 will be managed from and supported by the FMRB. To provide first response, the FMRB will have 24/7 staffing of security and emergency response trained personnel (on a call-out basis) capable of delivering first response emergency services and contacting appropriate backup support.

Current plans are to staff the FMRB with qualified operators to deliver backup ASAP operations and with qualified maintenance personnel to perform maintenance activities at the FMRB and on the pipeline ROW from MP 183 to MP 529, as described in earlier sections. Personnel assigned to the FMRB, will work a normal urban work schedule and live in the Fairbanks area (offisite) rather than being housed at the facility. The 24/7 staffing of FMRB Security positions will be met through typical three-shift schedules, including day, night, and swing shifts. The FMRB will require approximately 9 FTE management positions with roles functioning in administration, staff supervision, management, technical services, scheduling, and outreach.

2.8.9.3 Big Lake Maintenance and Response Base (BLMRB)

The Big Lake Maintenance and Response Base (BLMRB) will serve as a major support location for pipeline maintenance and response activities north of the offtake point, as there is existing industrial and commercial infrastructure in the Matanuska-Susitna Borough (MSB). The BLMRB is planned to be an urban industrial facility located within the MSB and conceptually collocated with the Big Lake offtake facilities at the end of the ASAP line near its tie-in to the ENSTAR system (Beluga line). ASAP facilities and equipment that will be operated and primarily maintained from the BLMRB are:

- Mainline pipeline ROW MP 529 to MP 733

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- BLMRB facilities, including administrative, storage, warehouse, and equipment facilities

The key maintenance activities supported at the BLMRB are:

BLMRB administrative, storage, warehouse, and equipment facilities maintenance

- BLMRB roads and pads
- Original Equipment Manufacturer maintenance
- Rolling-stock equipment O&M

The maintenance activities on the ROW between MP 529 and MP 733 will be primarily supported from the BLMRB. These activities will be performed under a maintenance manager and team that will be deployed and provided equipment and facilities support from the BLMRB. Their activities will be:

- Pig launching/receiving
- Valve maintenance
- Cathodic protection system maintenance
- Communications system maintenance
- Supervisory Control and Data Acquisition Systems maintenance
- Civil infrastructure maintenance (for example, bridge, access road, slope erosion, vegetation control, and flood damage)
- ROW monitoring: ground
- ROW monitoring: aerial

A security crew will be based at the BLMRB. Emergency response for the pipeline from MP 529 through MP 733 will be managed from and supported by the BLMRB. To provide first response, the BLMRB will have 24/7 staffing of security and emergency response trained personnel (on a call-out basis) capable of delivering first response emergency services and contacting appropriate backup support.

Current plans are to staff the BLMRB with qualified maintenance personnel to perform maintenance activities at the BLMRB and on the pipeline ROW from MP 529 to MP 733, as described in earlier sections. Personnel assigned to the BLMRB will work a normal urban work schedule and live in the MSB area rather than being housed at the facility. The 24/7 staffing of BLMRB Security positions will be met through typical three-shift schedules, including day, night, and swing shifts. The BLMRB will require approximately 5 FTE management positions that will function in roles of administration, staff supervision, management, and technical services. All BLMRB staff will be housed off-site (in town).

2.8.9.4 Anchorage Headquarters

The ASAP corporate headquarters will be located within the Municipality of Anchorage, and will be an urban office facility that will provide offices for corporate staff. Technology will be leveraged

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as necessary to provide real-time monitoring of pipeline functions by support teams in the Anchorage headquarters. The ASAP Anchorage offices will be the administrative center of the corporate organization. Key management and administrative functions that support the organization will be centrally resourced in the corporate offices. The Anchorage Headquarters will require 88 FTE management positions for Operations and Maintenance that will function in the following roles:

- Executive Management
- Finance and Accounting
- Commercial and Gas Distribution
- Operations
- Legal Services/Land Management
- Government and External Affairs
- Engineering
- Health, Safety, Security, Environmental, and Quality (HSSEQ)
- Human Resources
- Information Technology

The ASAP corporate organization will be staffed with professionals to support management and administrative functions. Personnel assigned to the corporate offices will work a normal urban work schedule and live in the Anchorage area. The 24/7 staffing of security positions will be met using a third-party contractor that works typical, three-shift schedules, including day, night, and swing shifts. All Anchorage staff will be housed off-site (in town). Headquarters are currently proposed to be located at AGDC's present offices at 3201 C St., Suite 200, Anchorage, AK 99503.

2.9 PROJECT FOOTPRINT

The Project Footprint was not fully defined in the 2012 FEIS, although several components were quantified (Table 2-1; see GIS files in USACE, 2012). Material site acreages and several access road locations were not determined at that time (USACE, 2012). Quantifiable uses of land included approximately 4.1 thousand acres for permanent use and 10.9 thousand acres of land for temporary use (15 thousand acres total), among several other lands considered while the Project developed (USACE, 2012).

The current revised and complete ASAP Project footprint that includes full construction easements and all off-ROW features (including material sites) will require 21,237.3 acres of land (Table 2-1). This total Project Footprint acreage comprises 8,907.0 acres of impact to freshwater wetlands (7,573.2 acres permanent, 1,161.4 acres temporary), 0.9 acres of impact to intertidal wetlands (0.8 acres permanent, 0.1 acres temporary), 171.5 acres of permanent impact to subtidal wetlands, and 12,330.3 acres of impact to uplands.

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2.10 STREAM CROSSINGS

The ASAP Project, including the Mainline, the Fairbanks Lateral and off-ROW facilities (e.g., access roads) will cross a total of 312 streams (See Section 5.2 for more detail). Of these streams, 265 will be impacted by the Mainline, 7 by the Fairbanks Lateral, and 40 by access roads.

The ASAP 36-inch Mainline will cross approximately 265 streams or creeks (50 anadromous), as follows:

- 6 aerial (bridge) crossings
- 155 isolated open cut crossings
- 97 open cut crossings
- 7 trenchless crossings using horizontal directional drilling (HDD), including the Yukon River

The 12-inch Fairbanks Lateral will cross 7 streams or creeks (0 anadromous), as follows:

- 4 isolated open cut crossings
- 3 open cut crossings

The access roads will result in culverts (pipes) or bridges being placed in or over 40 streams or creeks (14 anadromous) as follows:

- 17 bridges (14 temporary, 3 permanent)
- 23 culverts (4 temporary, 19 permanent)

The total number of centerline stream crossings in the FEIS was 515 (495 on the Mainline, and 20 on the Fairbanks Lateral) (USACE, 2012). That list was developed by ASAP's engineering and wetlands teams through early desktop and field studies between 2009 and 2010 using the best available information at that time. Since then, changes in pipeline routing and the addition of new access roads and other facilities have occurred, and better desktop and field data for streams and wetlands have been collected.

ASAP's waterways engineering team and its wetlands delineation team played key roles in developing a list of field targets to best inform construction modes and methods through areas that could require special design. Many of these selected targets required on-site visits for engineering purposes to assess surface water features identified during desktop analysis.

In addition to the 312 streams crossed by the Project, ASAP engineers and scientists have identified 179 hydrologic points of interest (HPOIs). The HPOI features do not meet the criteria relative to possessing an ordinary high water mark defined in the USACE Regulatory Guidance Letter (RGL) 05-05, but are jurisdictional areas for which engineers may need to give special design consideration (see AGDC, 2015 or Section 5.2 Water Resources, below, for more information).

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The pipeline construction ROW is positioned nearby streams that it does not cross or directly impact. Nearby streams will be evaluated on a site-by-site basis to determine whether special planning or mitigation is needed at these sites during construction or operation of the pipeline.

Some material sources along the Sagavanirktok River in the Northern region will utilize gravel from river banks. This siting is being done with consideration of input from the Alaska Department of Fish and Game (ADFG).

2.11 REFERENCES

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3. CONNECTED ACTIONS

3.1 CONNECTED ACTIONS LISTED IN THE FINAL ENVIRONMENTAL IMPACT STATEMENT

The Final Environmental Impact Statement (FEIS) listed as a Connected Action:

> *"…the construction and operation of four aboveground pipelines that would connect the Prudhoe Bay Central Gas Facility to the Gas Conditioning Facility (GCF) for supply of natural gas and natural gas liquids (NGLs), and return of bi-products …"* (USACE, 2012)

The Alaska Stand Alone Pipeline (ASAP) design has advanced to a level that the concept of the aboveground connecting lines between the GCF and Central Gas Facility (CGF) has been assimilated into the Project Description. As discussed in Section 2, above, and in recent ASAP documents, the NGL line has been stricken from the current ASAP Project design plans (AGDC, 2015, 2014). A single natural gas feed line will transport gas between the CGF and the GCF, where gas will be conditioned, and waste products will be returned via the two return lines (one for Carbon Dioxide [CO_2] and one for liquids). This element of the Project should no longer be considered a Connected Action, but as part of the ASAP Project design (see Section 2.3, Design Refinements). The environmental effects of these actions are described in Section 3 of the FEIS and in Section 5, Environmental Analysis, in this EED.

3.2 CONNECTED ACTIONS IN THE REVISED ALASKA STAND ALONE PIPELINE DESIGN

There are no connected actions associated with the revised Proejct. The U.S. Army Corps of Engineers (USACE) has indicated that a sales tap, or valve, cutting into the Mainline or Fairbanks Lateral would be considered a Connected Action; however, offtake valves are not a component of the Project, so there is no associated Connected Action. As discussed previously, the ASAP Mainline will terminate at its connection and tie-in to a local distribution system - the existing ENSTAR Natural Gas pipeline near Big Lake. The Fairbanks Lateral will end west of the University of Alaska Fairbanks campus. The scope of the project does not include any community infrastructure (offtake valves, decompression stations, or local distribution infrastructure for communities along the line); however, it is a reasonably forseeable action that some communities would want access to gas and request to tap into the line to feed local distribution infrastructure that would be developed in the future (Section 3.4).

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3.3 REASONABLY FORESEEABLE ACTIONS IN THE FINAL ENVIRONMENTAL IMPACT STATEMENT

The FEIS (USACE, 2012) discussed the following as reasonably foreseeable actions:

- A distribution system of gas for the Fairbanks region
- Liquefied Natural Gas (LNG) export and processing
- Distribution of NGLs from a Cook Inlet NGL Extraction Plant (NGLEP)

The first two of these items remain as reasonably foreseeable actions in the future under ASAP; however the third is no longer foreseeable under the revised Project Design.

3.4 REASONABLY FORESEEABLE ACTIONS IN REVISED ASAP DESIGN

The Project has undergone a conceptual design change to transport readily usable natural gas that will be more accessible to communities along the route. Therefore, it is a reasonably foreseeable action that some communities, as well as government entities or forthcoming projects within reasonable proximity to ASAP may want to access gas from the pipeline as a source of fuel. Depending on cost and feasibility, these communities, entities, and projects may decide to develop the infrastructure required to access ASAP gas and distribute it for residential, governmental, or commercial use.

Section 5.12 Socioeconomics of this document provides information about the potential opportunities, costs and details for communities within 60 miles of the ASAP Pipeline route to access gas. An example of the initial infrastructure that a community, entity, or project would be responsible for installing to access gas from the ASAP Mainline would be a buried 4-inch sales tap, a service line, and an above-ground sales tap site facility. This facility would receive gas from the service line and direct it through strainers and a metering station. The gas would then be heated, depressurized, and odorized before leaving the facility into a community or local distribution system. Other possibilities include the transport of compressed natural gas (CNG), as described in the POD (AGDC, 2014), and in Section 5.12, Socioeconomics, of this document.

3.5 REFERENCES

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

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4. ALTERNATIVES AND OPTIONS CONSIDERED

4.1 ALTERNATIVE MEASURES CONSIDERED IN THE FINAL ENVIRONMENTAL IMPACT STATEMENT

Several alternatives were evaluated in the Final Environmental Impact Statement (FEIS) (USACE, 2012), including:

- Energy Source Alternatives:
  - Kenai Peninsula and Cook Inlet natural gas
  - Nenana Basin natural gas, Gubik natural gas, or both
  - Liquefied Natural Gas (LNG) import
  - Hydroelectric power
  - Nuclear power
  - Coal and coal gas renewable resources (wind, geothermal, biomass, and tidal)
    - Energy conservation measures and programs

- Natural Gas Transport System Alternatives:
  - Dry gas pipeline from North Slope
  - Smaller-diameter pipeline
  - Spur pipeline from a large North Slope-to- Lower Continental 48 U.S. States (Lower 48) or Valdez Pipeline
  - Pipeline from North Slope to Fairbanks; transport by rail car to the Southcentral region (Southcentral)
  - Transport by truck and trailer

- Pipeline Route Alternatives:
  - Major Route Alternative:
    - Richardson Highway Route Alternative:
  - Route Variations:
    - Fairbanks Route Variation
    - Alaska Intertie Route Variation
    - Denali National Park Route Variation
    - Alaska Railroad (ARR) Route Variations

- Aboveground Facility Site Alternatives

A number of these alternatives were considered but eliminated from detailed analysis in the FEIS (Chapter 4, Table 4.6; USACE, 2012). The Denali National Park (DNP) Route Variation was previously eliminated from further analysis in the FEIS because existing law at that time would have restricted use of the Park. The Denali National Park Improvement Act (S.157), enacted in 2013, would allow the pipeline to traverse the Park, but only if it was determined that the DNP Route

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Alternative was the Least Environmentally Damaging Practicable Alternative (LEDPA). The USACE has suggested that any of the following route alternatives could be carried forward for analysis in a Draft Supplemental EIS (SEIS). These scenarios include:

- No Action Alternative;
- AGDC's proposed route, or preferred alternative (AGDC, 2015);
- Denali National Park Alternative (through DNP) (see USACE, 2012);
- 2012 ASAP FEIS route alternative (USACE, 2012)

Consistent with NEPA, federal agencies must consider reasonable alternatives to a proposed action, in this case, the potential approval of a JAfP (404/10). Considering alternatives helps to ensure that ultimate decisions concerning the proposed Project are well founded and consistent with other national policy goals and objectives.

4.2 DENALI NATIONAL PARK

4.2.1 ASAP's Historic Assessment of a Route through DNP

An alternative route through Denali National Park (DNP) was assessed in the FEIS Alternatives chapter and weighed against the Alaska Gasline Development Corporation's (AGDC's) proposed right-of-way (ROW) that bypasses DNP (USACE, 2012). In the FEIS, National Wetland Inventory (NWI) data were used to compare acreages of wetlands for both the proposed route and for the DNP Alternative route (USACE, 2012). However, NWI data can be very coarse in some areas and may have limited accuracy. AGDC's wetlands consultant, ASRC Energy Services (AES) carried out field validations for the DNP Alternative route, which provided "boots on the ground" data to support aerial interpretation of photos and wetlands delineation. These data showed that the NWI dataset for this area was very coarse compared to the more reliable AES-delineated wetlands data. AGDC carried out additional reconnaissance surveys and a review of additional geotechnical data, environmental data, and other information in 2015. The DNP Alternative was re-routed slightly, which ultimately helped to improve constructability and reliability of the pipeline, avoid commercial and residential properties, and minimize environmental impacts.

4.2.2 Assessment of the Denali National Park Alternative

ASAP's current route and the DNP Alternative route are depicted in Figure 4-1. The current ASAP route begins to parallel DNP at Mile Post (MP) 531 at the Moody Bridge (Nenana River) crossing, traversing behind the Glitter Gulch area. At MP 535.8, the current route and the DNP Alternative route diverge from one another. The current route continues to bypass the park to the east, climbing the ridge line at a higher elevation, whereas the DNP alternative route generally parallels the highway corridor into the Park on flatter terrain. The southern end of the DNP Alternative route moves southeast to exit the park and avoid construction and operational impacts to the McKinley Village area. The current route and DNP alternative route rejoin each other at MP 543. The lengths of both routes are similar, only differing by about 0.3 miles.

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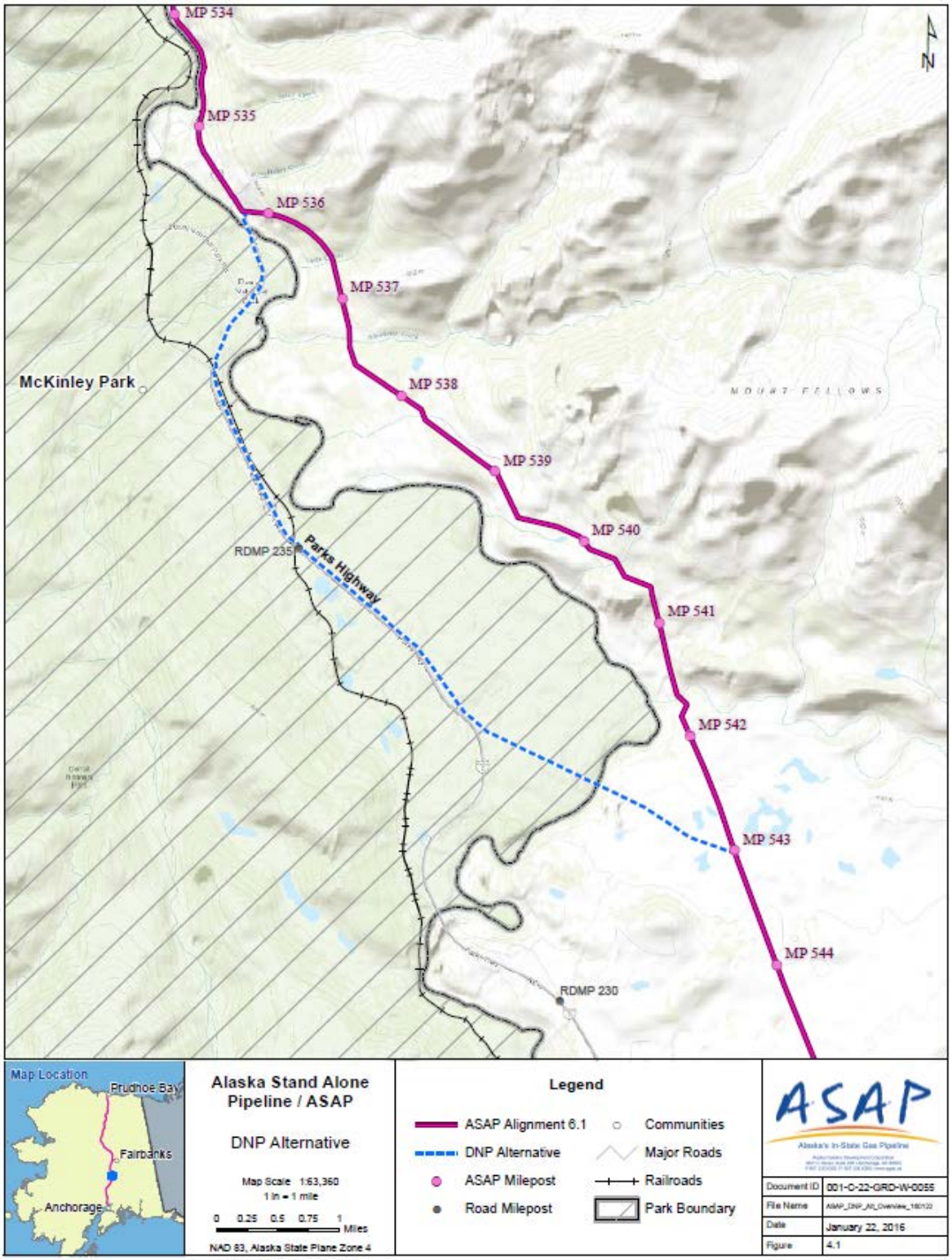
Figure 4-1 The Denali National Park Alternative



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The total permanent and temporary wetlands impact acreage for both alignments is provided in Table 4-1. Functional Capacity Index (FCI) scores of all wetlands along the ASAP ROW and for the DNP Alternative have been summarized and provided to the USACE and the National Park Service (see Attachment 8 – Aquatic Site Assessment; see also AGDC, 2013). Routing and design have attempted to minimize impacts to wetlands. Uplands are utilized to the extent practicable, and wetland habitat primarily consists of palustrine scrub / shrub along both routes, with smaller portions of forested or emergent wetlands also present. Some depressional emergent wetlands (i.e., vernal pools) have been delineated inside the study corridors, which may provide important local habitat for the watersheds by temporarily retaining seasonal precipitation and snowmelt. These depressional wetlands are present in both alternatives, but the presence of the Parks Highway on the alternative route (through the Park) increases the difficulty in avoiding these depressional emergent wetlands. The proposed ASAP route bypassing the park would avoid these wetlands without the difficulty of avoiding or moving the Parks Highway.

Table 4-1 Comparison of Wetland Impacts for the ASAP Right-of-Way and for the Denali National Park (DNP) Alternative

Stream Name	ASAP Right-of-Way (DNP Bypass)	DNP Alternative
Linear Mileage	7.2 miles	7.5 miles
Permanent Operational ROW Wetlands Impact Acreage[a] (Nominal 53ft corridor)	21.9 acres	10.6 acres
Temporary ROW Wetlands Impact Acreage[a] (Nominal 120ft corridor)	49.2 acres	22.6 acres

Notes:

a. ASRC Energy Services (AES) completed field data collection and validation analysis on proposed route from 2010 – 2015 and on the 2012 DNP Alternative route during the 2013 - 2014 field season. Additional delineation occurred through extrapolation of these data and desktop interpretation of aerial imagery.

Neither of the two routes cross anadromous fish streams. The proposed route crosses multiple narrow creeks, whereas the DNP Alternative route crosses fewer but wider waterways, as well as navigable waterways. The proposed route crosses a cumulative total of 346 ft of streams, which are mostly small, unknown creeks at higher elevation (Table 4-2). Nine of the ten streams on the proposed route are 28 ft or less in bank full width, and none of the stream crossings are over navigable waters (Table 4-2).

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Table 4-2 Characteristics of Streams Crossed by the ASAP Centerline along the DNP Bypass Route

Stream Name	Bank Full Width (ft)	USACE-Designated Navigable Waterway?
Lynx Creek	13	No
Montana Creek	26	No
Unknown	20	No
Unknown	28	No
Unknown	11	No
Unknown	11	No
Unknown	5	No
Yanert Fork	200	No
Unknown	25	No
Unknown	7	No
TOTALS	**346**	**0**

The DNP Alternative route crosses more cumulative stream width than the ASAP ROW bypassing DNP. Three streams were crossed that ranged in distance from 110 – 436 ft, equating to a cumulative total of 863 ft of stream that would be crossed by the DNP Alternative. Two of these required crossings were at the Nenana River, a USACE-designated navigable waterway that necessitates the pipeline to traverse more than than 300 ft of stream width.

Table 4-3 Cumulative Stream Width Crossed by the Denali National Park Alternative

Stream Name	Bank Full Width (ft)	Crossing Mode	USACE-Designated Navigable Waterway?
Nenana River	436	Aerial Crossing (Existing Pedestrian Bridge)	Yes
Riley Creek	110	Aerial Crossing (New)	No
Nenana River	317	Trench	Yes
TOTALS	**863**		

4.3 YUKON RIVER CROSSING

The preferential order in options for crossing the Yukon River has changed. Horizontal Directional Drilling (HDD) under the Yukon River is now AGDC's preferred option. Using the pre-existing E.L. Patton Yukon River Bridge and the new suspension bridge across the Yukon River are not proposed. The revision was the result of engineering and environmental review.

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4.4 ADDITIONAL OPTIONS CONSIDERED FOR ALASKA STAND ALONE PIPELINE

In addition to the alternatives assessed in the FEIS (USACE, 2012), AGDC has studied and assimilated additional options into the Project since the FEIS. One option involved the use of West Dock's Dock Head 3 (DH3) as the preferred location for barge entry during the construction period. In an effort to avoid and minimize environmental impacts, several North Slope ports of entry were screened to accommodate the new conceptual design change involving modular components barged into Prudhoe Bay to construct the Gas Conditioning Facility (GCF) (Attachment 3). Details of proposed winter dredging of a permitted navigational channel into DH3, dredge material disposal on bottomfast ice, and causeway modifications are discussed in detail in ASAP's Dredge and Disposal Plan (Attachment 3).

Another option that was considered, but dismissed, was the concept of a 30-mile extension of the Fairbanks Lateral from its current terminus in Fairbanks to the city of North Pole, Alaska, approximately 30 miles away. AGDC investigated whether the design proposed in the JAfP (AGDC, 2015) meets its statutory mandate to deliver gas to Alaskans at the lowest possible cost. Alaska Statute (AS) 31.25.005 directs AGDC to advance an in-state pipeline capable of delivering natural gas to Fairbanks, and to accomplish this goal in a safe, efficient, and economic manner. The current design provides gas to Fairbanks and will significantly reduce power and heating costs, as well as improve air quality. AGDC must balance the desire to maximize public benefit with economic feasibility, cost-effectiveness, and environmental impacts. Furthermore, there are fundamental local distribution decisions for the Fairbanks area that remain unresolved and that do not warrant additional investigation of the extended route to the city of North Pole at this time. The current Project Design meets AGDC's statutory obligation to deliver gas to Fairbanks and leverages the existing local distribution system. The details of AGDC's consideration of this alternative were outlined in a July 24, 2014 letter from the president of AGDC (Attachment 4).

4.5 REFERENCES

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ ASAP – Joint Application for Permit Revised*. Dec 29, 2015 (Submitted to the U.S. Army Corps of Engineers on January 13, 2016).

AGDC. 2013. *Alaska Stand Alone Gas Pipeline/ ASAP – Wetlands and Waters of the United States Delineation Report and Preliminary Jurisdictional Determination for Denali National Park Alternative Route.* October 2013. Document No: 003-C-22-R-D-0012

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

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5. ENVIRONMENTAL ANALYSIS

The Environmental Analysis section of the Environmental Evaluation Document (EED) describes how the Alaska Stand Alone Pipeline (ASAP) Project revisions that occurred between the Final Environmental Impact Statement (FEIS) (USACE, 2012) and the Joint Application for Permit (JAfP) (AGDC, 2015) have subsequently led to a change in environmental impact of affected physical, biological, and human environments. Direct, indirect, and cumulative impacts expected to result from construction and operations are defined, as well as mitigation measures that could reduce impacts to each affected resource.

The environmental consequences of constructing and operating the proposed project vary in intensity and duration. Four levels of impact duration were defined and considered in the FEIS: temporary, short term, long term, and permanent (USACE, 2012). Temporary impacts will generally occur during construction, with the resources returning to preconstruction conditions almost immediately afterward. Short-term impacts will continue for approximately 3 years following construction. Impacts were considered long term if the resources will require more than 3 years to recover. Permanent impacts will occur as a result of activities that modify resources to the extent that they would not return to preconstruction conditions during the life of the proposed project, such as with construction of aboveground structures. Impacts that resulted in a change in the environment were quantified to the extent practical.

The revised project will incorporate measures to reduce environmental consequences, as described in Section 5.23. The Alaska Gasline Development Corporation (AGDC) will incorporate additional mitigation measures required in authorizations and permits that will be issued by environmental permitting agencies prior to the construction and operations phases of the proposed project.

5.1 SOILS AND GEOLOGY

The FEIS (USACE, 2012) presents impacts to soils and geology from the ASAP Project. This section describes the anticipated changes in impacts to soils and geology based on the revised project description (AGDC, 2015). Recent revisions to the ASAP Project, such as temporary use of West Dock facilities during construction and shifts in the alignment of the Mainline pipeline and the Fairbanks Lateral, result in changes to the previous assessment of the effects of the proposed project on soils and geology.

5.1.1 Affected Environment

The affected soil and geologic environments have not changed since the development of the FEIS. The locations of some project elements have changed; however, the general soil types, geomorphology, and geological resources of the project area described in the FEIS remain valid (USACE, 2012).

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One geologic feature in the project area that was not identified in the FEIS (USACE, 2012) could affect the Mainline pipeline. The feature is a frozen debris lobe, similar to a slow-moving landslide, that is flowing westward down a mountain slope near Mile Post (MP) 193 of the proposed project. More than 10 other frozen debris lobes exist along the Dalton Highway corridor, but frozen debris lobe 'A' is closest to transportation infrastructure. It consists of rock, sand, silt, woody debris, and ice, and is 65 ft tall and 560 ft wide at its front. Its movement has accelerated in recent years and is presently estimated to be approximately 12 ft per year. It is now less than 230 ft from the Dalton Highway and could reach the highway in fewer than 20 years (Daanen et al., 2012). The Alaska Department of Transportation & Public Facilities (ADOT&PF) is evaluating moving the Dalton Highway rather than attempting to maintain it in place.

Nearshore dredging at West Dock and dredged material disposal are new elements of the proposed project that were not assessed in the FEIS (USACE, 2012). The physical composition of the sea-floor substrate in the general vicinity of the proposed dredging is variously described as primarily silt with a thin layer of sand and clayey sand; soft, silty sand mixed with a thin layer of gravel and organics; and silty sand underlain with gravel (AGDC, 2015).

5.1.2 Environmental Consequences

The effects of revisions to the proposed project on the assessment of soils and geology impacts reported in the FEIS (USACE, 2012) are described in this section.

5.1.2.1 Construction

In the FEIS, the first approximately six miles of the Mainline were planned to be constructed above-ground, elevated on Vertical Support Members (VSMs) (USACE, 2012). That Mainline segment is now planned to be buried, similar to most of the Mainline, and it will be installed during the winter. The backfill, including surface organic material, will be left mounded on top of the trench to allow for settling, with the aim of the final ground surface being at or slightly above the grade of adjacent areas. Special techniques may need to be used for restoration of the trench to prevent alteration of the ice-rich permafrost. These may include using additional backfill to account for excess settling if wet permafrost thaws after pipe installation, installing ditch plugs (blocks of tundra or other native sod, bentonite, or other appropriate material), or revegetating to aid in achieving thermal stability of the soil in the trench. In drier areas, the trench backfill may remain above the surrounding grade even after settling. In this case, the backfill may be seeded with upland species. Where the trench intersects waterbodies or inundated areas, the backfill may settle below existing grade due to ground ice melting, resulting in stretches of the trench being inundated. Depending on the content of massive ice in the vicinity, some sections of inundated trench may propagate permafrost thaw into the surrounding area, especially where stretches of flooded trench intersect ice wedge troughs.

Since the FEIS (USACE, 2012), the plan for handling of topsoil has been refined. The proposed project will entail segregating topsoil and replacing it as the last layer of backfill in the trench in two situations, where practicable: in wetlands and within designated agricultural lands. This is not

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practicable when construction is done in winter, which will affect many wetlands areas. In most locations along the pipeline trench, topsoil will not be segregated and will be used as general back-fill. This could result in the loss of nutrients, organic matter, seed bank, and other plant parts that are beneficial to vegetation growth and site restoration. However, it is expected that, following stabilization, regrowth of vegetation will occur over time.

With advancement of the design of the proposed project, the project footprint has increased since the FEIS. The estimated volume of sand and gravel anticipated to be needed for bedding, temporary and permanent pads, and access roads has increased from levels that were previously not fully quantified (Table 5.1-1). Advancement of the design included closer evaluation of topography, soils, and trench slopes with respect to soil conditions, and accommodation of thermal requirements, which also contributed to the change in borrow volumes needed for construction. AGDC has also refined its estimates of the number of material sites to be used, from 546 identified in the FEIS to 89 developed material sites (Table 2-4, above). Construction plans also call for two additional privately-owned sites (1 near Willow, 1 near Fairbanks) to be used. Approximately 25 MCY of gravel will be required from the material sites along the different sections of the route (Table 5.1-1).

Table 5.1-1 compares the sand and gravel material needs known at the time of the FEIS and those anticipated for the ASAP Project based on the information available at the time of POD development; the spreads are similar but not identical between the two project concepts. The material needs for the Fairbanks Lateral were not identified in the FEIS (USACE, 2012; AGDC, 2014). As noted in the FEIS (USACE, 2012), a material site mining plan and a reclamation plan will be developed to reduce impacts associated with material extraction.

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Table 5.1-1 Comparison of Material Needs and Sites for the Alaska Stand Alone Pipeline Project

Spread	FEIS (USACE, 2012)				Current Project (AGDC, 2015)			
	Location	Spread Length (Miles)	ASAP Material Needs (CY)[a]	Material Sites Anticipated	Location	Spread Length (Miles)	ASAP Material Needs (CY)[b]	Developed Material Sites
1	GCF to Chandalar Shelf	183	2,501,000	49	GCF to southern side of Atigun Pass	181	6,750,000	18
2	Chandalar Shelf to Yukon River	177	5,375,000	75	Southern side of Atigun Pass to Yukon River	178	8,500,000	31
3	Yukon River to Healy	169	3,410,000	164	Yukon River to Yanert River	183	5,000,000	21
4	Healy to South Terminus	208	1,793,000	257	Yanert River to South Terminus	192	4,750,000[b]	18
FL	Fairbanks Lateral	34	Not reported	Not reported	Fairbanks Lateral	33	250,000[b]	1
Total:			**13,079,000[a]**	**546**			**25,250,000**	**89**

Notes:

a. 2012 FEIS material needs were never fully defined or quantified for all pads, access roads, and other features.

b. Current material site needs for Spread 4 and the Fairbanks Lateral do not include approximately 100,000 cubic yards required from each of two commercial sites to provide material for the eastern portion of the Fairbanks Lateral and for Willow. Quantities also do not include approximately 11,200 cubic yards of specialty railroad ballast and 233,400 cubic yards of slope armoring (rip rap) that will be purchased from existing commercial providers. The spread 1 estimate for the revised Project includes 2,000,000 cubic yards needed for the GCF facility and roads. Fairbanks Lateral

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Winter dredging at West Dock and dredge material disposal are elements new to the proposed project since the FEIS (USACE, 2012). Dredging of a navigation channel will entail removing approximately 250,000 cubic yards (CY) of bottom material to an elevation of -10 ft mean lower low water (MLLW) (Attachment 3). The dredge spoils will be trucked to a disposal location on the eastern shore of Prudhoe Bay, approximately 7.5 miles southeast of the dredge location near Dock Head (DH) 3 of West Dock. Dredge spoils will be deposited in piles approximately 1 to 2 ft deep over 100 acres of bottomfast ice. The material is expected to gradually be dispersed through gouging and scour by ice in winter, longshore transport by wind-driven current, and wave action during ice-free season storms (AGDC, 2015).

5.1.2.2 Operations

The proposed project route will cross two seismic zones and several fault lines. The potential effects of the project's location in seismically active areas do not differ from those described in the FEIS (USACE, 2012).

The potential hazard presented to long-term operation of the ASAP Project by frozen debris lobe 'A' near MP 193 – the closest to the proposed project – is being considered as design progresses. Appropriate methods to mitigate the hazard will be defined during detailed engineering. The Mainline alignment has shifted westward, and to the western side of the Dalton Highway, so the ASAP Mainline lies approximately 200 ft farther from the flow. The frozen debris lobes are not yet well understood, and their movement may be accelerated by a warming climate (Daanen et al., 2012).

5.1.2.3 Yukon River Crossing Variations and Denali National Park Route Variation

The potential effects of the Yukon River Crossing are expected to be the same as were described in the FEIS (USACE, 2012). However, Horizontal Directional Drilling (HDD) has been determined to be feasible, and this, rather than suspending the pipeline on a new bridge, is now the preferred option.

The FEIS description of effects related to soils and geology for the Denali National Park (DNP) Route Variation remains valid.

5.1.3 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

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Daanen, R.P., G. Grosse, M.M. Darrow, T.D. Hamilton, and B.M. Jones. 2012. "Rapid movement of frozen debris-lobes: implications for permafrost degradation and slope instability in the south-central Brooks Range, Alaska." *Natural Hazards and Earth System Science*. 12: 1521-1537. http://www.nat-hazards-earth-syst-sci.net/12/1521/2012/nhess-12-1521-2012.pdf. Accessed September 22-, 2014.

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

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5.2 WATER RESOURCES

Impacts to water resources, including surface waters, groundwater, and floodplains, have changed as a result of revisions to the Alaska Stand Alone Pipeline (ASAP) Project. The revisions are minimal in relation to the change in geographical scale and footprint of the project, and many revisions resulted in an overall reduction to the potential impacts to water resources.

A summary of probable centerline stream crossings was first reported to the Corps of Engineers in ASAP's 2010 Clean Water Act application leading up to the publication of the Project's Environmental Impact Statement in 2012. This list was developed by ASAP's engineering and wetlands teams through early desktop and field studies between 2009 and 2010 using the best available information at that time. Since then, changes in pipeline routing and the addition of new access roads and other facilities have occurred, and better desktop and field data for streams and wetlands have been collected.

From a wetlands perspective, a stream is defined as having seasonally flowing water (at least in most years), and by having bed and bank. The reason is that a riverine classification includes all habitats contained within a channel. These systems can be Relatively Permanent Waters (RPWs) (i.e., tributaries that typically flow year-round or have continuous flow at least seasonally) or Non-RPWs. Channels are defined by overseeing agencies as displaying an ordinary high water mark, which refers to the line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider characteristics of a surrounding area.

Hydrologic features without an ordinary high water mark may be wetlands and may be important considerations for engineers, but these do not meet the wetlands definition for streams. The engineering definition of a stream crossing, either by the pipeline centerline or by an access road, is that there exists surface water that is likely to require application of a special design method or mode (whether meeting the wetlands definition of a stream or not). This includes areas of permanently-flooded emergent wetlands, which can convey water through the landscape and require special design.

In previous Clean Water Act permit applications, ASAP has combined the engineering and wetlands-identified streams into a single stream list. After review, however, many of the streams as determined by the engineers did not meet the wetlands stream definition and were removed from the stream list. The stream list provided is a complete list of features that meet the wetlands definition of a stream. The additional field targets that were identified by engineering as areas requiring special design, but that do not meet the wetlands definition for a stream are now contained in a second list, termed "Hydrologic Points of Interest", or HPOI's (AGDC, 2015).

ASAP's waterways engineering team and its wetlands delineation team played key roles in developing a list of field targets visited in 2014 and 2015 to best inform construction modes and methods through areas that could require special design. Many of these selected "stream targets" required

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on-site visits for engineering purposes to assess surface water features identified during desktop analysis. In the FEIS, 515 stream crossings were reported, but project changes and field validations, in combination with applying wetland and engineering definitions of streams, has reduced this to 312 streams crossed by the Project and 179 hydrologic points of interest (HPOIs) (AGDC, 2015). The HPOI features do not meet the criteria relative to possessing an ordinary high water mark defined in a USACE Regulatory Guidance Letter (RGL) (05-05), but are jurisdictional areas for which engineers may need to give special design consideration. This is not an exhaustive list of HPOI's, but a categorization of initial field targets according to the correct definition.

5.2.1 Affected Environment

The ASAP Project, including Mainline, Fairbanks Lateral and off-ROW facilities (e.g., access roads) will cross or impact a total of 312 streams (See Section 5.2 for more detail). Of these streams, 265 will be on the Mainline, 7 on the Fairbanks Lateral, and 40 on access roads.

The ASAP 36-inch Mainline will cross approximately 265 streams or creeks (50 anadromous), as follows:

- 6 aerial (bridge) water crossings
- 155 isolated open cut crossings
- 97 open cut crossings
- 7 trenchless waterbody crossings using horizontal directional drilling (HDD), including the Yukon River

The 12-inch Fairbanks Lateral will cross 7 streams or creeks (0 anadromous), as follows:

- 4 isolated open cut crossings
- 3 open cut crossings

The access roads will result in culverts (pipes) or bridges being placed in or over 40 streams or creeks (14 anadromous) as follows:

- 17 bridges (14 temporary, 3 permanent)
- 23 culverts (4 temporary, 19 permanent)

The total number of centerline stream crossings in the FEIS was 515 (495 on the Mainline, and 20 on the Fairbanks Lateral) (USACE, 2012). This list was developed by ASAP's engineering and wetlands teams through early desktop and field studies between 2009 and 2010 using the best available information at that time. Since then, changes in pipeline routing and the addition of new access roads and other facilities have occurred, and better desktop and field data for streams and wetlands have been collected.

ASAP's waterways engineering team and its wetlands delineation team played key roles in developing a list of field targets to best inform construction modes and methods through areas that could

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require special design. Many of these selected targets required on-site visits for engineering purposes to assess surface water features identified during desktop analysis.

In addition to the 312 streams crossed by the Project, ASAP engineers and scientists have identified 179 hydrologic points of interest (HPOIs). The HPOI features do not meet the criteria relative to possessing an ordinary high water mark defined in the USACE Regulatory Guidance Letter (RGL) 05-05, but are jurisdictional areas for which engineers may need to give special design consideration.

From a wetlands perspective, a stream is defined as having seasonally flowing water (at least in most years), and by having bed and bank. The reason is that a riverine classification includes all habitats contained within a channel. These systems can be Relatively Permanent Waters (RPWs) (i.e., tributaries that typically flow year-round or have continuous flow at least seasonally) or Non-RPWs. Channels are defined by overseeing agencies as displaying an ordinary high water mark, which refers to the line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider characteristics of a surrounding area.

Hydrologic features without an ordinary high water mark may be wetlands and may be important considerations for engineers, but these do not meet the wetlands definition for streams. The engineering definition of a stream crossing, either by the pipeline centerline or by an access road, is that there exists surface water that is likely to require application of a special design method or mode (whether meeting the wetlands definition of a stream or not). This includes areas of permanently-flooded emergent wetlands, which can convey water through the landscape and require special design.

In previous submittals, we have combined the engineering- and wetlands-identified streams into a single stream list. After review, however, many of the streams as determined by the engineering staff did not meet the wetlands stream definition and were removed from the stream list. The attached stream list is a complete list of features that meet the wetlands definition of a stream. The additional field targets that were identified by engineering but that do not meet the wetlands definition for a stream are now contained in a second list, termed “Hydrologic Points of Interest”, or HPOI’s.

The pipeline construction ROW is positioned nearby streams that it does not cross or directly impact. Nearby streams will be evaluated on a site-by-site basis to determine whether special planning or mitigation is needed at these sites during construction or operation of the pipeline.

Some material sources along the Sagavanirktok River in the Northern region will utilize gravel from river banks. This siting is being done with consideration of input from the Alaska Department of Fish and Game (ADFG).

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There have been no substantive changes to the federal, state, or local regulations applicable to the proposed project. The FEIS description of the environment remains very similar, since route realignments did not result in realignments far from the previous alignment. Alignment changes did result in a reduction in the total number of stream crossings; however, the revised alignment remains in the same watersheds and does not change the description of the potentially affected watershed characteristics, surface waters, groundwater, and floodplains in the hydrologic regions.

5.2.2 Environmental Consequences

5.2.2.1 Construction

The overall number and location of river and stream crossings have changed based on the proposed revisions to the pipeline alignment. The total number of stream crossings since the FEIS has been reduced to 312 (265 Mainline, 7 Fairbanks Lateral, 40 access roads) (Table 5.2-1). Since the FEIS, access roads stream crossings have been defined and incorporated into the project footprint. Reducing the number of centerline stream crossings has reduced the potential impact to surface waters within the project area. Several HPOIs have been identified that will require special construction techniques.

Construction will not result in long-term impacts to stream flow regimes or stream profiles. It is expected that disturbances will be temporary and a direct result of actual construction activities. Stream characteristics and riparian areas will be restored to preconstruction conditions to the maximum practicable extent.

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Table 5.2-1 Stream Crossings and Characteristics

A. Mainline

Mainline Stream ID	Stream Name	NHD Stream Type	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)	Perm. Vol. (CY)	Temp. Vol. (CY)
ST_3.1	Putuligayuk River	Perennial	AS	-148.58862	70.2805546	264	N/A	0
ST_4.7	Unknown	Artificial Path	OC	-148.62989	70.2613195	73	1,100	550
ST_27.2	Unknown	Perennial	OC	-148.75789	69.9472865	33	300	100
ST_74.5	Unknown	Perennial	OC	-148.74327	69.3031662	76	1,100	550
ST_76.5	Unknown	Perennial	OC	-148.77265	69.2762727	105	1,800	900
ST_76.7	Unknown	Perennial	OC	-148.77454	69.2729679	15	300	100
ST_76.9	Unknown	Perennial	OC	-148.77378	69.2712631	32	600	300
ST_82.5	Unknown	Perennial	OC	-148.82763	69.1951417	18	300	100
ST_85.1	Unknown	Perennial	OC	-148.84205	69.1600577	32	300	100
ST_88.1	Unknown	Perennial	OC	-148.86422	69.1235502	33	300	100
ST_90.2	Unknown	Perennial	OC	-148.83687	69.0959935	37	300	100
ST_99	Unknown	Perennial	OC	-148.88924	68.97641	39	300	100
ST_100.5	Unknown	Perennial	OC	-148.89695	68.957104	10	300	100
ST_101.5	Dan Creek	Perennial	OC	-148.90002	68.9432864	6	100	100
ST_106.7	Oksrukuyik Creek Tributary	Perennial	OC	-148.88075	68.8691732	35	300	100
ST_108.5	Oksrukuyik Creek Tributary	Perennial	OC	-148.86019	68.8437823	102	1,300	100
ST_121.5	Unknown	Perennial	OC	-149.07951	68.6956947	31	300	100
ST_128.5	Toolik River	Perennial	IOC	-149.31946	68.646814	25	400	300
ST_129.2	Imnavait Creek	Perennial	IOC	-149.34259	68.6413655	12	300	100

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Mainline Stream ID	Stream Name	NHD Stream Type	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)	Perm. Vol. (CY)	Temp. Vol. (CY)
ST_130.8	Kuparuk River	Perennial	IOC	-149.38167	68.6237979	45	300	500
ST_132.3	Unknown	Intermittent	IOC	-149.41542	68.6081264	5	300	100
ST_160.2	Unknown	Artificial Path	IOC	-149.37106	68.4518746	379	2,600	3900
ST_221.3	Unknown	Intermittent	IOC	-149.32807	68.4117042	103	1,800	1100
ST_405.3	Unknown	Perennial	OC	-149.32301	68.4071322	975	4,100	6900
ST_594.3	Unknown	Perennial	OC	-149.31419	68.3734622	54	1,000	400
ST_594.4	Unknown	Perennial	IOC	-149.36855	68.2847682	4	100	100
ST_157.4	Trevor Creek	Perennial	IOC	-149.37192	68.2835229	24	300	200
ST_158.3	Unknown	Intermittent	IOC	-149.39245	68.2723278	68	1,000	700
ST_158.9	Unknown	Intermittent	IOC	-149.40356	68.2645287	15	300	200
ST_160.2	Unknown	Intermittent	OC	-149.42044	68.2472239	58	1000	400
ST_160.5	Unknown	Intermittent	IOC	-149.42127	68.2434816	62	1,000	600
ST_162	Unknown	Perennial	IOC	-149.40909	68.2230194	102	1,800	1000
ST_162.6	Atigun River	Artificial Path	IOC	-149.4113	68.2156041	747	3,500	7600
ST_163.5	Unknown	Perennial	OC	-149.40828	68.2024309	48	400	300
ST_163.7	Unknown	Intermittent	OC	-149.41187	68.1996511	18	300	100
ST_165.3	Unknown	Intermittent	OC	-149.43006	68.1794408	22	300	200
ST_165.4	Unknown	Intermittent	OC	-149.43248	68.1776135	12	200	100
ST_166	Spike Camp Creek	Artificial Path	IOC	-149.43874	68.1693836	67	1,000	700
ST_166.5	Unknown	Intermittent	OC	-149.43635	68.1642531	48	400	300
ST_167.5	Unknown	Intermittent	IOC	-149.44128	68.1485937	25	300	300
ST_168	Unknown	Intermittent	OC	-149.44522	68.1416621	28	300	200
ST_168.2	Unknown	Intermittent	OC	-149.4462	68.1394854	78	1,100	600

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ST_169.9	Unknown	Perennial	OC	-149.49115	68.1275229	179	2,000	1300
ST_171.6	Unknown	Perennial	IOC	-149.53785	68.1134391	385	3,500	3900
ST_173.1_2	Unknown	Intermittent	OC	-149.5503	68.0935418	27	300	200
ST_173.5	Unknown	Perennial	OC	-149.55496	68.0886493	118	1,900	800
ST_174.9	Unknown	Intermittent	OC	-149.59028	68.0744162	99	1,100	700
ST_178.2	Trib to Dietrich River	Perennial	IOC	-149.65447	68.036275	22	300	200
ST_178.3_1	Dietrich River	Perennial	IOC	-149.6566	68.0362596	248	2,200	2500
ST_178.3_2	Dietrich River	Perennial	IOC	-149.65811	68.0358678	332	2,400	3400
ST_178.4	Dietrich River	Perennial	IOC	-149.66261	68.0347091	776	5,200	8000
ST_178.6	Dietrich River	Perennial	IOC	-149.66712	68.0335111	417	2,900	4300
ST_178.9	Dietrich River	Perennial	IOC	-149.67604	68.0315797	208	3,000	2200
ST_178.9_1	Dietrich River	Perennial	IOC	-149.67826	68.0313653	170	2,000	1700
ST_178.9_2	Dietrich River	Perennial	IOC	-149.68017	68.031209	398	2,600	4100
ST_179	Dietrich River	Perennial	IOC	-149.68328	68.0309951	480	2,800	4900
ST_179.2_1	Dietrich River	Perennial	IOC	-149.68704	68.0307374	256	2,200	2600
ST_179.2_2	Dietrich River	Perennial	IOC	-149.68848	68.0306386	145	2,000	1500
ST_179.3	Dietrich River	Perennial	IOC	-149.69387	68.0302697	300	2,400	3100
ST_180.3	Unknown	Perennial	IOC	-149.72237	68.0227646	25	300	300
ST_181.6	Dietrich River	Perennial	IOC	-149.74744	68.0061143	227	2,200	2300
ST_183.5	Unknown	Perennial	IOC	-149.76073	67.9828605	10	300	100
ST_184.4	Unknown	Intermittent	IOC	-149.76668	67.9703528	80	1,100	800
ST_184.9	Unknown	Perennial	IOC	-149.76862	67.9628571	77	1,100	800
ST_185.3	Unknown	Intermittent	IOC	-149.77081	67.9572284	12	300	100

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ST_187.4	Nutirwik Creek	Artificial Path	IOC	-149.81844	67.9344833	106	1,900	1100
ST_189.5	Unknown	Intermittent	IOC	-149.81661	67.9052494	50	1,000	500
ST_189.8	Unknown	Intermittent	OC	-149.81595	67.9012775	14	300	100
ST_190.5	Unknown	Perennial	IOC	-149.81836	67.8907238	210	2,100	2100
ST_193.5	Unknown	Perennial	IOC	-149.82821	67.8487877	268	3,300	2800
ST_194.9	Unknown	Intermittent	IOC	-149.83079	67.8277718	389	2,600	4000
ST_196.1	Unknown	Perennial	IOC	-149.82486	67.8108167	9	100	100
ST_197.6	Unknown	Intermittent	OC	-149.80428	67.7925386	56	1,000	400
ST_198.9	Unknown	Intermittent	IOC	-149.77857	67.7756954	148	2,000	1500
ST_201.7	Snowden Creek	Perennial	IOC	-149.75288	67.7375777	114	1,900	1200
ST_202.7_1	Unknown	Intermittent	OC	-149.74046	67.7254736	6	100	100
ST_202.8	Unknown	Intermittent	OC	-149.73972	67.7242326	32	300	200
ST_204.6	Unknown	Perennial	IOC	-149.72755	67.6982871	100	1,800	1000
ST_207.3	Unknown	Perennial	IOC	-149.71857	67.6598206	238	2,200	2400
ST_208.6	Dietrich River	Artificial Path	IOC	-149.74054	67.6454777	203	2,100	1050
ST_209	Unknown	Perennial	IOC	-149.75345	67.642295	29	300	300
ST_210.9	Middle Fork Koyokuk River 3	Artificial Path	IOC	-149.78724	67.6192196	2023	8,400	4200
ST_213.1	Unknown	Perennial	IOC	-149.7865	67.5881402	23	300	200
ST_218.3	Linda Creek	Perennial	IOC	-149.84393	67.5196885	40	300	400
ST_218.9	Gold Creek	Perennial	IOC	-149.85107	67.5123506	44	300	500
ST_219.7	Sheep Creek	Perennial	IOC	-149.85604	67.5008785	217	2,100	2200
ST_220.2	Wolf Pup Creek	Perennial	IOC	-149.85857	67.4935144	12	300	100
ST_221	Nugget Creek	Perennial	IOC	-149.86349	67.4834455	23	300	200

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ST_221.3	Unknown	Intermittent	IOC	-149.87376	67.481322	14	300	100
ST_224.8	Unknown	Intermittent	IOC	-149.99369	67.4603247	52	600	500
ST_225.7	Unknown	Intermittent	IOC	-150.02512	67.4558472	4	100	100
ST_225.8	Unknown	Ephemeral	OC	-150.02908	67.4552765	53	600	400
ST_226.1	Unknown	Intermittent	IOC	-150.03717	67.4540362	15	300	200
ST_226.8	Unknown	Intermittent	IOC	-150.05287	67.4471355	3	100	100
ST_228.9	Minnie Creek	Perennial	IOC	-150.07873	67.4201169	63	1,000	600
ST_230.3	Unknown	Intermittent	IOC	-150.0947	67.4011931	23	300	200
ST_233.6	Unknown	Intermittent	IOC	-150.13057	67.3561068	15	300	200
ST_236.3	Marion Creek	Perennial	IOC	-150.16095	67.3198955	68	1,000	500
ST_239.5	Clara Creek	Perennial	IOC	-150.1634	67.2732127	7	100	100
ST_240.8	Slate Creek	Perennial	IOC	-150.16658	67.2552692	103	1,800	1100
ST_246	Rosie Creek	Perennial	OC	-150.26488	67.1971105	64	700	500
ST_254.2	Chapman Creek	Perennial	IOC	-150.35044	67.0967004	5	100	100
ST_260.5	South Fork Ko-yokuk River	Artificial Path	IOC	-150.28376	67.0176584	261	3,100	1050
ST_262.6	Unknown	Perennial	OC	-150.30141	66.9906869	8	100	100
ST_270.8	Unknown	Intermittent	OC	-150.47762	66.8970114	12	300	100
ST_272.2	Jim River	Artificial Path	IOC	-150.51172	66.883027	217	2,400	2200
ST_274.5	Douglas Creek	Perennial	OC	-150.55662	66.8559254	86	1,300	700
ST_281.2	Prospect Creek	Perennial	IOC	-150.66824	66.7782638	68	1,000	700
ST_285.5	Little Nasty Creek	Perennial	IOC	-150.65634	66.7164559	210	2,100	2100
ST_288.2	North Fork Bo-nanza Creek	Perennial	IOC	-150.64746	66.6825236	77	1,100	800

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ST_289.8	Bonanza Creek	Perennial	IOC	-150.65591	66.6602414	71	1,000	700
ST_298.4	Fish Creek	Perennial	IOC	-150.71934	66.547764	50	1,000	500
ST_300.1	Unknown	Perennial	IOC	-150.71705	66.5249767	19	300	200
ST_301.1	Unknown	Perennial	IOC	-150.71205	66.5099555	18	300	200
ST_306.8	Kanuti River	Artificial Path	IOC	-150.62725	66.4413715	88	1,100	550
ST_321.7	Dall Creek	Perennial	IOC	-150.34789	66.2679836	15	300	200
ST_333.7	No Name Creek	Perennial	IOC	-150.16684	66.1162141	37	300	400
ST_366.3	Isom Creek	Perennial	IOC	-149.4732	65.7969877	4	100	100
ST_340.2	Fort Hamlin Hills Creek	Perennial	IOC	-150.13039	66.0283758	22	300	200
ST_347.2	Unknown	Perennial	IOC	-149.96247	65.9622096	17	300	200
ST_356	Yukon River	Artificial Path	TD	-149.74205	65.8797915	2185	3,800	15500
ST_364.2	Unknown	Perennial	IOC	-149.53425	65.8118937	3	100	100
ST_373.1	Unknown	Perennial	IOC	-149.29026	65.7391291	2	100	100
ST_374.2	Unknown	Perennial	IOC	-149.25952	65.7292097	3	100	100
ST_374.8	Unknown	Perennial	OC	-149.24265	65.7246682	2	100	100
ST_376.9	Unknown	Perennial	IOC	-149.17976	65.7102664	3	100	100
ST_381	Hess Creek	Artificial Path	IOC	-149.07394	65.6728185	139	1,900	1400
ST_384.9	Unknown	Perennial	IOC	-148.99262	65.6320829	3	100	100
ST_387.2	Unknown	Perennial	IOC	-148.94819	65.6090012	9	100	100
ST_390.5	Erickson Creek	Perennial	IOC	-148.87272	65.5740508	4	100	100
ST_394.9	Lost Creek	Perennial	IOC	-148.79125	65.5227633	14	200	100
ST_398.1	Unknown	Perennial	OC	-148.70596	65.4956347	4	100	0

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ST_401.3	East Fork Tolovana River	Perennial	IOC	-148.63304	65.4611514	69	1,000	700
ST_404.2	Unknown	Perennial	OC	-148.60866	65.4206454	9	100	100
ST_404.4	Winter Creek	Perennial	OC	-148.60866	65.4182503	3	100	100
ST_405	Unknown	Perennial	OC	-148.60868	65.4095976	4	100	100
ST_405.3	Unknown	Perennial	OC	-148.60869	65.4055463	1	300	100
ST_406.6	Unknown	Perennial	OC	-148.60873	65.3859178	12	300	100
ST_409.3	Unknown	Ephemeral	OC	-148.58353	65.3538351	3	0	100
ST_429.2	Tatalina River	Perennial	IOC	-148.67801	65.0985529	64	1,000	500
ST_430.6	Unknown	Perennial	IOC	-148.6746	65.0785024	48	400	200
ST_431.3	Washington Creek	Perennial	IOC	-148.66908	65.0692416	40	300	100
ST_437.6	Chatanika River	Artificial Path	IOC	-148.68178	64.9785791	185	2,100	1050
ST_442.1	Unknown	Perennial	OC	-148.6866	64.9184321	74	1,100	550
ST_442.8	Unknown	Perennial	OC	-148.68066	64.9089224	37	300	100
ST_444.1	Unknown	Perennial	OC	-148.68015	64.890698	3	100	100
ST_445.2	Unknown	Perennial	OC	-148.69914	64.877333	12	300	100
ST_447.5	Unknown	Perennial	OC	-148.7525	64.8547776	5	100	100
ST_448.4	Unknown	Perennial	OC	-148.76403	64.8440313	5	100	100
ST_449.3	Unknown	Perennial	OC	-148.76752	64.8328011	14	200	100
ST_451	Unknown	Perennial	OC	-148.77537	64.8095191	3	100	100
ST_453.8	Goldstream Creek	Perennial	IOC	-148.82679	64.7799154	97	1,100	550
ST_464.5	Unknown	Perennial	OC	-149.0355	64.6599036	65	600	100

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ST_464.6	Little Goldstream Creek	Perennial	IOC	-149.03546	64.6581051	33	300	100
ST_471.9	Tanana River	Artificial Path	TD	-149.11786	64.5688532	2283	3,900	1950
ST_475	Nenana River	Artificial Path	IOC	-149.14882	64.5271224	301	2,400	1200
ST_484.5	Unknown	Perennial	IOC	-149.26218	64.4009349	51	1,000	500
ST_488.2	Nenana River	Artificial Path	IOC	-149.30109	64.3509717	43	300	100
ST_493.4	Unknown	Perennial	OC	-149.30209	64.2769682	3	100	100
ST_500.5	Birch Creek	Perennial	IOC	-149.29158	64.1760518	9	100	100
ST_501.1	Unknown	Perennial	IOC	-149.28451	64.1683683	2109	7,000	21600
ST_503.7	Bear Creek	Perennial	IOC	-149.25134	64.1352779	57	600	600
ST_503.9	June Creek	Perennial	IOC	-149.24801	64.1325248	16	300	200
ST_511.7	Rock Creek	Perennial	OC	-149.14265	64.0319503	30	300	200
ST_514.7	Slate Creek	Perennial	IOC	-149.12111	63.989618	44	300	500
ST_518.6	Little Panguingue Creek	Perennial	IOC	-149.09961	63.9367266	28	300	300
ST_519.9	Panguingue Creek	Perennial	OC	-149.07805	63.9201293	57	1,000	500
ST_522.4	Unknown	Perennial	IOC	-149.08009	63.8859937	8	100	100
ST_524.8	Dry Creek	Artificial Path	OC	-149.06511	63.8525229	610	3,200	4300
ST_529.2	Antler Creek	Perennial	IOC	-148.97761	63.8154297	38	300	400
ST_530.3	Bison Gulch	Perennial	IOC	-148.95426	63.8042918	24	300	200
ST_530.9	Nenana River	Artificial Path	AS	-148.93332	63.8028195	192	1,800	0
ST_531.2	Coyote Creek	Perennial	OC	-148.92725	63.800431	5	100	100
ST_531.6	Dragonfly Creek	Perennial	OC	-148.92246	63.7959531	22	300	200

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ST_531.9	Eagle Creek	Perennial	OC	-148.91927	63.7904192	3	100	100
ST_532.7	Coyote Creek	Perennial	OC	-148.90932	63.7803017	39	300	300
ST_533.1	Grizzly Creek	Perennial	OC	-148.90971	63.7753861	3	100	100
ST_533.7	Hornet Creek	Perennial	OC	-148.90876	63.76647	58	1,000	400
ST_533.9	Ice Worm Gulch	Perennial	OC	-148.90708	63.7639294	80	1,100	600
ST_534.9	Junco Creek	Perennial	OC	-148.89934	63.7503354	7	100	100
ST_535.7	Kingfisher Creek	Perennial	OC	-148.89017	63.7404052	34	300	200
ST_536.7	Lynx Creek	Perennial	AS	-148.86428	63.7333186	13	200	100
ST_537.4	Montana Creek	Perennial	IOC	-148.85995	63.7238479	9	100	100
ST_540.3	Unknown	Perennial	OC	-148.78895	63.6978555	11	300	100
ST_540.9	Unknown	Perennial	IOC	-148.77857	63.69216	19	400	200
ST_541.2	Unknown	Perennial	IOC	-148.77636	63.6880948	5	100	100
ST_541.6	Yanert Fork	Artificial Path	IOC	-148.77234	63.6819757	150	2,000	1000
ST_550.1	Carlo Creek	Perennial	OC	-148.80196	63.5699815	8	100	100
ST_550.7	Unknown	Intermittent	OC	-148.80529	63.5619788	3	100	100
ST_554.9	Slime Creek	Perennial	IOC	-148.80852	63.5068606	32	300	300
ST_558.6	Nenana River	Artificial Path	AS	-148.80444	63.456288	357	2,500	1250
ST_559.5_1	Unknown	Perennial	OC	-148.81359	63.4463878	8	100	100
ST_559.5_2	Unknown	Perennial	IOC	-148.81453	63.4457971	15	300	200
ST_559.6	Unknown	Perennial	IOC	-148.81557	63.4451393	33	300	300
ST_560.9	Unknown	Perennial	IOC	-148.83658	63.4283604	146	2,000	1500
ST_564	Unknown	Perennial	OC	-148.87929	63.391129	23	300	200
ST_564.7	Jack River	Perennial	IOC	-148.89152	63.3838904	140	1,900	1400
ST_565	Unknown	Perennial	OC	-148.89465	63.3813886	3	100	100

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ST_565.1	Unknown	Perennial	OC	-148.89879	63.3814133	11	100	100
ST_566.6	Pass Creek	Perennial	IOC	-148.94754	63.3742776	344	2,500	3500
ST_579	Unknown	Perennial	IOC	-149.24152	63.2716358	5	100	100
ST_580.3	Unknown	Perennial	IOC	-149.26764	63.256637	8	100	100
ST_580.8	Squaw Creek	Perennial	IOC	-149.27955	63.2525747	26	300	300
ST_581.4	Unknown	Intermittent	OC	-149.29163	63.2458333	3	0	0
ST_581.8	Unknown	Perennial	IOC	-149.29917	63.2412554	15	300	200
ST_582.9	Unknown	Perennial	IOC	-149.32224	63.2285183	8	100	100
ST_583.7	Unknown	Perennial	IOC	-149.33161	63.2191572	307	2,400	3100
ST_584.2	Middle Fork Chu-litna River	Perennial	IOC	-149.32668	63.2118484	93	1,100	550
ST_584.7	Fourth of July Creek	Perennial	IOC	-149.33414	63.2060041	13	300	100
ST_587.6	East Fork Chu-litna River	Perennial	IOC	-149.36076	63.1722421	117	1,900	1200
ST_588.5	Unknown	Intermittent	IOC	-149.36999	63.1619972	11	300	100
ST_591.4	Hardage Creek	Perennial	IOC	-149.42675	63.1293147	26	300	300
ST_591.8	Unknown	Perennial	IOC	-149.43288	63.1238494	60	1,000	600
ST_594.2	Antimony Creek	Perennial	IOC	-149.47038	63.0970397	4	100	100
ST_594.3	Unknown	Perennial	OC	-149.47121	63.0956441	2	300	100
ST_594.4	Unknown	Perennial	OC	-149.47162	63.0949525	2	300	100
ST_596.1	Honolulu Creek	Perennial	TD	-149.482	63.0708854	114	1,900	950
ST_597	Unknown	Perennial	IOC	-149.49439	63.0595523	3	100	100
ST_598.6	Unknown	Perennial	IOC	-149.51468	63.0389515	4	100	100

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Mainline Stream ID	Stream Name	NHD Stream Type	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)	Perm. Vol. (CY)	Temp. Vol. (CY)
ST_599.4	Little Honolulu Creek	Perennial	IOC	-149.52386	63.0295037	4	100	100
ST_601.1	Hurricane Gulch	Perennial	IOC	-149.54673	63.0076392	40	300	400
ST_604.5	Granite Creek	Perennial	IOC	-149.62539	62.9764973	6	100	100
ST_607.3	Division Creek	Perennial	OC	-149.66964	62.9432692	8	100	100
ST_607.8	Unknown	Perennial	OC	-149.67545	62.9359494	8	100	100
ST_610	Pass Creek	Perennial	IOC	-149.71352	62.9105732	32	300	100
ST_610.3	Unknown	Perennial	OC	-149.71949	62.9078185	2	100	100
ST_612.1	Little Coal Creek	Perennial	IOC	-149.77079	62.8954632	17	300	200
ST_614.1	Unknown	Perennial	IOC	-149.81847	62.8790003	13	300	100
ST_615.6	Horseshoe Creek	Perennial	IOC	-149.86292	62.8707414	18	300	200
ST_631.8	Byers Creek	Perennial	IOC	-150.19992	62.7101086	66	1,000	700
ST_635.6	Unknown	Perennial	IOC	-150.22568	62.6648111	30	300	300
ST_638.4	Troublesome Creek	Perennial	TD	-150.23	62.6267069	158	1,700	1100
ST_639.2	Chulitna River	Artificial Path	TD	-150.2512	62.6194927	1745	3,300	1650
ST_640.3	Unknown	Perennial	IOC	-150.27399	62.611601	3	100	100
ST_647.8	Unknown	Perennial	OC	-150.25999	62.5137957	37	300	100
ST_650.5	Unknown	Perennial	OC	-150.27887	62.4772196	10	300	100
ST_652.2	Unknown	Perennial	OC	-150.27556	62.454044	26	600	100
ST_656.4	Unknown	Perennial	OC	-150.26462	62.3946393	4	0	100
ST_658.9	Unknown	Perennial	OC	-150.26333	62.3591799	6	100	100
ST_661.2	Trapper Creek	Perennial	OC	-150.27334	62.3307884	73	1,100	550
ST_667.5	Sawmill Creek	Perennial	OC	-150.25477	62.2435863	50	900	450

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ST_669.8	Trib to Rabideux Creek	Perennial	OC	-150.23822	62.2132364	19	300	0
ST_670	Unknown	Perennial	OC	-150.23793	62.2094003	4	100	0
ST_670.9	Queer Creek	Perennial	IOC	-150.23702	62.1975209	25	300	300
ST_672	Rabideux Creek	Perennial	IOC	-150.21044	62.1884678	71	1,000	700
ST_673	Unknown	Perennial	OC	-150.1889	62.1792503	5	100	100
ST_673.5	Susitna River	Artificial Path	AS	-150.17523	62.1756758	923	2,500	1250
ST_677.4	Unknown	Perennial	OC	-150.09915	62.1361024	34	300	100
ST_680.7	Montana Creek	Perennial	AS	-150.0603	62.1044462	97	1,000	500
ST_683.7	Goose Creek	Perennial	IOC	-150.061	62.0615291	72	1,000	500
ST_685.4	Susitna Slough	Perennial	IOC	-150.08856	62.0419631	93	1,100	550
ST_687.3	Susitna Slough	Perennial	IOC	-150.09726	62.0163175	148	2,000	1000
ST_690.4	Sheep Creek Slough	Perennial	IOC	-150.08054	61.9744484	132	1,900	950
ST_692.5	Caswell Creek	Perennial	IOC	-150.07531	61.9458283	69	1,000	500
ST_694.5	Kashwitna River	Artificial Path	TD	-150.08094	61.9200951	194	1,800	900
ST_695.8	197 1/2 Mile Creek	Perennial	OC	-150.06377	61.9070928	251	2,200	1100
ST_696.4	Unknown	Intermittent	OC	-150.0625	61.8997041	16	300	100
ST_697	196 Mile Creek	Perennial	IOC	-150.06449	61.8910044	309	2,400	1200
ST_702.7	North Fork Little Willow Creek	Perennial	OC	-150.11232	61.8156389	9	100	100
ST_702.9	Little Willow Creek	Perennial	IOC	-150.1152	61.8139099	78	1,100	550

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Mainline Stream ID	Stream Name	NHD Stream Type	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)	Perm. Vol. (CY)	Temp. Vol. (CY)
ST_703	Little Willow Creek Slough	Perennial	OC	-150.11713	61.8124038	33	300	100
ST_705.5	Willow Creek	Artificial Path	TD	-150.12284	61.7769499	169	1,700	1650
ST_713.1	Rolly Creek	Perennial	IOC	-150.15897	61.6786595	35	300	100
ST_719.7	Fish Creek	Perennial	IOC	-150.22536	61.5918018	175	2,000	1000
ST_729.1	Little Susitna River	Artificial Path	IOC	-150.14125	61.4708419	197	2,100	1050
						Total	**242,700**	**220,550**

Notes:

AS = Aerial Span (Bridge)
IOC = Isolated Open Cut
OC = Open Cut
TD = Trenchless Drilling (HDD)

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B. Fairbanks Lateral

Fairbanks Lateral Stream ID	Stream Name	NHD Stream Type	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)	Perm. Vol. (CY)	Temp. Vol. (CY)
ST_1.4	Unknown	Intermittent	OC	-148.648	64.9484	4	20	20
ST_7	Hard Luck Creek	Perennial	IOC	-148.4813	64.9494	3	50	30
ST_21.3	West Fork Moose Creek	Perennial	IOC	-148.0518	64.9464	3	310	500
ST_24.8	Goldstream Creek	Perennial	IOC	-147.9794	64.9158	49	60	30
ST_25.3	Happy Creek	Perennial	OC	-147.9732	64.9091	10	50	30
ST_29.2	Sheep Creek	Perennial	OC	-147.9031	64.8688	4	270	170
ST_30.3	Ace Creek	Perennial	IOC	-147.8753	64.8602	24	40	20
						Total	**800**	**800**

Notes:

IOC = Isolated Open Cut
OC = Open Cut

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C. Access Roads

Crossing Description								
Access Rd Stream Crossing ID	Stream Name	Long. (DD 83)	Lat. (DD 83)	Road Name	Type	Crossing Type	OHW Width (ft)	Fill (CY)
0000-01	Unknown	-148.573	70.3268	GCF Access Road	Perm.	Culvert	32	100
0000-02	Unknown	-148.582	65.3535	AR-N-409.6	Perm.	Culvert	3	100
0000-03	Unknown	-149.468	63.073	AR-NSF-595.5	Perm.	Culvert	113	100
0000-04	Unknown	-149.116	64.5566	AR-BV-YD-E-472.73	Perm.	Bridge	593	0
0000-05	Unknown	-149.634	62.9769	AR-YD-N-604.36	Perm.	Culvert	12	100
0000-06	Unknown	-148.774	63.6886	AR-BV-MS-536.86	Perm.	Culvert	10	100
0000-07	Unknown	-149.473	63.0743	AR-NSF-595.5	Perm.	Culvert	15	100
0032-01	Unknown	-148.704	70.0425	Ar_BV-20.27	Perm.	Culvert	57	195
0385-01	Unknown	-149.436	68.1666	AR-N-166.24	Perm.	Culvert	25	100
0410-01	Unknown	-149.533	68.1153	AR-171.37	Temp.	Bridge	111	0
0460-01	Dietrich River	-149.709	68.0242	AR-MS-180.03	Perm.	Bridge	39	578
0465-01	Dietrich River	-149.74	68.0101	AR-181.36	Temp.	Bridge	297	0
0466-01	Unknown	-149.739	68.0083	AR-181.36	Temp.	Culvert	4	5
0466-03	Unknown	-149.744	68.0054	AR-181.76	Temp.	Culvert	5	16
0785-01	Unknown	-150.631	66.8242	AR-CAMP-YD-277.83	Perm.	Bridge	3	306
0845-02	Unknown	-150.78	66.5355	AR-MS-299.52	Perm.	Bridge	23	433
1049-01	West Fork Tolovana River	-148.666	65.4602	AR-MS-401.56	Perm.	Bridge	151	474
1049-05	Tolovana River	-148.639	65.4587	AR-MS-401.56	Perm.	Bridge	164	664
1135-04	Unknown	-149.168	64.4884	AR-MS-477.94	Temp.	Bridge	42	0

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Crossing Description								
Access Rd Stream Crossing ID	Stream Name	Long. (DD 83)	Lat. (DD 83)	Road Name	Type	Crossing Type	OHW Width (ft)	Fill (CY)
1135-06	Unknown	-149.163	64.4883	AR-MS-477.94	Temp.	Culvert	65	510
1180-02	Unknown	-149.322	64.2846	AR-BV-MS-492.73	Perm.	Culvert	10	34
1321-03	Yanert Fork	-148.771	63.6822	AR-MS-543.1	Perm.	Bridge	187	485
1321-05	Unknown	-148.777	63.695	AR-MS-543.1	Perm.	Culvert	3	10
1321-06	Unknown	-148.788	63.6979	AR-MS-543.1	Perm.	Culvert	4	10
1321-08	Montana Creek	-148.858	63.7237	AR-BV-MS-536.86	Perm.	Bridge	11	376
1321-09	Unknown	-148.777	63.688	AR-BV-MS-536.86	Perm.	Culvert	12	27
1329-02	Unknown	-148.807	63.5619	AR-550.72	Temp.	Culvert	6	12
1491-02	Unknown	-149.575	63.0053	AR-MR-601.78	Perm.	Culvert	3	45
1491-03	Unknown	-149.588	63.0084	AR-MS-601.78	Perm.	Culvert	2	14
1600-01	Queer Creek	-150.22	62.1914	AR-MS-671.36	Perm.	Bridge	26	526
1612-03	Unknown	-150.097	62.1436	AR-MS-676.59	Perm.	Culvert	24	116
1636-01	Sheep Creek Slough	-150.067	61.9879	MS-689.51	Perm.	Bridge	72	491
1669-01	Unknown	-150.11	61.8156	AR-MS-702.65	Perm.	Culvert	17	99
1692-02	Unknown	-150.222	61.5975	AR-BV-718.7	Perm.	Culvert	2	22
1692-03	Fish Creek	-150.211	61.5946	AR-BV-718.7	Perm.	Bridge	126	416
1695-08	Unknown	-150.109	61.5658	AR-BV-MS-721.68	Perm.	Bridge	48	410
1695-09	Little Susitna River	-150.098	61.5642	AR-BV-MS-721.68	Perm.	Bridge	102	867
1695-10	Unknown	-150.012	61.5518	AR-BV-MS-721.68	Perm.	Bridge	26	393
1695-11	Unknown	-150	61.5508	AR-BV-MS-721.68	Perm.	Culvert	6	111

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Crossing Description								
Access Rd Stream Crossing ID	Stream Name	Long. (DD 83)	Lat. (DD 83)	Road Name	Type	Crossing Type	OHW Width (ft)	Fill (CY)
1695-12	Unknown	-149.978	61.5616	AR-BV-MS-721.68	Perm.	Culvert	21	150
						Total	**2,473**	**8,497**

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5.2.3 Gas Conditioning Facility to Mile Post 531

The proposed ASAP Project Mainline Right-of-Way (ROW) from Mile Post (MP) 0 to MP 531 will have 172 crossings that are considered streams and rivers. All available crossing methods are expected to be used in this segment. The amount of water resources impacted by access roads will depend on the number of access roads necessary for construction.

5.2.3.1 Mile Post 531 to Mile Post 542

The proposed ASAP Project ROW from MP 531 to MP 542 will have 15 crossings that are considered streams and rivers. Impacts from construction will primarily stem from the addition of access roads, as there are fewer streams in this segment. Impacts will depend on number and location of access roads, and these have yet to be finalized.

5.2.3.2 Mile Post 542 to Mile Post 733.5

The proposed ASAP Project ROW from MP 542 to MP 733.5 (the terminus) will have 78 crossings that are considered streams and rivers. The same stream crossing methods as described in the FEIS will be used, and impacts do not need to be updated (USACE, 2012).

5.2.3.3 Fairbanks Lateral

The proposed ASAP Project ROW for the Fairbanks Lateral will have seven crossings that are considered streams and rivers. This is a significant reduction from the FEIS, where 20 stream crossings were previously proposed (USACE, 2012).

5.2.3.4 Access Roads

Access road stream crossings will not change the magnitude or the scope of the potential impact to individual stream crossings presented in the FEIS (USACE, 2012). Stream crossing methods have been determined for all crossings based on the ASAP Stream Crossing Construction Mode Determination Manual developed in 2015 (Attachment 11).

5.2.3.5 Material Sources

The ASAP Project will utilize gravel from some streams during construction, including the Sagavanirktok River and others. Removal of gravel from these locations has been discussed with federal and state agencies, including the USACE, USFWS, ADFG, and DNR and these discussions continue today to ensure impacts to water and fish are minimized. Where gravel resources can be utilized without permanently or substantially impacting water or fish from stream below ordinary high water that would create temporary impact can reduce the amount of permanently impacted areas. Any gravel removal would have short-term and temporary effects on surface water hydrology in the immediate vicinity of the removal site. AGDC continues to work with agencies to avoid fish

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habitat for these selected sites in order to minimize impacts to water quality and aquatic species while making use of the available material

5.2.4 Operation

Maintaining the temperature of existing water resources is important for limiting impacts to these resources. A pipeline that is chilled may freeze surrounding areas and cause ice damming along waterways or persistent layers of ice. Moreover, a pipeline that is maintained at too high of a temperature can result in melting permafrost soils. To maintain the existing thermal regime and protect the stability of water resources, the ASAP pipeline will be remain at or near the ambient soil temperature and will not be chilled or heated for transport.

5.2.5 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

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5.3 TERRESTRIAL VEGETATION

The revised Alaska Stand Alone Pipeline (ASAP) alignment has reduced the length of the Mainline from 737 miles to approximately 733 miles, and the length of the Fairbanks Lateral from 34 miles to approximately 30 miles (AGDC, 2015; 2014), a cumulative reduction in approximately 8 total miles of pipeline. Analysis of the revised pipeline route shows that the Mainline has shifted further from the adjacent transportation corridors, but this has decreased the total length of the pipeline. Overall, the Project footprint has increased from the Final Environmental Impact Statement (FEIS) (USACE, 2012), largely due to more detailed design information on access roads, material sites, and camp locations.

Many of the major alignment changes in the revised pipeline Mainline route shift away from disturbed transportation corridors and into floodplains, forested areas, and other natural environments. This section describes the changes to the affected environment and potential impacts of the ASAP Project as they related to terrestrial vegetation.

5.3.1 Affected Environment

Since the FEIS was issued (USACE, 2012), the Alaska Gasline Development Corporation (AGDC) has updated the description of potentially affected ecoregions into three major categories consistent with U.S. Army Corps of Engineers (USACE) permitting applications. The North Slope Ecoregion spans from Mile Post (MP) 0 to MP 169.5. Subcomponent ecoregions include the Beaufort Coastal Plain, the Brooks Foothills, and the Brooks Range. The Interior Ecoregion spans from MP 169.5 to MP 577.5. It includes five subcomponent ecoregions: Kobuk Ridges and Valleys, Ray Mountains, Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, and Tanana-Kuskokwim Lowlands. The Southcentral Region (Southcentral) ecoregion spans from MP 577.5 to the pipeline terminus (MP 733.5) and includes the Alaska Range and the Cook Inlet Basin subcomponent ecoregions. No new rare or sensitive plant species were identified as a result of the project revisions.

5.3.1.1 Northern Ecoregion

The Alaskan North Slope Arctic tundra spans from the foothills of the Brooks Range to the Arctic Ocean. These cold-climate landscapes are characterized by the year-round presence of permafrost. Arctic tundra is noted for its lack of trees; extremely low temperatures; frost-molded landscape; minimal precipitation; short growing seasons; strong, dry winds; low biotic diversity; and cold, saturated soils. Thaw lakes, ponds, and tundra polygons dominate the pocked landscape. Polygons range from 15 to 165 ft in diameter and are a ubiquitous feature in this region. Arctic tundra ecoregion functions are of particular scientific importance, since effects of climate change may be largest there (Stevenson et al., 2014; Alessa et al., 2011; White et al., 2007; Lashof and Ahuja, 1990).

The extreme low temperatures result in dry air conditions, with minimal moisture-holding capabilities. Harsh climate conditions have selected for small plants with limited growth, even though the majority of biomass is accumulated in the root system. Deep-rooted plant species, such as trees, are

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absent from the landscape, since the extensive root depths required by some deep-rooted plants may be inhibited by the presence of permafrost.

The growing season ranges from 50 to 60 days, and although summers are characterized by sunlight for 24 hours a day, short growing seasons maintain permafrost conditions. Most plants reproduce by fission and budding, in addition to seed production, to cope with the short and unpredictable growing seasons that inhibit insect pollination and seedling establishment.

5.3.1.2 Interior Ecoregion

The Alaska Interior region spans from the Brooks Range to Broad Pass, and is broadly classified as boreal forest. It is a large and diverse patchwork of distinctive ecosystems, including mountain ranges, uplands, meandering rivers, lowland plains, and thaw lake communities. Unlike the Arctic tundra, permafrost coverage in boreal forests is discontinuous; the majority (75 to 80 percent) of permafrost can be found on north-facing slopes, which remain colder and wetter due to decreased sunlight exposure (Seifert, 2011; Woo and Carey, 1998; Van Cleve et al., 1983).

Alaskan boreal forest soils are characterized by large local variations due to differences in topography, hydrology, and temperature. In general, upland soils are ochric (yellowish-brown), while lowlands are dark colored from high organic matter concentrations (Ping et al., 2006). Productivity comparisons between north- and south-facing slopes suggest variability in species abundance and higher decomposition rates in the drier, warmer southern-facing slopes (Evans et al., 1989; Olson, 1963).

Variable topography and fire regimes create a mosaic landscape in the boreal forest, replete with vegetation stands of various species composition, ages, and successional stages. Stand-replacing wildfires are a natural disturbance in boreal forests and are important for species succession. Different populations of black spruce (*Picea mariana*) and white spruce (*Picea glauca*) reflect disparities in slope and aspect within the boreal landscape. Black spruce dominates areas associated with permafrost and north-facing slopes; whereas, white spruce is closely associated with warm, dry, south-facing slopes and well-drained areas (Van Cleve et al., 1983).

Boreal forest succession is characterized by the initial post-disturbance establishment of pioneer plants, such as fireweed (*Chamerion angustifolium*), that will later be replaced with low shrubs and trees, such as alder (*Alnus spp*.) and willow (*Salix spp*.), and later still, by deciduous forests characterized by balsam poplar (*Populus balsamifera*) and quaking aspen (*Populus tremuloides*). Finally, 100 to 350 years after the initial disturbance, black and white spruce forests with moss and lichen ground cover will return as the final successional stage.

5.3.1.3 Southcentral Ecoregion

Southcentral has some of the most variable landscape and mild temperatures in the state. The mountainous topography of the region is carved by major waterways, such as the Susitna River. The relatively moderate climate is classified as subarctic, with summer temperatures reaching 65

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degrees Fahrenheit (°F) and winters dropping to 10°F. These mild winters and cool summers are largely the result of the additive effect of ocean proximity and protection from cold northern winds by the Alaskan Range.

Vegetation in this region is highly variable; alder shrubland and temperate forests are common in coastal regions, and boreal forests are found inland. In the past 30 years, Southcentral forest populations have experienced extensive mortality to due to population explosions of the spruce beetle (*Dendroctonus rufipennis*) (Werner et al., 2006). Although decimation from spruce beetle attack is declining, the impacts are still seen on stand development and composition. The delivery of marine-derived nutrients (Nitrogen [N] and Carbon [C]), via anadromous fish, to riverine and terrestrial ecosystems is of particular importance to Southcentral (Hicks et al., 2005).

5.3.2 Environmental Consequences

There are several changes to the pipeline alignment that change the potential construction and operational impacts of the Project on vegetation communities, including:

1) The alignment along the Susitna River was shifted to the west and is now closer to the floodplain than the disturbed transportation corridor.
2) South of the Nenana River, the alignment was shifted to its west side into undeveloped forest and away from the disturbed transportation corridor.
3) The Fairbanks Lateral segment was shifted into rural forested ridges, away from the railroad corridor.
4) The alignment in the Northern Ecoregion was moved west, further away from the Sagavanirktok (Sag) River and the Dalton Highway transportation corridor.

Under the current alignment, the Mainline was shifted away from the disturbed transportation corridors (as mentioned) and into more of the natural landscape, which requires removal of a greater amount of vegetation than previously considered in the FEIS (USACE, 2012). Elimination of aboveground facilities (compressor stations at various MPs, a Straddle and Offtake Facility, and the Natural Gas Liquid Extraction Plant [NGLEP] facility) lowers the potential vegetation impacts at these locations, as compared with the FEIS.

Table 5.3-1 identifies the vegetation communities that will be affected by construction and long-term operations of the proposed project.

5.3.2.1 Construction

The project's construction and operational ROWs are described in detail in Section 2.6, above. The following construction practices could affect vegetation along the pipeline corridor:

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1) Clearing, Grubbing, and Grading: The separation of topsoil will only apply to where the ROW is graded and will be limited to agricultural areas.
2) Trenching: During excavation, attempts will no longer be made to separate excavated soils into topsoil and subsoil.
3) Backfilling: Separating topsoil from subsoil during grading will now occur only in agricultural areas.
4) Rehabilitation: There are no significant changes that will impact rehabilitation beyond what was already considered in the FEIS (USACE, 2012).

Agricultural land accounts for less than 1 percent of total acreage in the construction ROWs (USACE, 2012). Soils will be separated on agricultural lands for purposes of rehabilitation; however, the removal and disturbance to agricultural topsoil could expose invasive seed banks to the soil surface, which could negatively affect the re-establishment of native species and agricultural crops. A study in Alaska's Matanuska-Susitna Valley found over 64 weed species growing in agricultural areas (Conn et al., 2011).

Soils will not be separated in non-agricultural areas, which represent the majority of land types in the corridor. The success and establishment of native flora is influenced by the soil composition used to fill ditches. Indiscriminate filling will mix topsoil layers with mineral soil and live roots needed for seed establishment, will decrease native plant regrowth, and will open up the area for increased invasive potential. There will be an increased area stunted in plant regrowth, since seedling establishment will be inhibited by mixed topsoil or lack of topsoil near the soil surface in habitats impacted by backfilling.

The potential benefit of separating soils for non-agricultural land types will not likely be realized because of the relatively low probability of topsoil being present in the undisturbed soil profile, the difficulty of soil layer separation during winter months, recovery rates of native vegetation in the absence of plant rootstock (this will vary by ecoregion), and invasive species establishment potential.

Changes in the alignment of the Fairbanks Lateral and Mainline pipeline, and more advanced design information, have resulted in a revised assessment of the vegetation community composition potentially affected by access roads. The previous Project footprint was not fully defined; however, the current footprint allows for a comprehensive and cohesive assessment of permanent and temporary vegetation impacts, broken down by Project component in each ecoregion (Table 5.3-1). These impacts have refined the preliminary impact estimates reported previously (USACE, 2012)

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Table 5.3-1 Aboveground Impacts to Vegetation Communities (Acres) Within the Project Footprint

Ecoregion/ Components	Barren Land (Rock/Sand/Clay)	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Dwarf Scrub	Emergent Herbaceous Wetlands	Evergreen Forest	Grassland/Herbaceous	Mixed Forest	Open Water	Pasture/Hay	Perennial Ice/Snow	Sedge/Herbaceous	Shrub/Scrub	Woody Wetlands	Grand Total
Northern Ecoregion	**452.1**	**0.0**	**0.0**	**0.8**	**168.1**	**72.0**	**9.7**	**1,793.4**	**71.6**	**0.0**	**0.0**	**0.0**	**250.1**	**0.0**	**60.9**	**1,372.3**	**326.5**	**1.1**	**4,578.6**
Permanent Impact	**252.0**	**0.0**	**0.0**	**0.0**	**72.5**	**14.8**	**4.4**	**1,274.6**	**61.1**	**0.0**	**0.0**	**0.0**	**239.6**	**0.0**	**60.3**	**1,115.1**	**235.6**	**1.1**	**3,331.1**
Access Road	1.0	0.0	0.0	0.0	8.7	0.7	0.2	56.7	11.0	0.0	0.0	0.0	2.0	0.0	0.0	99.7	5.5	0.0	185.5
Camp	0.0	0.0	0.0	0.0	0.0	2.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	7.2
Construction Impact – Permanent	14.2	0.0	0.0	0.0	61.7	0.0	0.7	908.1	19.3	0.0	0.0	0.0	3.1	0.0	0.0	505.2	183.1	0.0	1,695.4
Dredge Disposal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
Existing Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Facility Pad	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	9.5	0.0	0.0	0.0	2.7	0.0	0.0	95.1	0.0	0.0	110.8
Material Source	236.1	0.0	0.0	0.0	0.9	0.0	0.0	298.6	21.1	0.0	0.0	0.0	131.3	0.0	0.0	399.3	47.0	1.1	1,135.4
Pipe Storage Yard	0.7	0.0	0.0	0.0	1.1	0.0	0.0	6.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	15.5	0.0	0.0	24.3
Vertical Support Member	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Dock Dredge Area	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.5	0.0	0.0	0.0	59.6
West Dock Mooring Dolphin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Dock New Fill	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.6	0.0	0.0	0.0	11.2
West Dock Temporary Barge Bridge	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.4
Temporary Impact/ Minimization	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.7**	**0.6**	**0.0**	**3.8**

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Ecoregion/ Components	Barren Land (Rock/Sand/Clay)	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Dwarf Scrub	Emergent Herbaceous Wetlands	Evergreen Forest	Grassland/Herbaceous	Mixed Forest	Open Water	Pasture/Hay	Perennial Ice/Snow	Sedge/Herbaceous	Shrub/Scrub	Woody Wetlands	Grand Total
Pipeline Stream Crossing	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Temporary Workspace	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.5	0.0	3.3
Uplands/ Avoidance	**200.0**	**0.0**	**0.0**	**0.8**	**95.5**	**57.2**	**5.3**	**517.6**	**10.5**	**0.0**	**0.0**	**0.0**	**10.5**	**0.0**	**0.6**	**255.5**	**90.3**	**0.0**	**1,243.8**
Access Road	10.0	0.0	0.0	0.8	79.2	16.7	5.3	36.6	10.3	0.0	0.0	0.0	3.6	0.0	0.0	88.1	2.9	0.0	253.4
Camp	52.9	0.0	0.0	0.0	0.0	31.1	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.2	0.0	95.3
Construction Impact – Permanent	11.5	0.0	0.0	0.0	8.4	0.0	0.0	213.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	14.9	16.1	0.0	264.3
Existing Road	0.4	0.0	0.0	0.0	1.7	3.9	0.0	2.2	0.0	0.0	0.0	0.0	4.9	0.0	0.3	0.1	0.0	0.0	13.5
Material Source	116.2	0.0	0.0	0.0	0.0	0.0	0.0	247.3	0.0	0.0	0.0	0.0	1.5	0.0	0.0	142.4	71.0	0.0	578.5
Pipe Storage Yard	8.9	0.0	0.0	0.0	5.0	0.0	0.0	14.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.1	0.0	31.0
TAPS ROW	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Temporary Workspace	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
West Dock New Fill	0.0	0.0	0.0	0.0	0.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0	6.3
Interior Ecoregion	**234.5**	**2.4**	**987.3**	**1.3**	**543.6**	**92.6**	**19.9**	**256.6**	**21.3**	**4,327.8**	**303.5**	**696.3**	**11.1**	**1.0**	**0.0**	**99.7**	**3,864.2**	**345.2**	**11,808.3**
Permanent Impact	**65.4**	**0.0**	**117.8**	**0.0**	**64.8**	**0.1**	**1.4**	**146.5**	**13.1**	**1,275.4**	**66.6**	**89.9**	**2.1**	**0.0**	**0.0**	**36.5**	**1,962.4**	**166.1**	**4,008.1**
Access Road	3.4	0.0	16.2	0.0	7.2	0.0	0.0	4.9	1.6	185.6	9.7	16.8	0.3	0.0	0.0	0.5	202.7	31.1	480.1
Camp	0.3	0.0	1.5	0.0	1.7	0.0	0.7	2.0	0.0	2.1	1.7	0.1	0.0	0.0	0.0	0.0	56.4	0.0	66.6
Construction Impact – Permanent	59.4	0.0	61.1	0.0	39.0	0.0	0.0	104.6	11.5	924.2	39.4	57.9	0.1	0.0	0.0	30.7	1,423.4	131.4	2,882.6
Existing Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

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Facility Pad	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.3	0.0	0.0	0.0	0.0	0.7	0.0	4.4
HDD Entry Pad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.8
HDD Exit Pad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Material Source	1.9	0.0	37.2	0.0	16.1	0.1	0.6	33.2	0.0	154.0	15.7	14.8	1.7	0.0	0.0	5.3	245.9	3.4	529.9
Pipe Storage Yard	0.4	0.0	0.4	0.0	0.6	0.0	0.0	1.7	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	30.7	0.0	39.7
Railroad Siding	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	2.5
Temporary Impact/ Minimization	**1.7**	**0.0**	**24.2**	**0.0**	**0.8**	**0.0**	**0.0**	**0.6**	**1.6**	**187.7**	**0.0**	**21.4**	**0.9**	**0.0**	**0.0**	**0.0**	**44.3**	**80.0**	**363.3**
Access Road	0.6	0.0	0.8	0.0	0.2	0.0	0.0	0.3	0.0	0.6	0.0	0.2	0.8	0.0	0.0	0.0	0.2	0.0	3.7
Construction Impact – Temporary	0.0	0.0	23.4	0.0	0.3	0.0	0.0	0.0	1.6	180.8	0.0	19.3	0.0	0.0	0.0	0.0	40.2	79.9	345.7
HDD False ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0	1.9	0.0	0.0	0.0	0.0	2.9	0.0	9.8
Pipeline Stream Crossing	0.7	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.1	1.7
Temporary Workspace	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	2.4
Uplands/ Avoidance	**167.5**	**2.4**	**845.2**	**1.3**	**478.0**	**92.5**	**18.5**	**109.5**	**6.5**	**2,864.7**	**237.0**	**585.0**	**8.1**	**1.0**	**0.0**	**63.2**	**1,857.4**	**99.1**	**7,436.9**
Access Road	8.3	0.0	133.3	0.0	70.5	4.0	1.8	4.7	1.1	534.5	36.9	137.4	3.3	1.0	0.0	1.3	294.7	21.4	1,254.3
Camp	0.7	0.0	3.9	0.0	42.4	13.6	0.0	1.7	0.0	48.1	0.7	4.8	0.0	0.0	0.0	0.0	20.7	0.4	136.9
Construction Impact – Permanent	83.3	2.4	343.0	0.0	82.1	0.0	1.3	56.9	2.6	1,284.1	133.8	228.0	2.2	0.0	0.0	4.4	849.2	43.3	3,116.7
Construction Impact – Temporary	0.0	0.0	131.9	0.0	7.1	0.0	0.1	0.0	2.1	174.5	3.5	46.0	0.8	0.0	0.0	0.0	20.0	21.9	408.1

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Existing Road	0.8	0.0	0.8	0.0	5.1	0.0	0.0	0.0	0.0	0.7	0.0	0.1	0.4	0.0	0.0	0.0	2.1	0.1	10.1
Facility Pad	0.0	0.0	4.3	1.3	13.4	1.5	9.6	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	31.6
HDD Entry Pad	0.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.9	0.0	0.0	0.0	0.0	0.5	0.0	2.5
HDD Exit Pad	0.0	0.0	0.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	2.2
HDD False ROW	0.0	0.0	7.1	0.0	6.0	0.0	0.0	0.0	0.0	51.8	0.0	3.4	0.0	0.0	0.0	0.0	15.3	2.2	85.7
Material Source	67.3	0.0	208.0	0.0	236.4	72.1	5.3	43.8	0.8	729.6	54.7	158.4	1.3	0.0	0.0	57.4	638.4	7.2	2,280.8
Pipe Storage Yard	2.9	0.0	8.5	0.0	10.7	1.3	0.0	1.8	0.0	30.2	7.3	5.8	0.0	0.0	0.0	0.0	9.5	0.4	78.5
Railroad Siding	2.4	0.0	1.7	0.0	0.6	0.0	0.3	0.0	0.0	7.3	0.0	0.3	0.0	0.0	0.0	0.0	3.9	1.9	18.5
TAPS ROW	0.3	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
Temporary Workspace	0.8	0.0	1.8	0.0	0.4	0.0	0.0	0.5	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.1	8.2
Southcentral Ecoregion	**7.2**	**10.8**	**1,198.5**	**11.1**	**71.2**	**16.6**	**47.7**	**0.4**	**116.3**	**419.6**	**1.8**	**1,392.4**	**4.4**	**2.2**	**0.0**	**0.0**	**397.5**	**281.0**	**3,978.7**
Permanent Impact	**0.1**	**1.5**	**28.6**	**0.0**	**5.1**	**0.0**	**1.2**	**0.4**	**50.0**	**57.0**	**0.1**	**90.8**	**0.1**	**1.6**	**0.0**	**0.0**	**65.0**	**104.6**	**406.3**
Access Road	0.0	1.1	3.5	0.0	0.5	0.0	1.0	0.4	17.3	8.2	0.0	14.2	0.0	0.0	0.0	0.0	13.9	42.8	102.8
Camp	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	14.4	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	18.0
Construction Impact – Permanent	0.1	0.4	23.2	0.0	1.2	0.0	0.2	0.0	31.3	23.0	0.0	68.2	0.1	1.6	0.0	0.0	32.7	52.4	234.5
HDD Exit Pad	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Material Source	0.0	0.0	1.2	0.0	2.9	0.0	0.0	0.0	1.4	11.4	0.1	3.1	0.0	0.0	0.0	0.0	18.0	9.1	47.1
Pipe Storage Yard	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0	0.0	0.0	0.0	0.0	0.1	0.3	1.6

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Ecoregion/ Components	Barren Land (Rock/Sand/Clay)	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Dwarf Scrub	Emergent Herbaceous Wetlands	Evergreen Forest	Grassland/Herbaceous	Mixed Forest	Open Water	Pasture/Hay	Perennial Ice/Snow	Sedge/Herbaceous	Shrub/Scrub	Woody Wetlands	Grand Total
Railroad Siding	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.3	0.0	0.9
Temporary Impact/ Minimization	**0.0**	**0.0**	**15.4**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**12.7**	**12.5**	**0.0**	**14.9**	**0.0**	**0.3**	**0.0**	**0.0**	**1.2**	**33.7**	**90.8**
Access Road	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.8
Construction Impact – Temporary	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	9.1	2.1	0.0	4.8	0.0	0.3	0.0	0.0	1.0	13.5	32.3
HDD False ROW	0.0	0.0	13.4	0.0	0.0	0.0	0.0	0.0	3.4	10.4	0.0	9.9	0.0	0.0	0.0	0.0	0.0	19.9	57.0
Pipeline Stream Crossing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Temporary Workspace	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.4
Uplands/ Avoidance	**7.0**	**9.3**	**1,154.4**	**11.1**	**66.2**	**16.6**	**46.4**	**0.1**	**53.7**	**350.1**	**1.7**	**1,286.7**	**4.3**	**0.3**	**0.0**	**0.0**	**331.3**	**142.6**	**3,481.5**
Access Road	0.3	0.3	100.1	0.2	12.4	1.9	26.7	0.1	10.7	70.9	0.0	179.5	0.0	0.0	0.0	0.0	80.7	16.4	500.0
Camp	0.0	0.0	6.7	0.0	1.2	0.0	0.0	0.0	0.4	3.2	0.0	22.9	0.0	0.0	0.0	0.0	0.6	0.0	35.0
Construction Impact – Permanent	1.3	7.6	698.1	0.0	16.6	1.4	13.5	0.0	24.0	209.9	0.8	815.8	0.8	0.3	0.0	0.0	213.4	52.5	2,055.7
Construction Impact – Temporary	0.0	0.1	19.2	0.0	0.3	0.0	0.4	0.0	1.6	3.9	0.0	20.2	0.0	0.0	0.0	0.0	8.3	3.9	58.0
Existing Road	0.0	0.0	7.0	0.0	5.0	0.3	1.9	0.0	0.9	0.2	0.0	0.4	0.1	0.0	0.0	0.0	0.3	0.1	16.1
Facility Pad	0.5	0.0	0.0	8.2	10.1	1.0	0.0	0.0	0.0	0.0	0.0	1.3	3.4	0.0	0.0	0.0	0.0	0.0	24.5
HDD Entry Pad	0.0	0.0	3.1	0.0	0.0	0.0	0.9	0.0	0.1	0.3	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.3	6.9
HDD Exit Pad	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	5.5
HDD False ROW	0.0	0.0	28.4	0.0	0.7	0.0	1.3	0.0	0.6	9.2	0.0	43.8	0.0	0.0	0.0	0.0	0.0	2.8	86.8

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Material Source	4.9	0.0	275.2	2.6	11.8	11.0	0.0	0.0	12.7	45.9	0.9	180.2	0.0	0.0	0.0	0.0	14.8	65.5	625.6
Pipe Storage Yard	0.0	1.3	12.0	0.0	2.3	0.0	0.4	0.0	2.3	3.9	0.0	17.3	0.0	0.0	0.0	0.0	7.6	0.8	47.9
Railroad Siding	0.0	0.0	2.0	0.0	5.9	1.0	1.0	0.0	0.4	0.0	0.0	1.5	0.0	0.0	0.0	0.0	5.7	0.2	17.6
Temporary Workspace	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.2	1.7
Grand Total	693.8	13.1	2,185.7	13.2	782.9	181.2	77.4	2,050.4	209.2	4,747.4	305.3	2,088.7	265.6	3.2	60.9	1,472.0	4,588.2	627.3	**20,365.5**
Permanent Total	**317.6**	**1.5**	**146.5**	**0.0**	**142.3**	**14.9**	**7.0**	**1,421.4**	**124.2**	**1,332.5**	**66.7**	**180.7**	**241.8**	**1.6**	**60.3**	**1,151.6**	**2,263.1**	**271.8**	**7,745.5**
Temporary Total	**1.9**	**0.0**	**39.6**	**0.0**	**0.9**	**0.0**	**0.1**	**1.9**	**14.3**	**200.2**	**0.0**	**36.3**	**0.9**	**0.3**	**0.0**	**1.7**	**46.2**	**113.8**	**457.9**
Avoidance Total	**374.4**	**11.6**	**1,999.7**	**13.2**	**639.7**	**166.3**	**70.2**	**627.2**	**70.7**	**3,214.7**	**238.6**	**1,871.7**	**22.9**	**1.3**	**0.6**	**318.7**	**2,278.9**	**241.7**	**12,162.2**
No Impact To Mapped Vegetation																			
Northern Ecoregion	**1.0**	**0.0**	**0.0**	**0.0**	**3.7**	**27.4**	**0.0**	**0.7**	**41.4**	**0.0**	**0.0**	**0.0**	**23.1**	**0.0**	**5.5**	**593.8**	**0.0**	**0.0**	**696.7**
Bridge	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.0	0.0	1.4
Construction Impact - Avoidance	1.0	0.0	0.0	0.0	2.8	0.0	0.0	0.7	40.3	0.0	0.0	0.0	7.8	0.0	0.0	556.5	0.0	0.0	609.1
Ice Access Road	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	37.2	0.0	0.0	38.8
West Dock Existing Fill	0.0	0.0	0.0	0.0	0.0	27.3	0.0	0.0	0.0	0.0	0.0	0.0	15.1	0.0	4.9	0.0	0.0	0.0	47.3
West Dock Temporary Barge Bridge Rake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Interior Ecoregion	**4.0**	**0.0**	**14.4**	**0.0**	**1.8**	**0.0**	**0.1**	**0.0**	**0.3**	**24.0**	**0.4**	**4.9**	**15.8**	**0.0**	**0.0**	**0.2**	**10.5**	**12.3**	**88.7**
Bridge	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	1.2
Construction Impact - Avoidance	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	3.0

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HDD Crossing	0.6	0.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.4	1.9	13.3	0.0	0.0	0.0	3.3	0.0	29.1
Ice Access Road	2.9	0.0	8.6	0.0	0.0	0.0	0.1	0.0	0.3	19.4	0.0	3.0	2.3	0.0	0.0	0.2	6.4	12.2	55.4
Southcentral Ecoregion	**2.3**	**0.0**	**23.9**	**0.0**	**0.7**	**0.0**	**1.2**	**0.0**	**5.8**	**8.8**	**0.0**	**27.4**	**5.2**	**0.0**	**0.0**	**0.0**	**1.8**	**9.3**	**86.4**
Bridge	0.5	0.0	0.0	0.0	0.5	0.0	1.0	0.0	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	2.8
Construction Impact - Avoidance	0.0	0.0	0.6	0.0	0.0	0.0	0.2	0.0	0.2	0.3	0.0	0.6	0.0	0.0	0.0	0.0	0.5	0.0	2.4
HDD Crossing	1.8	0.0	12.1	0.0	0.0	0.0	0.0	0.0	1.1	2.9	0.0	12.2	3.8	0.0	0.0	0.0	0.5	2.1	36.7
Ice Access Road	0.0	0.0	11.2	0.0	0.2	0.0	0.0	0.0	4.2	5.6	0.0	14.5	0.8	0.0	0.0	0.0	0.7	7.2	44.5
Grand Total	7.3	0.0	38.3	0.0	6.2	27.4	1.4	0.7	47.5	32.8	0.4	32.3	44.1	0.0	5.5	594.0	12.3	21.6	**871.8**
Project Footprint Overlay Totals																			
Footprint Overlay Totals	**701.1**	**13.1**	**2,224.0**	**13.2**	**789.1**	**208.6**	**78.7**	**2,051.2**	**256.7**	**4,780.2**	**305.7**	**2,120.9**	**309.7**	**3.2**	**66.4**	**2,066.0**	**4,600.5**	**648.9**	**21,237.3**

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Dust Deposition

The project requires use of 298 new roads totaling 174.4 miles (Table 2-1). During road development, dust deposition will increase proportionately. Dust deposition can greatly decrease photosynthetic capabilities of native plant communities, which is especially important in Arctic communities that have short growing seasons. In addition, dust deposition can inhibit weed management tools, such as foliar applications of the generalist herbicide, glyphosate, which will become inert when it contacts dirt.

West Dock

With proposed modification and dredging in the navigation channel at West Dock under the revised project, marine vegetation impacts will occur that were not considered in the FEIS (USACE, 2012). Populations of kelp (an algae) have been observed in Prudhoe Bay (Busdosh et al., 1985) and could be minimally affected by the dredging program. Although kelp forests in the Beaufort Sea are more often identified with the Boulder Patch, they have been found in Prudhoe Bay, near West Dock (Busdosh et al., 1985) and are capable of attaching to soft substrates, in addition to rocky boulders (Dunton et al., 1982). Dredging can negatively impact kelp communities by increasing turbidity and inhibiting plants from photosynthesizing (Lyngby and Mortensen, 1996).

West Dock Head (DH) 3 dredging is scheduled for the winter (Attachment 3), when kelp is least photosynthetically active. Surface and bottom currents in Prudhoe Bay can allow sediments to drift shoreward from moderate distances. Since kelp community density is positively correlated with water depth (Busdosh et al., 1985), any dredged sediment will travel away from potential communities near- or offshore form West Dock. In fact, Ekman transport vectors have shown that the strongest offshore water movement in the Beaufort Sea occurs between October and January (Yang, 2006). The results of these studies, coupled with the fact that the proposed dredge plan is almost identical to BP Exploration (Alaska), Inc.'s (BPXA's) permitted 10-year dredge plan at West Dock (USACE Permit Number POA-1979-291-OO), are strong indicators that there will be minimal, if any, impacts to marine vegetation or algae (Attachment 3).

5.3.2.2 Operations

Pipeline

Under the revised alignment, the Mainline is shifted away from the disturbed transportation corridors (as mentioned) and into more of the natural landscape, which will require increased mowing in habitats predominantly composed of tall vegetation, such as forest and scrub and shrub habitats.

The ASAP Project will result in some habitat fragmentation where construction of the pipeline exists. Specific results and impacts to vegetation from Project components in each region can be estimated through the use of Table 5.3-1, above.

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Access Roads

The utilization of access roads can facilitate the transport, spread, and establishment of non-native and invasive species (Hulme, 2009). AGDC will develop a framework for preventing spatial dispersal of invasive plants. Considerations will include seed sources, preventative measures, and monitoring and eradication procedures. Specific results and impacts to vegetation are shown in the tables, above.

Additional Aboveground Facilities

Aboveground facilities potentially affecting vegetation communities include the GCF, MLBV locations, pig launcher / receiver stations, camps, PSYs, and others. Compressor stations, the Straddle and Offtake Facility, and the NGLEP were omitted from the Project, eliminating vegetation impacts from those project elements. All Project components and resulting impacts are now fully defined and provided in Table 5.3-1, above.

5.3.3 References

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5.4 WETLANDS

AGDC has implemented extensive measures to reduce impacts to wetlands in its Project Design, including the routing of the pipeline alignment. These measures, along with a detailed Mitigation Statement, are provided in great detail AGDC's Joint Application for Permit (JAfP) to the Corps of Engineers for the ASAP Project (AGDC, 2015).

5.4.1 Affected Environment

Some changes have occurred to the Project since the FEIS that will impact wetlands. The first 7 miles of pipeline were originally supported aboveground on Vertical Support Members (VSMs), but this section of the Project is now designed to be buried below it. The burial of the first 7 miles improves the operational reliability of the pipeline, improves construction logistics, and helps to limit impacts to caribou movements and other wildlife, which can be impeded (see discussion in Section 2, above, and Section 5, below). The north-south orientation of the buried line will not impede sheetwater flow in wetlands, which drains gravitationally following the elevation gradient.

Another major change to the scope of the ASAP Project is the addition of West Dock (AGDC, 2015; 2014). The Gas Conditioning Facility (GCF) in Deadhorse will be constructed from pre-fabricated modular units that will be shipped to Prudhoe Bay and received at West Dock's Dock Head (DH) 3. This will require the construction of a ballasted barge bypass bridge, use of new and existing roads, and winter dredging of a navigation route offshore to DH3 of West Dock to -9 foot below MLLW (AGDC, 2015; Attachment 3). Planned road expansions will permanently impact the marine wetland ecosystems near West Dock.

The entire ASAP route was reviewed with delineated wetlands data to avoid and minimize impacts to wetlands wherever practicable.

5.4.1.1 Regulatory Setting

There have been no pertinent changes to the regulatory setting pertaining to wetlands since the FEIS (USACE, 2012). However, the United States Environmental Protection Agency (USEPA) has proposed a series of changes to Clean Water Act regulations that would clarify the agencies rule and jurisdiction, and in doing so, potentially expand its jurisdiction over wetlands within the US. It is not yet known whether this rule change would have any impact on the ASAP Project. The proposed rule change is currently stalled in the courts through an injunction that is requiring further review.

5.4.1.2 Analysis Methodology

An Approved Jurisdictional Determination (AJD) was validated for the previous alignment in 2013 that confirmed sampling protocols and mapping methodology for wetland delineation data collection. However, the newest revision to the pipeline alignment necessitated additional field sampling.

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A Wetlands and Waters of the United States Delineation Report and an Aquatic Site Assessment have been provided as attachments to this document (Attachments 7 and 8).

Wetland delineations have been conducted outside of the 2,000-foot planning corridor to assess wetlands that would potentially be impacted by off ROW features, such as access roads and material sites (AES, 2014). Field assessments of the Denali National Park alternative route have also been provided to the USACE and National Park Service . On the basis of the habitat components observed and recorded at each field target, wetlands and other Waters of the United States (WOUS) areas were classified according to the system guidelines outlined in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). These data were incorporated into the Project's wetlands geodatabase containing project wetlands data. Final wetlands mapping and access road acreages were completed using ArcGIS. The aerial photography originally used to pre-map the study area was used as a base map to digitally map wetlands and habitat boundaries (AES, 2014).

Hydrologic modifiers have been added to each wetlands class. Areas determined to be uplands were classified as such and not assigned a Cowardin class. Wetland habitats were assigned identifiers according to Hydrogeomorphic (HGM) class (depressional, slope, flat, riverine, and lacustrine fringe) consistent with the method in Magee and Hollands (1998). These definitions vary from the class definitions found in Cowardin et al. (1979). This was done for ease of incorporating data into the functional assessment (Aquatic Site Assessment) model based on Magee and Hollands (1998). An assessment of wetlands function requires documenting data such as HGM class, wetland size, vegetation and soil attributes, and landscape characteristics on a field data sheet. Field targets identified as wetlands were analyzed in situ for functional capacity using a rapid assessment method developed by Magee and Hollands (1998), which has been modified and approved by the USACE for functional capacity assessment for the ASAP Project.

5.4.2 Wetlands Analysis

Wetland classes transected by the project corridor, with the addition of West Dock, can be grouped into five major classifications using the National Wetlands Inventory (NWI) classification system (Table 5.4-1): Marine, Estuarine, Riverine, Lacustrine, and Palustrine (Cowardin et al., 1979).

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Table 5.4-1 Wetland Subclasses within the National Wetlands Inventory Classification Hierarchy

Broadleaf Forest (PFO1)	Needleleaf Forest (PFO4)	Broadleaf Scrub/Shrub (PSS1)	Needleleaf Scrub/Shrub (PSS4)	Mixed and Other Scrub/Shrub (PSS)	Emergent Wetlands (PEM)	Palustrine Wetlands (POW)	Riverine Waters (R)	Lacustrine Waters (L)	Marine Wetlands (M)
PFO1/SS1B	PFO4/EM1B	PSS1/4B	PSS4/1B	PSS3/EM1B	PEM1/FO4B	PUB/EM1F$_X$	R2UBH	L1UBH	M2US1
PFO2/EM1B	PFO4/SS1B	PSS1/4C	PSS4/1C	PSS3/FO4B	PEM1/SS1B	PUB/EM1H$_X$	R2USC	L1UBH$_X$	-
PFO3B	PFO4/SS1C	PSS1/EM1B	PSS4/3B	-	PEM1/SS1C	PUB/EM1F	R3UBH	-	-
-	PFO4/SS4B	PSS1/EM1B$_X$	PSS4/EM1B	-	PEM1/SS1E	PUB/EM1H	R3US/SS1C	-	-
-	PFO4B	PSS1/EM1C	PSS4/EM1C	-	PEM1/SS1H	PUBF	R3USC	-	-
-	PFO4C	PSS1/EM1F	PSS4/FO4B	-	PEM1/SS1C$_X$	PUBF$_X$	R4SBC	-	-
-	-	PSS1/FO4B	PSS4B	-	PEM1/SS1F	PUBH	R4SBC	-	-
-	-	PSS1/FO4C	PSS4C	-	PEM1/SS3B	PUBH$_X$	R2UBH$_X$	-	-
-	-	PSS1/SS4B	PSS4/1E	-	PEM1/SS4B	PUBH/EM1B	R3UB/USC	-	-
-	-	PSS1/USC	PSS4/EM1F	-	PEM1/SS4C	PUB/ABH	R3UB/USH	-	-
-	-	PSS1B	PSS4E	-	PEM1/USB$_X$	PAB/EM1F	-	-	-
-	-	PSS1B$_X$	-	-	PEM1/USC	PAB/EM1H	-	-	-
-	-	PSS1C	-	-	PEM1B	PAB/SS1F	-	-	-
-	-	PSS1C$_X$	-	-	PEM1B$_X$	PABF	-	-	-
-	-	PSS1F	-	-	PEM1C	PABH	-	-	-
-	-	PSS1/4E	-	-	PEM1C$_X$	PML/SS1B	-	-	-
-	-	PSS1/EM1C$_X$	-	-	PEM1F	PUB/SS1F	-	-	-
-	-	PSS1/EM1E	-	-	PEM1F$_X$	PUB/SS1H	-	-	-
-	-	PSS1/EM1H	-	-	PEM1H	-	-	-	-
-	-	PSS1E	-	-	PEM1H$_X$	-	-	-	-
-	-	PSS1F$_X$	-	-	-	-	-	-	-
	-	PSS1H	-	-	-	-	-	-	-

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5.4.2.1 Ecoregions

Ecoregion categories have been simplified from nine different unified ecoregions in Alaska (Beaufort Coastal Plain, Brooks Foothills, Brooks Range, Kobuk Ridges and Valleys, Ray Mountains, Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, Alaska Range, and Cook Inlet Basin) to three ecoregions (Northern, Interior, and Southcentral) that encompass the previous divisions to make language consistent with USACE permitting applications.

5.4.2.2 Alignment Shifts

There are several changes to the alignment that affect wetlands, including: (1) the alignment along the Susitna River has shifted to the west and is now closer to the floodplain than the disturbed transportation corridor, (2) South of the Nenana River, the alignment has moved to the west of the Nenana River into undeveloped forest and away from the disturbed transportation corridor, (3) a portion of the alignment was moved from Minto Flats to the upland Summer Ridge area to avoid and minimize impacts to wetlands and reduce impacts to a state game refuge, (4) the Fairbanks Lateral segment has shifted into rural forested ridges, away from the railroad corridor, and (5) in the Northern Ecoregion, the alignment has moved west, away from the Sagavanirktok (Sag) River and the Dalton Highway transportation corridor.

5.4.2.3 Non-native and Invasive Plants

Information on material sites and access roads was not previously available to be used in calculations of impacts on wetland communities, but was taken into consideration when discussing potential dispersal or fostering of non-native and invasive species introductions and establishment in wetland habitat. All wetlands data for the comprehensive footprint and all components are available and reported in the tables, below.

5.4.2.4 Rare and Sensitive Plants

The proposed alignment will not impact the rare and sensitive species found within the Project corridor (as discussed in the Vegetation section of the FEIS [USACE, 2012]). However, the Alaska Natural Heritage Program did update their *Rare Plant Species Information* database in 2012 and again in 2015, and it includes approximately 350 rare and sensitive species found across the state. Ranges of these plant species that occur in wetland habitats that are on this list can be compared with the newest footprint to assess a potential for negative impacts.

There are no threatened or endangered plant species identified in Alaska except for the Aleutian Shield Fern [*Polystichum aleuticum*], which is found only on Adak Island, in the Aleutian Islands. However, rare and sensitive plants are found throughout the state and are characterized by strong habitat specificity, like wetlands. Although re-evaluation of Bureau of Land Management (BLM)-designated rare and sensitive plant species data is included in ASAP's future plans (AGDC, 2014), those plants unique to wetland habitats can be considered separately from other habitats. Some example species that could be impacted under the newest alignment include wheat sedge (*Carex atherodes* [I]), Hudson Bay sedge

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(*Carex heleonastes* [I]), bunge (*Oxygraphis glacialis* [N]), and umbellate starwort (*Stellaria umbellata* [I]) (I = Invasive; N = Native; Cortes-Burns et al., 2009).

5.4.2.5 2,000-Foot-Wide Planning Corridor

Alignment changes affected the total acreages of habitat impacted by the Project. Previously, only NWI data were used to determine impacts. In this assessment, only ASAP's field and desktop data (2,000-ft-Wide Planning Corridor) have been used.

The Project has been revised and has progressed to reporting a cohesive and complete footprint that is well advanced beyond the preliminary design (USACE, 2012). All components were considered conceptually in the FEIS, but exact locations were not available at the time of analysis, prohibiting all exact acreages from being included in wetland and upland calculations.

5.4.2.1 Grading and Trenching

There are no significant changes to grading and trenching practices that will impact wetlands beyond what has been discussed in previous publications (USACE, 2012; AGDC, 2015; 2014).

5.4.2.2 Backfilling

There are no significant changes to backfilling practices that will impact wetlands beyond what has been discussed in previous publications (USACE, 2012; AGDC, 2015; 2014).

5.4.2.3 Rehabilitation

There are no significant changes to rehabilitation methods that will impact wetlands beyond what has been discussed in previous publications (USACE, 2012; AGDC, 2015; 2014).

5.4.2.4 Fragmentation

There are no significant changes to fragmentation of wetlands beyond the scope of previous publications under the proposed alignment (USACE, 2012; AGDC, 2015; 2014).

5.4.2.5 Soil Compaction and Erosion

There are no significant changes to soil compaction and erosion avoidance methods that will impact wetlands beyond what has been discussed in previous publications (USACE, 2012; AGDC, 2015; 2014).

5.4.2.6 Construction and Operational Right-of-Way

ASAP has provided information on its Right-of-Way in Table 2-1 and Section 2.6, above, as well as in its Clean Water Act 404/10 application and project geodatabase (AGDC, 2015). The ASAP Project

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was designed with consideration of cross slope, terrain type, and avoidance and minimization of impacts to environmental resources where possible. The ASAP Project will require a variable-width temporary construction right-of-way (ROW) that matches the project footprint. The mainline construction ROW will range from a 120' easement at its narrowest point to a 350' easement at its widest point, which includes temporary workspaces and other lands required for constructing the pipeline. The Fairbanks Lateral construction ROW will range from a 100' easement at its narrowest point to a 350' easement at its widest point. Temporary Workspaces and HDD False Rights-of-Way used during construction will require up to an 800-ft wide easement.

The ASAP Project will require a permanent operational ROW that will range from a 53' easement at its narrowest point to a 350' easement at its widest point; this maximum distance will be required during the Operations and Maintenance phase of the Project to maintain certain side slope cuts performed during the Construction Phase of the Project. The Fairbanks Lateral Operational ROW will range from a 30ft easement at its narrowest point to 350' easement at its widest point to access and maintain the land.

5.4.2.7 Aboveground Facilities

Under the current alignment, three aboveground facilities have been removed from plans: compressor stations (at various MPs), a straddle and offtake facility, and an NGLEP facility. Additionally, West Dock modifications at Prudhoe Bay have been added to the plans under the revised design.

5.4.2.8 Fragmentation

Wetland habitat fragmentation under the proposed alignment will not be differentially affected beyond the scope of discussion in previous publications (USACE, 2012; AGDC, 2015; 2014).

5.4.2.9 Results of Analysis

Freshwater Wetlands

Freshwater wetland types within the project area are described in table 5.4-1, above. The freshwater wetland categories included in this section's analysis include palustrine forested wetlands, palustrine forested wetlands, palustrine shrub wetlands, ponds, lakes, intermittent wetlands, and perennial streams. The project footprint and impact categories were overlayed with wetlands data. All impacts to freshwater wetlands are described, below, in table 5.4-2 and figures 5.4-1 to 5.4-6. The Project will impact 8,907.0 acres of freshwater wetlands (7,573.2 acres permanent, 1,161.4 acres temporary). Permanent project impacts to wetlands, by hydrogeomorphic functional class were also analyzed, with results provided in Table 5.4-3 and Figure 5.4-3.

Marine Wetlands

Marine wetlands are characterized by saline water (greater than 30 parts per trillion [ppt]) regimes controlled by tidal action. They are exposed to currents and wave action originating in the open ocean

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(Dahl et al., 1991). Unlike other wetlands that are periodically flooded due to seasonal changes, marine wetlands are constantly vacillating between tidally influenced flooded and dry conditions. This dynamic hydrological regime can exert strong, selective forces on organisms that tolerate both environmental extremes. Impacts to subtidal and intertidal areas (marine) are concentrated at West Dock, Prudhoe Bay, and have been reported to the USACE (AGDC, 2015). Marine wetland impacts are described in table 5.4-2, below. The Project will impact 0.9 acres of intertidal wetlands (0.8 acres permanent, 0.1 acres temporary) and 171.5 acres of subtidal wetlands (all permanent). Permanent project impacts to wetlands (including marine), by hydrogeomorphic functional class were analyzed, with results provided in in Table 5.4-3 and in Figure 5.4-7. Additional details on marine impacts are provided in Section 5.18, Table 5.18-2, below.

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Table 5.4-2 Project Impacts to Wetlands by Ecoregion and Facility (Cowardin Classifications, in Acres)

Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Interior		**344.12**	**747.98**	**4.13**	**3,286.90**	**2.19**	**16.46**	**8.99**	**0.33**			**7,485.84**	**11,896.95**
(No Subregion)		**344.12**	**747.98**	**4.13**	**3,286.90**	**2.19**	**16.46**	**8.99**	**0.33**			**7,485.84**	**11,896.95**
Permanent Impact		**312.59**	**610.38**	**3.48**	**3,079.84**	**1.40**		**0.25**	**0.15**				**4,008.09**
Access Road		55.34	122.51	0.19	301.76	0.12		0.02	0.15				480.10
Camp		29.98	0.81	0.06	35.57			0.16					66.57
Construction Impact - Permanent		181.21	348.62	2.76	2,349.04	0.96							2,882.59
Existing Road					0.08								0.08
Facility Pad		0.03	0.04		4.37			0.01					4.44
HDD Entry Pad		0.12			0.71								0.83
HDD Exit Pad					1.37								1.37
Material Source		28.24	138.39	0.18	362.75	0.33		0.03					529.92
Pipe Storage Yard		17.17		0.29	22.21			0.03					39.71
Railroad Siding		0.52			1.98								2.49
Temporary Impact/ Minimization		**31.52**	**137.60**	**0.65**	**207.06**	**0.79**	**16.46**	**8.75**	**0.18**				**403.02**
Access Road						0.52	1.32	1.74	0.11				3.69
Bridge								1.16					1.16
Construction Impact - Avoidance			0.11		0.16								0.27
Construction Impact - Temporary		30.88	134.33	0.62	179.87								345.70
HDD Crossing					0.54		12.23						12.77
HDD False ROW			1.84		8.01								9.85
Ice Access Road		0.58	1.33	0.03	16.40		2.77	4.37	0.04				25.52
Pipeline Stream Crossing						0.27	0.15	1.22	0.03				1.67
Temporary Workspace		0.06			2.07			0.28					2.40

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Uplands/ Avoidance												**7,485.84**	**7,485.84**
Access Road												1,254.32	1,254.32
Camp												136.95	136.95
Construction Impact - Avoidance												2.75	2.75
Construction Impact - Permanent												3,116.70	3,116.70
Construction Impact - Temporary												408.07	408.07
Existing Road												10.07	10.07
Facility Pad												31.57	31.57
HDD Crossing												16.35	16.35
HDD Entry Pad												2.55	2.55
HDD Exit Pad												2.19	2.19
HDD False ROW												85.75	85.75
Ice Access Road												29.88	29.88
Material Source												2,280.83	2,280.83
Pipe Storage Yard												78.52	78.52
Railroad Siding												18.47	18.47
TAPS ROW												2.65	2.65
Temporary Workspace												8.24	8.24
Northern	**0.89**	**2,450.08**		**41.95**	**956.28**	**3.86**	**295.42**	**50.35**	**0.00**	**0.89**	**171.54**	**1,304.05**	**5,275.31**
Arctic Coastal Plain	**0.89**	**1,045.90**		**24.15**	**5.52**		**177.47**	**0.01**				**192.41**	**1,446.35**
Permanent Impact	**0.27**	**452.39**		**20.36**	**2.10**		**176.75**						**651.87**
Access Road	0.06	39.96		1.23	0.79		0.57						42.61
Camp		2.75		0.01									2.76
Construction Impact - Permanent	0.22	202.43		1.23	1.31								205.19
Material Source		191.84		17.87			176.17						385.88

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Pipe Storage Yard		15.40		0.01									15.41
Vertical Support Member		0.01		0.00									0.02
Temporary Impact/ Minimization	**0.61**	**593.51**		**3.79**	**3.43**		**0.72**	**0.01**					**602.07**
Bridge							0.72						0.72
Construction Impact - Avoidance	0.61	556.84		3.79	3.43								564.67
Ice Access Road		36.67											36.67
Pipeline Stream Crossing							0.00	0.01					0.01
Uplands/ Avoidance												**192.41**	**192.41**
Access Road												139.96	139.96
Camp												32.48	32.48
Construction Impact - Avoidance												10.44	10.44
Construction Impact - Permanent												3.66	3.66
Ice Access Road												0.17	0.17
Material Source												0.45	0.45
Pipe Storage Yard												5.26	5.26
Arctic Foothills		**805.88**		**2.93**	**114.21**	**0.20**	**117.95**	**41.91**	**0.00**			**356.06**	**1,439.13**
Permanent Impact		**773.43**		**2.93**	**110.87**	**0.19**	**117.95**	**41.88**					**1,047.25**
Access Road		70.05			1.73								71.78
Camp		4.48											4.48
Construction Impact - Permanent		586.87		2.40	104.02								693.29
Material Source		104.84		0.53	4.61	0.19	117.95	41.88					270.00
Pipe Storage Yard		7.19			0.51								7.70
Temporary Impact/ Minimization		**32.45**			**3.34**	**0.01**		**0.03**	**0.00**				**35.83**

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Construction Impact - Avoidance		28.79			3.34								32.13
Ice Access Road		1.88											1.88
Pipeline Stream Crossing						0.01		0.03	0.00				0.04
Temporary Workspace		1.77											1.77
Uplands/ Avoidance												**356.06**	**356.06**
Access Road												26.95	26.95
Camp												22.16	22.16
Construction Impact - Permanent												39.38	39.38
Existing Road												0.29	0.29
Ice Access Road												0.03	0.03
Material Source												264.00	264.00
Pipe Storage Yard												3.24	3.24
Brooks Range		**450.55**		**0.06**	**836.54**	**3.58**		**8.43**				**657.95**	**1,957.12**
Permanent Impact		**449.97**		**0.06**	**835.37**	**3.51**		**8.09**					**1,297.01**
Access Road		2.80		0.01	16.42			0.04					19.26
Construction Impact - Permanent		276.18		0.05	520.71								796.95
Existing Road					0.02								0.02
Material Source		170.99			297.00	3.51		8.05					479.56
Pipe Storage Yard					1.22								1.22
Temporary Impact/ Minimization		**0.58**			**1.17**	**0.07**		**0.34**					**2.16**
Construction Impact - Avoidance		0.12			0.09								0.21
Pipeline Stream Crossing						0.07		0.34					0.41
Temporary Workspace		0.46			1.08								1.54

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Uplands/ Avoidance												**657.95**	**657.95**
Access Road												52.25	52.25
Camp												40.70	40.70
Construction Impact - Avoidance												1.68	1.68
Construction Impact - Permanent												221.27	221.27
Existing Road												4.18	4.18
Material Source												314.06	314.06
Pipe Storage Yard												22.48	22.48
TAPS ROW												1.20	1.20
Temporary Workspace												0.15	0.15
GCF		**147.75**		**14.81**		**0.08**				**0.89**	**171.54**	**97.63**	**432.71**
Permanent Impact		**147.75**		**14.81**		**0.08**				**0.78**	**171.54**		**334.96**
Access Road		48.14		3.62		0.07							51.84
Dredge Disposal											100.00		100.00
Facility Pad		99.61		11.19		0.01							110.80
West Dock Dredge Area											59.64		59.64
West Dock Mooring Dolphin											0.04		0.04
West Dock New Fill										0.78	10.47		11.25
West Dock Temporary Barge Bridge											1.39		1.39
Temporary Impact/ Minimization										**0.12**			**0.12**
West Dock Temporary Barge Bridge Rake										0.12			0.12
Uplands/ Avoidance												**97.63**	**97.63**
Access Road												34.28	34.28

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Bridge												0.64	0.64
Existing Road												9.07	9.07
West Dock Existing Fill												47.34	47.34
West Dock New Fill												6.30	6.30
Southcentral		**142.12**	**85.53**	**2.42**	**281.65**	**0.43**	**8.19**	**4.24**	**0.06**			**3,540.43**	**4,065.08**
(No Subregion)		**142.12**	**85.53**	**2.42**	**281.65**	**0.43**	**8.19**	**4.24**	**0.06**			**3,540.43**	**4,065.08**
Permanent Impact		**123.78**	**76.87**	**1.12**	**201.91**	**0.17**	**0.68**	**1.76**	**0.02**				**406.31**
Access Road		42.54	5.13	0.70	53.27	0.17		0.97	0.02				102.80
Camp			17.95										17.95
Construction Impact - Permanent		66.21	22.88	0.42	144.34		0.68	0.00					234.54
HDD Exit Pad					1.38								1.38
Material Source		13.48	30.91		1.97			0.78					47.15
Pipe Storage Yard		0.69			0.94								1.63
Railroad Siding		0.85											0.85
Temporary Impact/ Minimization		**18.34**	**8.66**	**1.29**	**79.74**	**0.26**	**7.51**	**2.49**	**0.04**				**118.34**
Access Road						0.23		0.55					0.79
Bridge							2.54	0.26					2.80
Construction Impact - Avoidance					0.01								0.01
Construction Impact - Temporary		4.07	1.73		26.48			0.07					32.35
HDD Crossing		1.00	0.93		4.73		4.78	1.44					12.87
HDD False ROW		11.28	5.78	0.05	39.87								56.98
Ice Access Road		2.00	0.18	1.24	8.26		0.15						11.83
Pipeline Stream Crossing						0.03	0.04	0.17	0.04				0.28
Temporary Workspace		0.00	0.03		0.40								0.43

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Ecoregion / Facility	Lake	PEM	PFO	Pond	PSS	Intermittent	Lower Perennial	Upper Perennial	Unknown Perennial	Intertidal Marine	Subtidal Marine	Upland	Grand Total
Uplands/ Avoidance												**3,540.43**	**3,540.43**
Access Road												500.03	500.03
Camp												35.03	35.03
Construction Impact - Avoidance												2.40	2.40
Construction Impact - Permanent												2,055.75	2,055.75
Construction Impact - Temporary												57.95	57.95
Existing Road												16.14	16.14
Facility Pad												24.54	24.54
HDD Crossing												23.78	23.78
HDD Entry Pad												6.90	6.90
HDD Exit Pad												5.51	5.51
HDD False ROW												86.83	86.83
Ice Access Road												32.70	32.70
Material Source												625.62	625.62
Pipe Storage Yard												47.94	47.94
Railroad Siding												17.59	17.59
Temporary Workspace												1.72	1.72
Grand Total	**0.89**	**2,936.32**	**833.51**	**48.50**	**4,524.83**	**6.48**	**320.07**	**63.59**	**0.40**	**0.89**	**171.54**	**12,330.33**	**21,237.34**

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Figure 5.4-1 Permanent Wetland and Upland Impacts - Northern Ecoregion

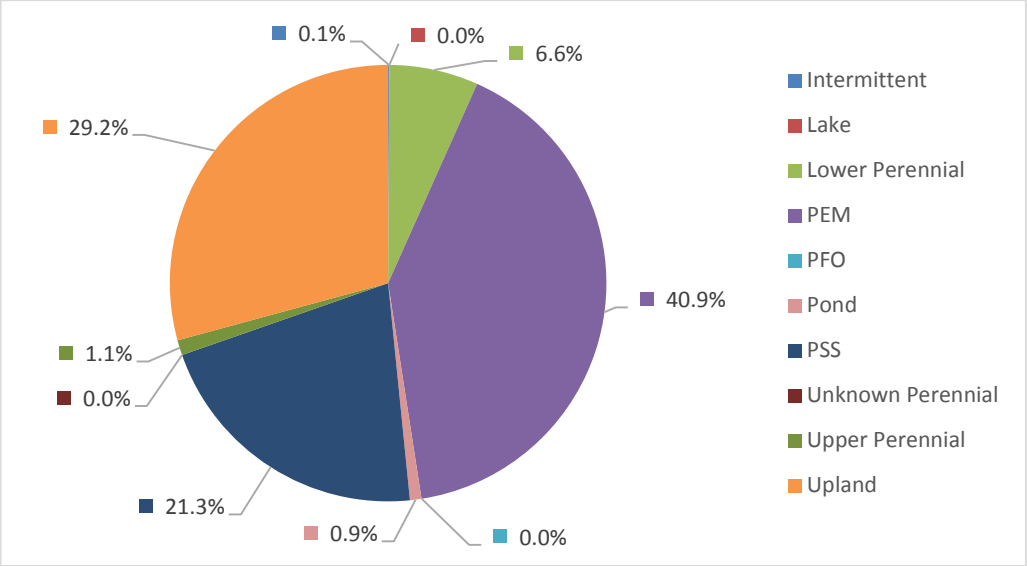

Figure 5.4-2 Permanent Wetland and Upland Impacts - Interior Ecoregion

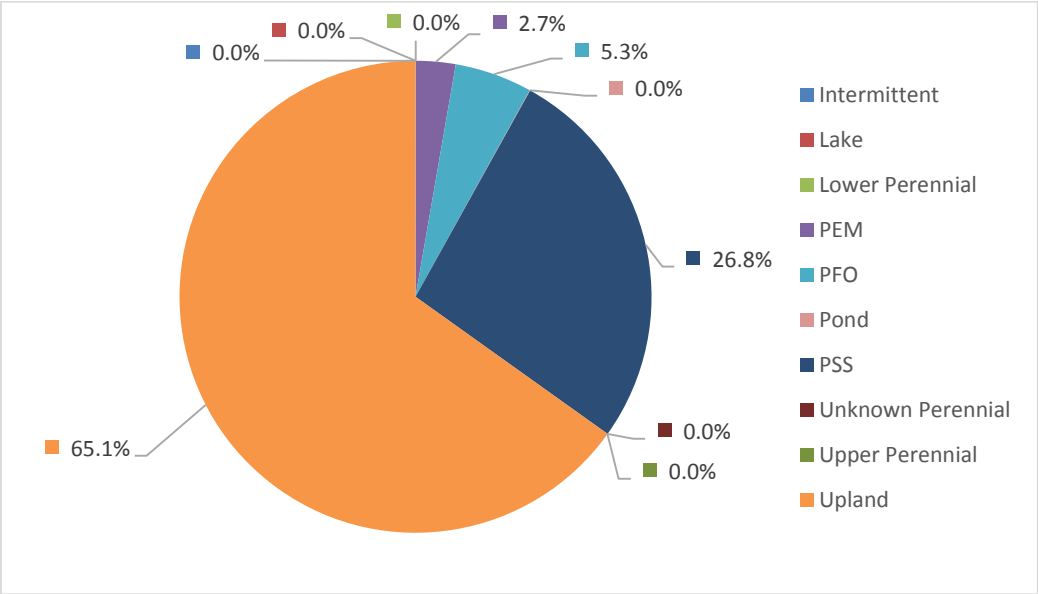

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Figure 5.4-3 Permanent Wetland and Upland Impacts - Southcentral Ecoregion

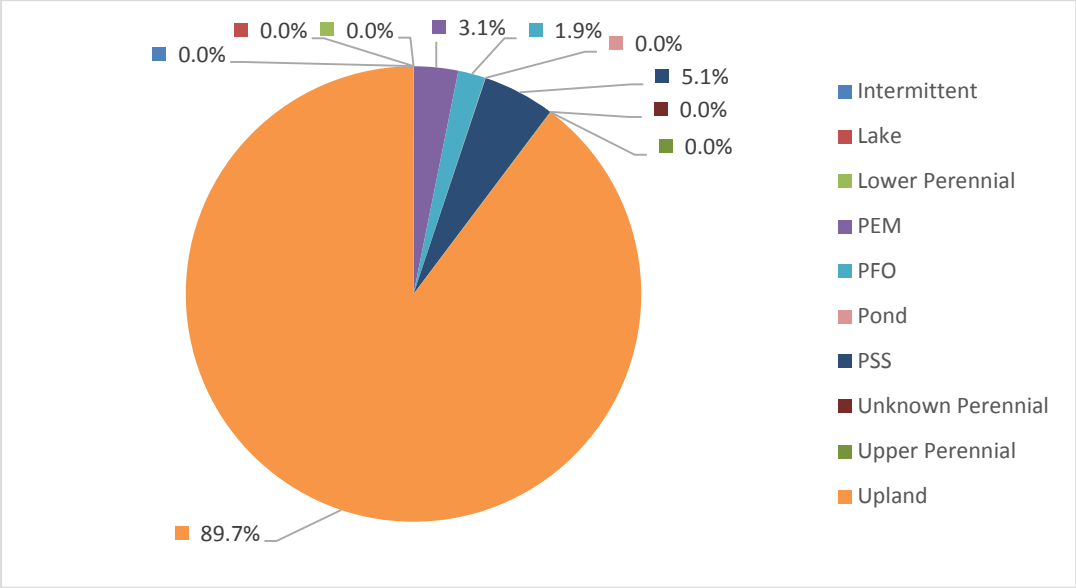

Figure 5.4-4 Permanent Wetland Impacts, by Classification - Northern Ecoregion

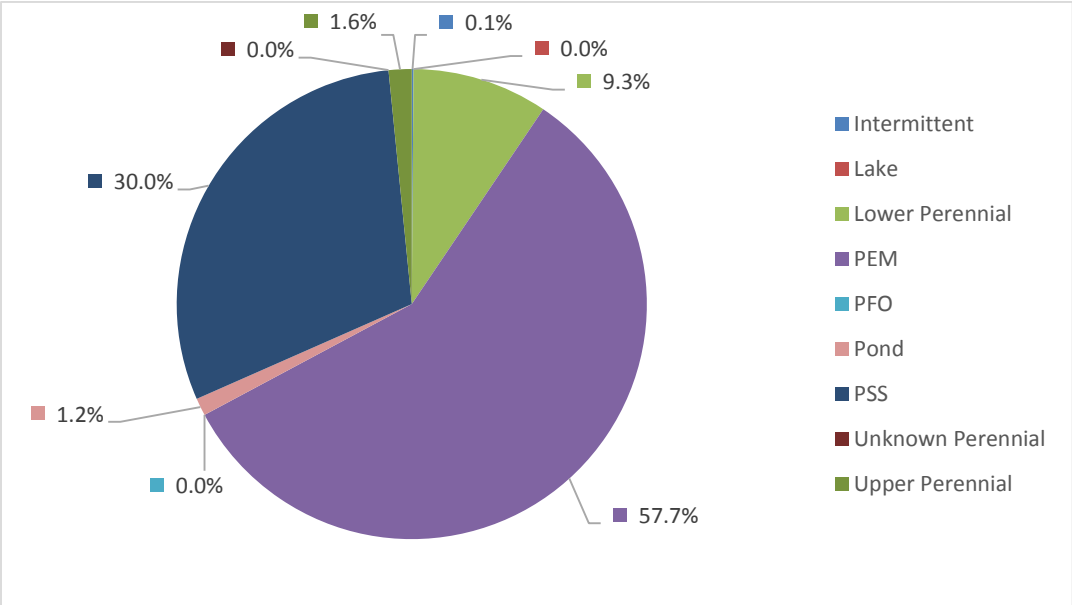

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Figure 5.4-5 Wetland Impacts, by Classification - Interior Ecoregion

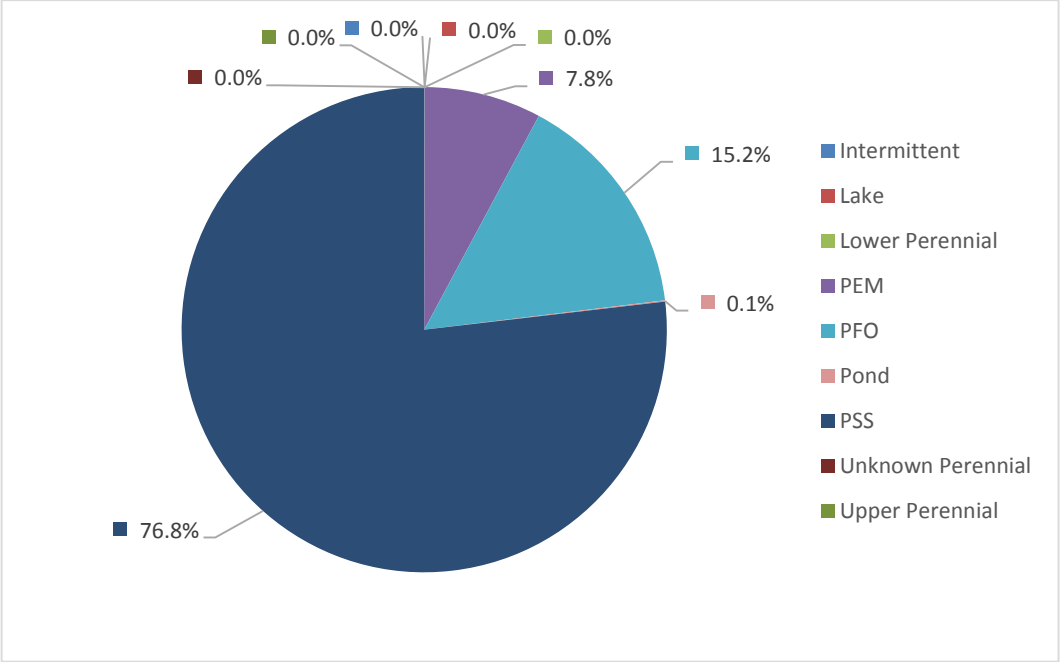

Figure 5.4-6 Permanent Wetland Impacts, by Classification - Southcentral Ecoregion

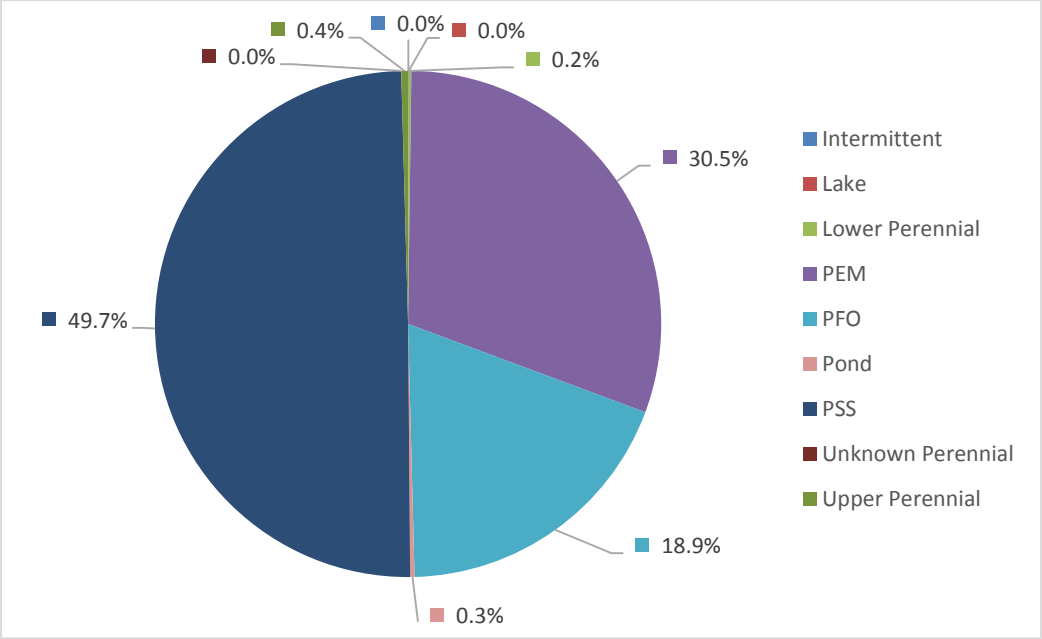

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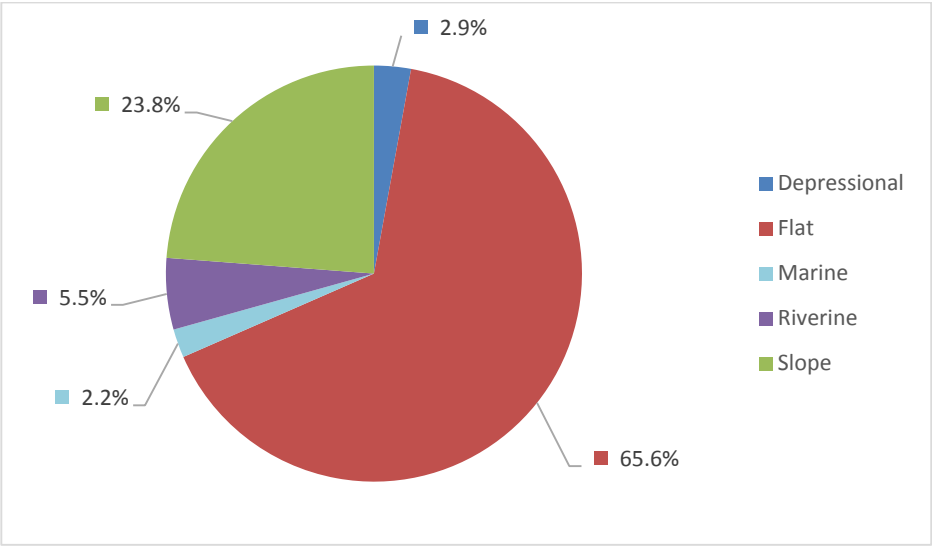
Table 5.4-3 Hydrogeomorphic Functional Class of Permanent Wetlands Impact within the Project Footprint

Classification	Northern		Interior		Southcentral	
HGM Class	**Acres**	**% Comp**	**Acres**	**% Comp**	**Acres**	**% Comp**
Flat	2304.5	69.2%	2517.1	62.8%	257.4	63.4%
Slope	441.5	13.3%	1353.2	33.8%	48.1	11.8%
Depressional	60.5	1.8%	90.0	2.2%	71.2	17.5%
Riverine	352.2	10.6%	47.8	1.2%	29.6	7.3%
Lacustrine	0.0	0.0%	0.2	0.0%	0.0	0.0%
Marine	172.3	5.2%	0.0	0.0%	0.0	0.0%
Total	**3,331.0**	**-**	**4,008.3**	**-**	**406.3**	**-**

Figure 5.4-7 Hydrogeomorphic Functional Class of Permanent Wetlands Impact within the Project Footprint



5.4.3 Environmental Consequences

Under the revised Project footprint and alignment, the ASAP Project has been able to reduce its expected impact to wetlands. Areas, such as material sites, camp locations, PSYs, and access roads that were previously considered conceptually, have been quantified for impact assessment. The pipeline is planned to cross weathered bedrock, glacial till and outwash, fluvial sand, silt, clay, lacustrine silt and clay, colluviums, and windblown silt and fine sand (AGDC, 2015; 2014).

Some types of thawed soil are too soft to support the buried pipeline and can lead to mechanical failures (Anderson and Anderson, 2010; Lachenbruch, 1970). Thaw-stable materials are soils that

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retain their strength and shape when thawed (Instanes et al., 1998). Large pore spaces and a reduction in the permafrost layer depth could result in deeper water percolation through the soil horizon and facilitate mounded upland areas to persist above the buried pipeline. Upland plant species found on the tops of tussocks in wetlands are more apt to wind dispersal mechanisms and will readily reseed these upland areas, as opposed to wetland plants that often rely on water or animals as dispersal mechanisms. However, non-thaw-stable material will compress over time and develop a trough on top of the buried pipeline. Thermokarst phenomena associated with buried pipelines in arctic habitats will facilitate pooling and long water residence times. Perennial flooding conditions may inhibit wetland plant species colonization after burial.

In wetlands, backfilling trenches will include replacing the side-cast vegetative mat on top of the pipe and original subsoil to enable optimal re-establishment of critical habitat. However, the pipeline construction is slated for winter months when separating the subsoil from the vegetative mat will not be possible (AGDC; 2015, 2014). Although winter construction minimizes impacts to wetland habitat from heavy construction vehicles, it will destroy the vegetative layer and plant root stock of wetland species. In addition, the amalgamation of subsoil and topsoil will facilitate open colonization from nearby plant species, including non-wetland species found on tops of tussocks in micro-uplands within the wetlands.

5.4.3.1 Gas Conditioning Facility

The GCF will be constructed from modules on a 69-acre gravel pad, approximately 1 mile from the existing Central Gas Facility. An additional pad area for the GCF camp and workspace totaling 41.8 acres would be constructed adjacent to the GCF. Each module will have a structural steel base and will be mounted on piles driven through the gravel pad. Modules containing process and utility equipment will generally be enclosed and heated to facilitate equipment during the Operations and Maintenance phase of the Project. Site preparation is expected to be completed using gravel from sources in close proximity to the GCF.

Approximately 4,200 ft of above-ground pipes supported on a single set of VSMs, 25 ft apart, will be used to transport gas from the existing Central Gas Facility to the GCF and return waste products. This will result in an estimated 171 VSMs and a total surface area ground disturbance of 839 square ft (SF). Minimum vertical clearance of the VSMs will be 7 ft to allow for wildlife passage.

5.4.3.2 Dust Deposition

Dust deposition can alter soil pH (higher near roads) and decrease nutrient availability (Nitrogen [N] and Phosphorus[P]), lower soil moisture, alter timing of active layer thaw, decrease biomass (especially mosses and lichens), lower species richness, increase open areas, cause burial vegetation, and increase herbaceous and shrub cover that is more adapted to disturbed conditions (Auerbach et al., 1997).

The Project has attempted to distance access roads from wetlands; dust impacts are expected to fall within 300 ft roads and significantly diminish past that point (Auerbach et al., 1997; Everett, 1980).

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Mitigation efforts will focus on dust avoidance and minimization, instead of total eradication. Previous studies have shown that the Prudhoe Bay vegetation is less impacted by the chemical effects of dust, since their limestone substrates are already adapted to large amounts of calcium. Instead, it is the physical deposition and coating that negatively impact this area (Walker and Everett, 1987). Therefore, timing of driving on access roads will be important, since summer months are drier, increasing the dust generated per vehicle (USACE, 2012). Burial of natural habitats from large dust loads must be avoided.

5.4.4 References

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5.5 TERRESTRIAL WILDLIFE

This section describes updates to the affected environment, changes to the regulatory setting, and differences in environmental consequences to terrestrial wildlife based on project changes and refinements since the Final Environmental Impact Statement (FEIS) was published (USACE, 2012).

5.5.1 Affected Environment

The terrestrial wildlife information presented in the FEIS (USACE, 2012) pertaining to the affected environment remains valid. The following are updates to the affected environment description:

- The Teshekpuk caribou herd was not included in the FEIS. The pipeline corridor crosses the eastern extreme of the Teshekpuk herd's wintering grounds and migration route between Wiseman (approximately Mile Post [MP] 230) and Deadhorse (ABR, Inc., 2005, 2012).

- The yellow-billed loon was not included in Table 5.5-4 of the FEIS because the species was a candidate for Endangered Species Act (ESA) listing in 2012 and was discussed in the Threatened and Endangered Species chapter of the FEIS (see Section 5.8.5.14 of the FEIS for a description of the affected environment for the yellow-billed loon [(USACE, 2012]).

- The Beaufort Sea Nearshore and Yukon Flats West Important Bird Areas (IBAs) were not discussed in the FEIS, and the Minto Flats IBA was inadvertently not included in Figure 5.5-2 of the FEIS (USACE, 2012). The shoreline, lagoons, barrier islands, and nearshore areas of the Beaufort Sea are located within the Beaufort Sea Nearshore IBA, which was designated for its global importance to migratory waterbirds, such as brant (*Branta bernicla*), long-tailed ducks (*Clangula hyemalis*), king eiders (*Clangula hyemalis*), red-throated loons (*Gavia stellata*), glaucous gulls (*Larus hyperboreus*), and arctic terns (*Sterna paradisaea*), during the months when the waters are ice-free (Smith et al., 2012). These nearshore habitats provide sheltered foraging and roosting areas used by molting seaducks, especially long-tailed ducks, and these habitats also provide breeding and staging areas for seaducks, seabirds, and shorebirds. The U.S. Fish and Wildlife Service (USFWS) considers the Beaufort Sea barrier islands and the lagoon habitat they create a Category II habitat for birds, meaning the habitat is of high value for bird species under evaluation by the agency, and the habitat is relatively scarce or becoming scarce on a national or ecoregional basis (USFWS, 2010). The Yukon Flats IBA is located in the western portion of the Yukon Flats National Wildlife Refuge (NWR) and was established because of the importance of the area to breeding waterbirds, particularly ducks, loons, geese, swans, and shorebirds. The Yukon Flats NWR supports the highest breeding densities of ducks in Alaska (USFWS, 2014a). The Project avoids the Yukon Flats NWR and the Yukon Flats West IBA. Figure 5.5-1 shows the updated important bird habitats.

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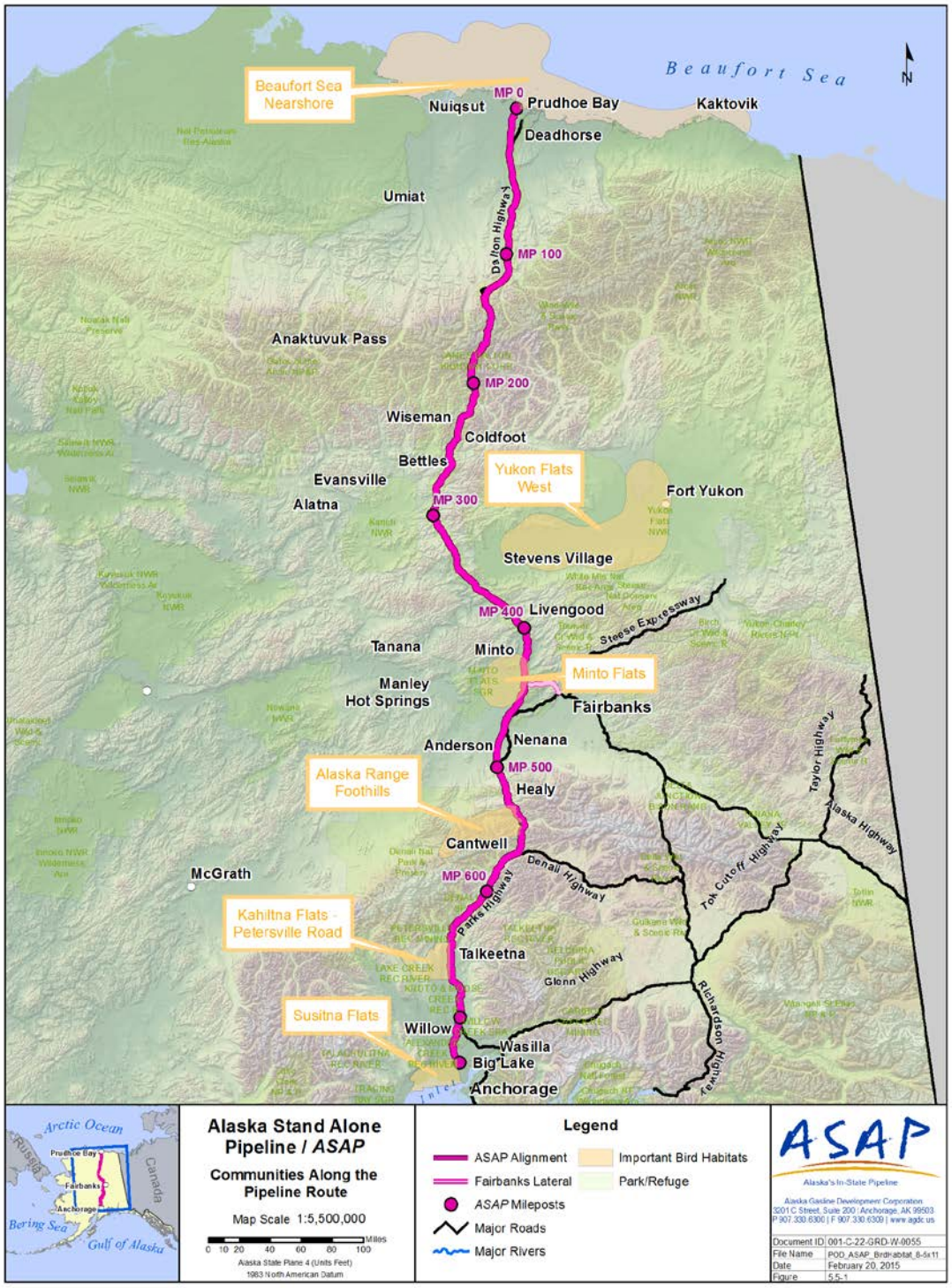
Figure 5.5-1 Important Bird Habitats along the Alaska Stand Alone Pipeline Route



(Smith et al., 2014).

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5.5.1.1 Regulatory Setting

Changes to the regulatory setting for terrestrial wildlife since the FEIS (USACE, 2012) include the following:

- On 1 October 2014, the USFWS published their 12-month finding on the petition to list the yellow-billed loon under the ESA. The USFWS concluded that listing the yellow-billed loon as threatened or endangered was not warranted at that time (USFWS, 2014b). While the USFWS is not listing the species, the yellow-billed loon remains a conservation priority for the agency.

- On 7 May 2014, the USFWS published a final rule in the Federal Register (FR) for the establishment of a nonessential experimental population of wood bison, a species that is classified as threatened in Alaska under the Endangered Species Act. One of the release areas considered for the species was within the Minto Flats region near the Project action area; however, a site near Shageluk, Alaska (outside the Project action area) was instead chosen for release and monitoring in Spring 2015. There are no confirmed plans to date for any reintroduction of Wood Bison to the Minto Flats.

5.5.2 Environmental Consequences

The environmental consequences of the proposed project on terrestrial wildlife remains largely unchanged from the assessment made in the FEIS. Project refinements since the FEIS that affect terrestrial wildlife include the following (USACE, 2012):

- West Dock will be modified to accommodate sealift barges, and 23 sealift barges will be required instead of the 9 evaluated in the FEIS.
- The first 7 miles of pipeline from the Gas Conditioning Facility (GCF) will be buried.
- The Mainline will be 4 miles shorter, but segments of the Mainline Right-of-Way (ROW) will be shifted away from existing ROWs.
- The Fairbanks Lateral will be rerouted and shorter.
- Construction ROWs will be a nominal 120 ft wide, and permanent ROWs will be a nominal 53 ft for the Mainline and 30 ft for the Fairbanks Lateral.
- Design of material sites and volumes, access roads, facilities, construction equipment, labor, and material transportation methods have advanced and better defined or refined.
- Construction timing, including time periods for seasonal construction, has been refined.

The discussion herein describes how these project refinements could affect terrestrial wildlife.

5.5.2.1 West Dock Modifications

West Dock is located within the Beaufort Sea Nearshore IBA. Waterbirds that use the lagoons and nearshore areas for brood rearing, molting, and migration where dredged material may be deposited could be temporarily displaced from these habitats and could be exposed to arsenic in the dredged

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material. However, birds are potentially exposed to the arsenic in its current location. In addition, the timing of dock and causeway upgrades will occur during the ice-free months when waterbirds are likely to be present, so waterbirds could be temporarily displaced during active construction activities. The Alaska Gasline Development Corporation (AGDC) has committed to performing bird nest surveys prior to summer construction activities if necessary.

5.5.2.2 Buried Pipeline

As noted above, in Section 2, the act of burying the first 7 miles of pipeline from the GCF will reduce impacts to wildlife migration and movement, particularly caribou (Smith and Cameron, 1992; Lawhead et al., 2006). Transcripts from the TAPS renewal DEIS Public Hearing in Barrow Alaska (Bureau of Land Management [BLM], 2002) recorded North Slope Borough (NSB) Mayor George Ahmaogak's public testimony, as he spoke on behalf of the NSB in regard to his concern about additional aboveground features that could impact wildlife on the North Slope (see quotation in Section 2.5.3, above) (BLM, 2002).

5.5.2.3 Pipeline Alignment Modifications

Mainline alignment modifications that shift the pipeline away from existing disturbed transportation and utility corridors that are most likely to affect wildlife include the North Slope segment (MPs 1 through 28.5), the 16-mile segment between Nenana and Anderson (MPs 472 through 488), the 20-mile segment in Broad Pass (MPs 574.6 through 594.5), and the 46-mile segment between Talkeetna and Willow (MPs 661.7 through 708). Habitat fragmentation will be increased in these areas, and species most dependent on large, contiguous, forested habitats, including many migratory land birds, could be most affected.

Because a permanent 53-foot ROW will be maintained, certain portions of these modified pipeline alignments could become more accessible to hunters and recreationists, resulting in higher rates of wildlife disturbance and mortality than reported in the FEIS (USACE, 2012).

The alignment modifications between Talkeetna and Willow route the pipeline away from disturbed ROW and closer to the Susitna River. This area has a high likelihood for bald eagle nests (Anthony et al., 1982; Bald Eagle Research Institute, 2008; Shook et al. 2013) and may require mitigation to avoid or minimize impacts to nests and disturbance to nesting birds during construction.

The Fairbanks Lateral alignment modification shifts the pipeline out of the Goldstream Creek drainage adjacent to the Alaska Railroad (ARR) and onto a forested ridge through approximately 29 miles of the Tanana Valley State Forest (TVSF), Management Unit 4 (Chatanika River, Cache Creek, Goldstream Valley; Division of Forestry, 2001); and adjacent to Murphy Dome Road, Murphy Dome Road Extension, and Old Murphy Dome Road. Wildlife impacts for the currently proposed alignment will differ from those described in the FEIS (USACE, 2012) because the route has moved into different habitat (proposed project moved from riparian corridor to upland ridge). The highlands near Murphy Dome in the TVSF are used for trapping, and moose, black bear, and grouse

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hunting (Division of Forestry, 2001). Wildlife impacts will include temporary disturbance during construction and habitat fragmentation for portions of the pipeline alignment not adjacent to existing roads. Increased disturbance by human activity will not be likely because of the current high use of the area relative to more remote portions of the pipeline.

5.5.2.4 Right-of-Way Width Modifications

Potential impacts to terrestrial wildlife during construction and operation of the pipeline from the change in ROW widths will be similar to those described in the FEIS (USACE, 2012), but potentially will be slightly greater because of the increased width of the construction ROW from 100 to 120 ft, and the increased width of the permanent ROW from 30 or 52 ft (depending on land ownership) to 53 ft for the entire length of the pipeline.

5.5.2.5 Material Sites, Access Roads, and Facilities

The number, distribution, length, and size of material sites, access roads, and other facilities has been refined since the FEIS, resulting in an increased overall project footprint from what was defined through available information in the FEIS (USACE, 2012). Areas of permanent impact could result in loss, fragmentation, and disturbance of wildlife habitat in these areas.

It is anticipated that individual material sites will be in the vicinity of existing transportation routes or utility corridors. The location of material sites (for example, river floodplain, upland forest, adjacency to existing infrastructure) will influence potential impacts to wildlife along the project corridor. Material sites will be permitted by the federal, state, and local government agencies, and require wildlife mitigation measures.

More access roads have been defined and quantified under the current design than in the FEIS, which will result in direct modification of wildlife habitat and increased access to wildlife in those areas. The wildlife habitat in these impacted areas will be lost, fragmented, or disturbed, resulting in increased disturbance to wildlife populations. These access roads will be designated as private and not for use by the general public.

The revised project includes modifications to facilities, including eliminating several compressor stations, two straddle plants, and one conditioning facility. The reduction in infrastructure along the pipeline corridor will mitigate project impacts.

5.5.2.6 Construction Seasons

The currently proposed POD for the project defines when construction activities occur, including seasonal activities (AGDC, 2014). Section 5.5 of the FEIS, particularly Table 5.5-7 (USACE, 2012), describes sensitive time periods for species and species groups along the project corridor. Additional information includes the following:

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- Winter construction activities have the potential to disturb denning black and brown bears throughout the length of the project.

- Birds protected under the Migratory Bird Treaty Act occur throughout the length of the project, and clearing and grubbing activities during migratory bird nesting periods (generally, from mid-May to late-July, depending on latitude) could disturb or destroy nests. Fall, winter, or spring clearing and grubbing will avoid disturbance or destruction of migratory bird nests.

- Bald and golden eagles and their nests are protected under the Bald and Golden Eagle Protection Act. AGDC will work with federal and state agencies to employ appropriate mitigation measures to avoid or minimize impacts to eagles and comply with existing regulations.

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5.6 FISH

This section describes potential impacts of the proposed project revisions on fish and fish habitat. The affected environment related to the freshwater fishery resources of the project area described in the Final Environmental Impact Statement (FEIS) (USACE, 2012) remains valid, and the classification of anadromous or resident fish streams has not changed as a result of the project revisions. Recent revisions to the ASAP Project, such as changes in the alignment of the Mainline pipe and the Fairbanks Lateral (see AGDC, 2015), result in changes to the previous assessment of the effects of the proposed project on fishery resources.

5.6.1 Affected Environment

The affected environment has been revised to include temporary impacts to the marine environment in the West Dock area, and to account for pipeline alignment shifts that add or eliminate some stream crossings. Fish stream surveys specific to the Alaska Stand Alone Pipeline (ASAP) Project were conducted during the 2011 and 2013-2015 field seasons to identify freshwater Essential Fish Habitat (EFH), identify both anadromous and resident fish streams, and provide resource input to assist in determining appropriate stream crossing methods for the pipeline. The 2015 fisheries studies for work on the pipeline ROW and off-ROW facilities are attached (Attachments 9 and 10). ASAP delivered its Essential Fish Habitat Assessment to the USACE in December 2015 as an attachment to the JAFP (AGDC, 2015). It is also included in the EED as Attachment 5. Evaluation of modes has been finalized (Attachment 11) and was utilized in developing the revised list of stream crossings, below.

5.6.1.1 Regulatory Setting

The federal regulatory requirements related to the fishery resources of the project area described in detail in the FEIS (USACE, 2012) have not changed. To meet the requirements of the Magnuson-Stevens Fishery Conservation and Management Act, the EFH Assessment has been updated to include revisions to freshwater EFH based on the revisions to the project description. In addition, a new section of the EFH Assessment has been added to address EFH impacts related to construction activities in the marine waters of the West Dock area of Prudhoe Bay (Attachment 5).

The Alaska Department of Fish and Game (ADF&G) Anadromous Waters Catalog has been updated and released in a recent 2015 revision (Johnson and Litchfield, 2015a, b, c). In this section and in other areas throughout the main body of the EED document, the most recent Anadromous Waters Catalog (AWC) was used to document a total of 50 anadromous stream crossings by the pipeline and 14 anadromous crossings by access roads (Johnson and Litchfield, 2015a, b, c). The EFH reports detailed information on habitat and species, as well as a list of streams crossed by the pipeline and access roads that contain EFH species (Attachment 5).

The ADF&G has developed new Blasting Standards (Timothy, 2013) since the FEIS (USACE, 2012) to replace the 1991 ADF&G Blasting Standards. ADF&G will apply Blasting Standards to both anadromous and resident fish stream crossings, where appropriate.

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All other regulatory requirements for fishery resources presented in the FEIS remain valid (USACE, 2012).

5.6.1.2 Project Area

The project area is located within three major hydrologic regions in Alaska, as follows:

1) Arctic Region – From the Gas Conditioning Facility (GCF) to Atigun Pass (ASAP Mile Post [MP] 0.0 to 166), including the Sagavanirktok (Sag) and Kuparuk River drainages
2) Interior Region – From Atigun Pass to Broad Pass (ASAP MP 166 to 568), all within the Yukon River drainage
3) Southcentral Region (Southcentral) – From Broad Pass to terminus near Cook Inlet (ASAP MP 568 to 733.5), including the Susitna and Little Susitna River drainages

The current ASAP Project's Mainline will cross an estimated 312 streams throughout the three hydrologic regions (265 for the Mainline, 7 for the Fairbanks Lateral, and an additional 40 streams for off-ROW features). Anadromous fisheries information for each crossing are provided, below, in table 5.6-1.

The potentially affected fishery resources of the Interior and Southcentral hydrologic regions remain as described in the FEIS (USACE, 2012). In the Arctic Region, the revised proposed pipeline does not cross the Sag River; however, the active channels of the Sag River may be used for material sites (see AGDC, 2015). The material sites are not expected to encroach into the flowing waters of the Sag River, but there may be potential material sites located on the dewatered gravel bars of the river.

Project revisions in the Arctic Region have resulted in identification of new, potentially affected fishery resources in that portion of the project area, which encompasses the coastal and marine waters near West Dock. With the proposed improvements at West Dock, activities, such as dredging, dredge material disposal, and the construction of a temporary bridge on the West Dock causeway, could affect fishery resources in that area that were not described in the FEIS (USACE, 2012).

Activities associated with the temporary barge bridge that will be located adjacent to the large breach on the West Dock causeway may be a fish passage concern to resource agencies. The large breach was initially constructed to facilitate fish passage, and it has been viewed as a success (Fechhelm, 1999). The temporary barge bridge needed to offload the modules is expected to be in place from mid-August through the end of September. This temporary bridge will reduce the effective cumulative opening of the 650-foot-wide breach to approximately 72.5 ft at the seafloor.

West Dock is a solid fill causeway that was completed to its current configuration in 1981. The causeway was built to support oil and gas development in the Prudhoe Bay area. Fishery managers became concerned that the solid fill causeway was impeding, and potentially blocking, nearshore fish passage. Initially a 50-foot channel breach was designed. After scientific examination and monitoring, the breach was proven to be ineffective at mitigating concerns with nearshore marine

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resources and coastal currents due to its size and location (Fechhelm et al., 1999). A secondary 650-foot breach was constructed in 1995 and 1996 between Dock Head (DH) 2 and DH 3 to enhance fish passage. This breach is considered to have had a positive impact on nearshore fish movements and fish populations, partially due to location and mixing of nearshore currents and marine water masses (Winters, 2014; Fechhelm et al., 1999).

Summer is the primary feeding and growth period for most fish in Alaska (Fechhelm et al., 1999). Anadromous and amphidromous fish spend their winters in the North Slope or Arctic Canadian river systems, and disperse out into the brackish nearshore coastal waters to feed during the Arctic summer (Craig, 1989). Most fish migrating through Prudhoe Bay overwinter in the Colville River, Sag River, or Mackenzie River in Canada; however, some may also overwinter in other streams along the North Slope. Young fish are less tolerant to high-saline water (Fechhelm et al., 1999); therefore, their migratory path is usually closer to shore where the melting ice creates a brackish water lens about 0.5 to 2.5 miles wide (Craig and Griffiths, 1981). The West Dock breach is an important transit route during this spring migration (Fechhelm 1999; Fechhelm et al., 2001), allowing fish to disperse greater distances within habitable waters.

Fish migrate from both the east and west to Prudhoe Bay. During the spring migration, late-June to early-July, young-of-the-year Arctic cisco (*Coregonus autumnalis*) from the Mackenzie River are transported via wind-driven currents (typically to the west) along the nearshore coast towards Prudhoe Bay (Fechhelm et al., 1999). Young fish also move from the Colville River eastward towards Prudhoe Bay. In mid- to late-August (fall migration), fish travel to their respective overwintering or spawning grounds. The fall migration may occur via a more offshore route, thus not using the West Dock breach (Winters, 2014).

Five fish species are predominant in Prudhoe Bay in the summer (Fechhelm et al., 1994; Fechhelm, 1999; Fechhelm et al., 2011):

1) Least cisco (*Coregonus sardinella*) spawns and overwinters in the Colville. The Mackenzie River stock is not thought to migrate all the way to Prudhoe Bay (some 600 miles west) (Fechhelm et al., 1999).
2) Arctic cisco (*Coregonus autumnalis*) spawns in the Mackenzie River and overwinters in the Colville River. Mature Arctic cisco (7+ years) travel back to the Mackenzie River during the fall migration to spawn (Hatfield et al., 1972a, b; Galloway et al., 1983; Fechhelm et al., 2007; USFWS, 2008a).
3) Broad whitefish (*Coregonus nasus*) spawn in North Slope and Canadian Arctic streams. They overwinter in brackish waters until sexually mature (USFWS, 2008b). Their migration distance may be minimal (Winters, 2014).
4) Dolly Varden (*Salvelinus malma*) spawn and overwinter in the Colville and other Arctic North Slope river systems (USFWS, 2008a).
5) Humpback whitefish (*Coregonus pidschian*) have a discontinuous distribution in the Beaufort Sea river systems. There are two populations: the eastern and the western stock. The

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eastern population originates in several western arctic Canadian rivers, including the Mackenzie River; and the western populations are found in the Colville River and several rivers to the west. The western stock migrates to Prudhoe Bay and Sampson Lagoon during the summer, overwinters in Colville River, and returns to their original spawning ground when they are sexually mature. It is unknown if the eastern stock migrates to Prudhoe Bay and overwinters in the Colville River, then back to their original spawning grounds (Fechhelm, 1999).

Many of the fish moving through the West Dock nearshore area provide an important source of subsistence food for North Slope communities, as well as those in the Canadian Arctic.

5.6.2 Environmental Consequences

The pipeline alignment changes have resulted in a decrease of stream crossings from 515 to 312 stream crossings with the revised pipeline alignment (USACE, 2012; AGDC, 2015). This also results in the elimination of several anadromous fish stream crossings for the revised alignment. With the greater definition of access road design, stream crossings and crossing mode have been provided, as well as information on anadromous fish species. Table 5.6-1 presents the revised list of streams crossed by the ASAP Project, indicating the presence of fish and anadromous species in those waterbodies. Specific fish data are documented for site visits and provided in reports to ADFG (see Attachments 9 and 10 for 2015 studies, as examples).

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Table 5.6-1 Alaska Stand Alone Pipeline Fish Stream Crossings

A. Mainline

Mainline Stream ID	Stream Name	NHD Stream Type	Anadromous	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)
ST_3.1	Putuligayuk River	Perennial	Yes	AS	-148.58862	70.2805546	264
ST_4.7	Unknown	Artificial Path	No	OC	-148.62989	70.2613195	73
ST_27.2	Unknown	Perennial	No	OC	-148.75789	69.9472865	33
ST_74.5	Unknown	Perennial	No	OC	-148.74327	69.3031662	76
ST_76.5	Unknown	Perennial	No	OC	-148.77265	69.2762727	105
ST_76.7	Unknown	Perennial	No	OC	-148.77454	69.2729679	15
ST_76.9	Unknown	Perennial	No	OC	-148.77378	69.2712631	32
ST_82.5	Unknown	Perennial	No	OC	-148.82763	69.1951417	18
ST_85.1	Unknown	Perennial	No	OC	-148.84205	69.1600577	32
ST_88.1	Unknown	Perennial	No	OC	-148.86422	69.1235502	33
ST_90.2	Unknown	Perennial	No	OC	-148.83687	69.0959935	37
ST_99	Unknown	Perennial	No	OC	-148.88924	68.97641	39
ST_100.5	Unknown	Perennial	No	OC	-148.89695	68.957104	10
ST_101.5	Dan Creek	Perennial	No	OC	-148.90002	68.9432864	6
ST_106.7	Oksrukuyik Creek Tributary	Perennial	No	OC	-148.88075	68.8691732	35
ST_108.5	Oksrukuyik Creek Tributary	Perennial	No	OC	-148.86019	68.8437823	102
ST_121.5	Unknown	Perennial	No	OC	-149.07951	68.6956947	31
ST_128.5	Toolik River	Perennial	No	IOC	-149.31946	68.646814	25
ST_129.2	Imnavait Creek	Perennial	No	IOC	-149.34259	68.6413655	12

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Mainline Stream ID	Stream Name	NHD Stream Type	Anadromous	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)
ST_130.8	Kuparuk River	Perennial	No	IOC	-149.38167	68.6237979	45
ST_132.3	Unknown	Intermittent	No	IOC	-149.41542	68.6081264	5
ST_160.2	Unknown	Artificial Path	No	IOC	-149.37106	68.4518746	379
ST_221.3	Unknown	Intermittent	No	IOC	-149.32807	68.4117042	103
ST_405.3	Unknown	Perennial	No	OC	-149.32301	68.4071322	975
ST_594.3	Unknown	Perennial	No	OC	-149.31419	68.3734622	54
ST_594.4	Unknown	Perennial	No	IOC	-149.36855	68.2847682	4
ST_157.4	Trevor Creek	Perennial	No	IOC	-149.37192	68.2835229	24
ST_158.3	Unknown	Intermittent	No	IOC	-149.39245	68.2723278	68
ST_158.9	Unknown	Intermittent	No	IOC	-149.40356	68.2645287	15
ST_160.2	Unknown	Intermittent	No	OC	-149.42044	68.2472239	58
ST_160.5	Unknown	Intermittent	No	IOC	-149.42127	68.2434816	62
ST_162	Unknown	Perennial	No	IOC	-149.40909	68.2230194	102
ST_162.6	Atigun River	Artificial Path	No	IOC	-149.4113	68.2156041	747
ST_163.5	Unknown	Perennial	No	OC	-149.40828	68.2024309	48
ST_163.7	Unknown	Intermittent	No	OC	-149.41187	68.1996511	18
ST_165.3	Unknown	Intermittent	No	OC	-149.43006	68.1794408	22
ST_165.4	Unknown	Intermittent	No	OC	-149.43248	68.1776135	12
ST_166	Spike Camp Creek	Artificial Path	No	IOC	-149.43874	68.1693836	67
ST_166.5	Unknown	Intermittent	No	OC	-149.43635	68.1642531	48
ST_167.5	Unknown	Intermittent	No	IOC	-149.44128	68.1485937	25
ST_168	Unknown	Intermittent	No	OC	-149.44522	68.1416621	28
ST_168.2	Unknown	Intermittent	No	OC	-149.4462	68.1394854	78

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Mainline Stream ID	Stream Name	NHD Stream Type	Anadromous	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)
ST_169.9	Unknown	Perennial	No	OC	-149.49115	68.1275229	179
ST_171.6	Unknown	Perennial	No	IOC	-149.53785	68.1134391	385
ST_173.1_2	Unknown	Intermittent	No	OC	-149.5503	68.0935418	27
ST_173.5	Unknown	Perennial	No	OC	-149.55496	68.0886493	118
ST_174.9	Unknown	Intermittent	No	OC	-149.59028	68.0744162	99
ST_178.2	Trib to Dietrich River	Perennial	No	IOC	-149.65447	68.036275	22
ST_178.3_1	Dietrich River	Perennial	No	IOC	-149.6566	68.0362596	248
ST_178.3_2	Dietrich River	Perennial	No	IOC	-149.65811	68.0358678	332
ST_178.4	Dietrich River	Perennial	No	IOC	-149.66261	68.0347091	776
ST_178.6	Dietrich River	Perennial	No	IOC	-149.66712	68.0335111	417
ST_178.9	Dietrich River	Perennial	No	IOC	-149.67604	68.0315797	208
ST_178.9_1	Dietrich River	Perennial	No	IOC	-149.67826	68.0313653	170
ST_178.9_2	Dietrich River	Perennial	No	IOC	-149.68017	68.031209	398
ST_179	Dietrich River	Perennial	No	IOC	-149.68328	68.0309951	480
ST_179.2_1	Dietrich River	Perennial	No	IOC	-149.68704	68.0307374	256
ST_179.2_2	Dietrich River	Perennial	No	IOC	-149.68848	68.0306386	145
ST_179.3	Dietrich River	Perennial	No	IOC	-149.69387	68.0302697	300
ST_180.3	Unknown	Perennial	No	IOC	-149.72237	68.0227646	25
ST_181.6	Dietrich River	Perennial	No	IOC	-149.74744	68.0061143	227
ST_183.5	Unknown	Perennial	No	IOC	-149.76073	67.9828605	10
ST_184.4	Unknown	Intermittent	No	IOC	-149.76668	67.9703528	80
ST_184.9	Unknown	Perennial	No	IOC	-149.76862	67.9628571	77
ST_185.3	Unknown	Intermittent	No	IOC	-149.77081	67.9572284	12

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Mainline Stream ID	Stream Name	NHD Stream Type	Anadromous	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)
ST_187.4	Nutirwik Creek	Artificial Path	No	IOC	-149.81844	67.9344833	106
ST_189.5	Unknown	Intermittent	No	IOC	-149.81661	67.9052494	50
ST_189.8	Unknown	Intermittent	No	OC	-149.81595	67.9012775	14
ST_190.5	Unknown	Perennial	No	IOC	-149.81836	67.8907238	210
ST_193.5	Unknown	Perennial	No	IOC	-149.82821	67.8487877	268
ST_194.9	Unknown	Intermittent	No	IOC	-149.83079	67.8277718	389
ST_196.1	Unknown	Perennial	No	IOC	-149.82486	67.8108167	9
ST_197.6	Unknown	Intermittent	No	OC	-149.80428	67.7925386	56
ST_198.9	Unknown	Intermittent	No	IOC	-149.77857	67.7756954	148
ST_201.7	Snowden Creek	Perennial	No	IOC	-149.75288	67.7375777	114
ST_202.7_1	Unknown	Intermittent	No	OC	-149.74046	67.7254736	6
ST_202.8	Unknown	Intermittent	No	OC	-149.73972	67.7242326	32
ST_204.6	Unknown	Perennial	No	IOC	-149.72755	67.6982871	100
ST_207.3	Unknown	Perennial	No	IOC	-149.71857	67.6598206	238
ST_208.6	Dietrich River	Artificial Path	No	IOC	-149.74054	67.6454777	203
ST_209	Unknown	Perennial	No	IOC	-149.75345	67.642295	29
ST_210.9	Middle Fork Ko-yokuk River 3	Artificial Path	Yes	IOC	-149.78724	67.6192196	2023
ST_213.1	Unknown	Perennial	No	IOC	-149.7865	67.5881402	23
ST_218.3	Linda Creek	Perennial	No	IOC	-149.84393	67.5196885	40
ST_218.9	Gold Creek	Perennial	No	IOC	-149.85107	67.5123506	44
ST_219.7	Sheep Creek	Perennial	No	IOC	-149.85604	67.5008785	217
ST_220.2	Wolf Pup Creek	Perennial	No	IOC	-149.85857	67.4935144	12
ST_221	Nugget Creek	Perennial	No	IOC	-149.86349	67.4834455	23

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ST_221.3	Unknown	Intermittent	No	IOC	-149.87376	67.481322	14
ST_224.8	Unknown	Intermittent	No	IOC	-149.99369	67.4603247	52
ST_225.7	Unknown	Intermittent	No	IOC	-150.02512	67.4558472	4
ST_225.8	Unknown	Ephemeral	No	OC	-150.02908	67.4552765	53
ST_226.1	Unknown	Intermittent	No	IOC	-150.03717	67.4540362	15
ST_226.8	Unknown	Intermittent	No	IOC	-150.05287	67.4471355	3
ST_228.9	Minnie Creek	Perennial	Yes	IOC	-150.07873	67.4201169	63
ST_230.3	Unknown	Intermittent	No	IOC	-150.0947	67.4011931	23
ST_233.6	Unknown	Intermittent	No	IOC	-150.13057	67.3561068	15
ST_236.3	Marion Creek	Perennial	Yes	IOC	-150.16095	67.3198955	68
ST_239.5	Clara Creek	Perennial	No	IOC	-150.1634	67.2732127	7
ST_240.8	Slate Creek	Perennial	Yes	IOC	-150.16658	67.2552692	103
ST_246	Rosie Creek	Perennial	No	OC	-150.26488	67.1971105	64
ST_254.2	Chapman Creek	Perennial	No	IOC	-150.35044	67.0967004	5
ST_260.5	South Fork Ko-yokuk River	Artificial Path	Yes	IOC	-150.28376	67.0176584	261
ST_262.6	Unknown	Perennial	No	OC	-150.30141	66.9906869	8
ST_270.8	Unknown	Intermittent	No	OC	-150.47762	66.8970114	12
ST_272.2	Jim River	Artificial Path	Yes	IOC	-150.51172	66.883027	217
ST_274.5	Douglas Creek	Perennial	Yes	OC	-150.55662	66.8559254	86
ST_281.2	Prospect Creek	Perennial	Yes	IOC	-150.66824	66.7782638	68
ST_285.5	Little Nasty Creek	Perennial	No	IOC	-150.65634	66.7164559	210
ST_288.2	North Fork Bo-nanza Creek	Perennial	No	IOC	-150.64746	66.6825236	77

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ST_289.8	Bonanza Creek	Perennial	No	IOC	-150.65591	66.6602414	71
ST_298.4	Fish Creek	Perennial	No	IOC	-150.71934	66.547764	50
ST_300.1	Unknown	Perennial	No	IOC	-150.71705	66.5249767	19
ST_301.1	Unknown	Perennial	No	IOC	-150.71205	66.5099555	18
ST_306.8	Kanuti River	Artificial Path	No	IOC	-150.62725	66.4413715	88
ST_321.7	Dall Creek	Perennial	No	IOC	-150.34789	66.2679836	15
ST_333.7	No Name Creek	Perennial	No	IOC	-150.16684	66.1162141	37
ST_366.3	Isom Creek	Perennial	No	IOC	-149.4732	65.7969877	4
ST_340.2	Fort Hamlin Hills Creek	Perennial	No	IOC	-150.13039	66.0283758	22
ST_347.2	Unknown	Perennial	No	IOC	-149.96247	65.9622096	17
ST_356	Yukon River	Artificial Path	Yes	TD	-149.74205	65.8797915	2185
ST_364.2	Unknown	Perennial	No	IOC	-149.53425	65.8118937	3
ST_373.1	Unknown	Perennial	No	IOC	-149.29026	65.7391291	2
ST_374.2	Unknown	Perennial	No	IOC	-149.25952	65.7292097	3
ST_374.8	Unknown	Perennial	No	OC	-149.24265	65.7246682	2
ST_376.9	Unknown	Perennial	No	IOC	-149.17976	65.7102664	3
ST_381	Hess Creek	Artificial Path	No	IOC	-149.07394	65.6728185	139
ST_384.9	Unknown	Perennial	No	IOC	-148.99262	65.6320829	3
ST_387.2	Unknown	Perennial	No	IOC	-148.94819	65.6090012	9
ST_390.5	Erickson Creek	Perennial	No	IOC	-148.87272	65.5740508	4
ST_394.9	Lost Creek	Perennial	No	IOC	-148.79125	65.5227633	14
ST_398.1	Unknown	Perennial	No	OC	-148.70596	65.4956347	4

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ST_401.3	East Fork Tolo-vana River	Perennial	No	IOC	-148.63304	65.4611514	69
ST_404.2	Unknown	Perennial	No	OC	-148.60866	65.4206454	9
ST_404.4	Winter Creek	Perennial	No	OC	-148.60866	65.4182503	3
ST_405	Unknown	Perennial	No	OC	-148.60868	65.4095976	4
ST_405.3	Unknown	Perennial	No	OC	-148.60869	65.4055463	1
ST_406.6	Unknown	Perennial	No	OC	-148.60873	65.3859178	12
ST_409.3	Unknown	Ephemeral	No	OC	-148.58353	65.3538351	3
ST_429.2	Tatalina River	Perennial	No	IOC	-148.67801	65.0985529	64
ST_430.6	Unknown	Perennial	No	IOC	-148.6746	65.0785024	48
ST_431.3	Washington Creek	Perennial	No	IOC	-148.66908	65.0692416	40
ST_437.6	Chatanika River	Artificial Path	Yes	IOC	-148.68178	64.9785791	185
ST_442.1	Unknown	Perennial	No	OC	-148.6866	64.9184321	74
ST_442.8	Unknown	Perennial	No	OC	-148.68066	64.9089224	37
ST_444.1	Unknown	Perennial	No	OC	-148.68015	64.890698	3
ST_445.2	Unknown	Perennial	No	OC	-148.69914	64.877333	12
ST_447.5	Unknown	Perennial	No	OC	-148.7525	64.8547776	5
ST_448.4	Unknown	Perennial	No	OC	-148.76403	64.8440313	5
ST_449.3	Unknown	Perennial	No	OC	-148.76752	64.8328011	14
ST_451	Unknown	Perennial	No	OC	-148.77537	64.8095191	3
ST_453.8	Goldstream Creek	Perennial	No	IOC	-148.82679	64.7799154	97
ST_464.5	Unknown	Perennial	No	OC	-149.0355	64.6599036	65

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ST_464.6	Little Goldstream Creek	Perennial	No	IOC	-149.03546	64.6581051	33
ST_471.9	Tanana River	Artificial Path	Yes	TD	-149.11786	64.5688532	2283
ST_475	Nenana River	Artificial Path	Yes	IOC	-149.14882	64.5271224	301
ST_484.5	Unknown	Perennial	No	IOC	-149.26218	64.4009349	51
ST_488.2	Nenana River	Artificial Path	Yes	IOC	-149.30109	64.3509717	43
ST_493.4	Unknown	Perennial	No	OC	-149.30209	64.2769682	3
ST_500.5	Birch Creek	Perennial	No	IOC	-149.29158	64.1760518	9
ST_501.1	Unknown	Perennial	No	IOC	-149.28451	64.1683683	2109
ST_503.7	Bear Creek	Perennial	Yes	IOC	-149.25134	64.1352779	57
ST_503.9	June Creek	Perennial	Yes	IOC	-149.24801	64.1325248	16
ST_511.7	Rock Creek	Perennial	No	OC	-149.14265	64.0319503	30
ST_514.7	Slate Creek	Perennial	No	IOC	-149.12111	63.989618	44
ST_518.6	Little Panguingue Creek	Perennial	No	IOC	-149.09961	63.9367266	28
ST_519.9	Panguingue Creek	Perennial	Yes	OC	-149.07805	63.9201293	57
ST_522.4	Unknown	Perennial	No	IOC	-149.08009	63.8859937	8
ST_524.8	Dry Creek	Artificial Path	No	OC	-149.06511	63.8525229	610
ST_529.2	Antler Creek	Perennial	No	IOC	-148.97761	63.8154297	38
ST_530.3	Bison Gulch	Perennial	No	IOC	-148.95426	63.8042918	24
ST_530.9	Nenana River	Artificial Path	No	AS	-148.93332	63.8028195	192
ST_531.2	Coyote Creek	Perennial	No	OC	-148.92725	63.800431	5
ST_531.6	Dragonfly Creek	Perennial	No	OC	-148.92246	63.7959531	22

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ST_531.9	Eagle Creek	Perennial	No	OC	-148.91927	63.7904192	3
ST_532.7	Coyote Creek	Perennial	No	OC	-148.90932	63.7803017	39
ST_533.1	Grizzly Creek	Perennial	No	OC	-148.90971	63.7753861	3
ST_533.7	Hornet Creek	Perennial	No	OC	-148.90876	63.76647	58
ST_533.9	Ice Worm Gulch	Perennial	No	OC	-148.90708	63.7639294	80
ST_534.9	Junco Creek	Perennial	No	OC	-148.89934	63.7503354	7
ST_535.7	Kingfisher Creek	Perennial	No	OC	-148.89017	63.7404052	34
ST_536.7	Lynx Creek	Perennial	No	AS	-148.86428	63.7333186	13
ST_537.4	Montana Creek	Perennial	No	IOC	-148.85995	63.7238479	9
ST_540.3	Unknown	Perennial	No	OC	-148.78895	63.6978555	11
ST_540.9	Unknown	Perennial	No	IOC	-148.77857	63.69216	19
ST_541.2	Unknown	Perennial	No	IOC	-148.77636	63.6880948	5
ST_541.6	Yanert Fork	Artificial Path	No	IOC	-148.77234	63.6819757	150
ST_550.1	Carlo Creek	Perennial	No	OC	-148.80196	63.5699815	8
ST_550.7	Unknown	Intermittent	No	OC	-148.80529	63.5619788	3
ST_554.9	Slime Creek	Perennial	No	IOC	-148.80852	63.5068606	32
ST_558.6	Nenana River	Artificial Path	No	AS	-148.80444	63.456288	357
ST_559.5_1	Unknown	Perennial	No	OC	-148.81359	63.4463878	8
ST_559.5_2	Unknown	Perennial	No	IOC	-148.81453	63.4457971	15
ST_559.6	Unknown	Perennial	No	IOC	-148.81557	63.4451393	33
ST_560.9	Unknown	Perennial	No	IOC	-148.83658	63.4283604	146
ST_564	Unknown	Perennial	No	OC	-148.87929	63.391129	23
ST_564.7	Jack River	Perennial	No	IOC	-148.89152	63.3838904	140

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ST_565	Unknown	Perennial	No	OC	-148.89465	63.3813886	3
ST_565.1	Unknown	Perennial	No	OC	-148.89879	63.3814133	11
ST_566.6	Pass Creek	Perennial	No	IOC	-148.94754	63.3742776	344
ST_579	Unknown	Perennial	No	IOC	-149.24152	63.2716358	5
ST_580.3	Unknown	Perennial	No	IOC	-149.26764	63.256637	8
ST_580.8	Squaw Creek	Perennial	No	IOC	-149.27955	63.2525747	26
ST_581.4	Unknown	Intermittent	No	OC	-149.29163	63.2458333	3
ST_581.8	Unknown	Perennial	No	IOC	-149.29917	63.2412554	15
ST_582.9	Unknown	Perennial	No	IOC	-149.32224	63.2285183	8
ST_583.7	Unknown	Perennial	No	IOC	-149.33161	63.2191572	307
ST_584.2	Middle Fork Chu-litna River	Perennial	Yes	IOC	-149.32668	63.2118484	93
ST_584.7	Fourth of July Creek	Perennial	No	IOC	-149.33414	63.2060041	13
ST_587.6	East Fork Chu-litna River	Perennial	Yes	IOC	-149.36076	63.1722421	117
ST_588.5	Unknown	Intermittent	No	IOC	-149.36999	63.1619972	11
ST_591.4	Hardage Creek	Perennial	No	IOC	-149.42675	63.1293147	26
ST_591.8	Unknown	Perennial	No	IOC	-149.43288	63.1238494	60
ST_594.2	Antimony Creek	Perennial	No	IOC	-149.47038	63.0970397	4
ST_594.3	Unknown	Perennial	No	OC	-149.47121	63.0956441	2
ST_594.4	Unknown	Perennial	No	OC	-149.47162	63.0949525	2
ST_596.1	Honolulu Creek	Perennial	Yes	TD	-149.482	63.0708854	114
ST_597	Unknown	Perennial	No	IOC	-149.49439	63.0595523	3

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ST_598.6	Unknown	Perennial	No	IOC	-149.51468	63.0389515	4
ST_599.4	Little Honolulu Creek	Perennial	No	IOC	-149.52386	63.0295037	4
ST_601.1	Hurricane Gulch	Perennial	No	IOC	-149.54673	63.0076392	40
ST_604.5	Granite Creek	Perennial	No	IOC	-149.62539	62.9764973	6
ST_607.3	Division Creek	Perennial	No	OC	-149.66964	62.9432692	8
ST_607.8	Unknown	Perennial	No	OC	-149.67545	62.9359494	8
ST_610	Pass Creek	Perennial	No	IOC	-149.71352	62.9105732	32
ST_610.3	Unknown	Perennial	No	OC	-149.71949	62.9078185	2
ST_612.1	Little Coal Creek	Perennial	No	IOC	-149.77079	62.8954632	17
ST_614.1	Unknown	Perennial	No	IOC	-149.81847	62.8790003	13
ST_615.6	Horseshoe Creek	Perennial	Yes	IOC	-149.86292	62.8707414	18
ST_631.8	Byers Creek	Perennial	Yes	IOC	-150.19992	62.7101086	66
ST_635.6	Unknown	Perennial	Yes	IOC	-150.22568	62.6648111	30
ST_638.4	Troublesome Creek	Perennial	Yes	TD	-150.23	62.6267069	158
ST_639.2	Chulitna River	Artificial Path	Yes	TD	-150.2512	62.6194927	1745
ST_640.3	Unknown	Perennial	No	IOC	-150.27399	62.611601	3
ST_647.8	Unknown	Perennial	Yes	OC	-150.25999	62.5137957	37
ST_650.5	Unknown	Perennial	No	OC	-150.27887	62.4772196	10
ST_652.2	Unknown	Perennial	Yes	OC	-150.27556	62.454044	26
ST_656.4	Unknown	Perennial	Yes	OC	-150.26462	62.3946393	4
ST_658.9	Unknown	Perennial	No	OC	-150.26333	62.3591799	6
ST_661.2	Trapper Creek	Perennial	Yes	OC	-150.27334	62.3307884	73

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ST_667.5	Sawmill Creek	Perennial	Yes	OC	-150.25477	62.2435863	50
ST_669.8	Trib to Rabideux Creek	Perennial	No	OC	-150.23822	62.2132364	19
ST_670	Unknown	Perennial	No	OC	-150.23793	62.2094003	4
ST_670.9	Queer Creek	Perennial	Yes	IOC	-150.23702	62.1975209	25
ST_672	Rabideux Creek	Perennial	Yes	IOC	-150.21044	62.1884678	71
ST_673	Unknown	Perennial	Yes	OC	-150.1889	62.1792503	5
ST_673.5	Susitna River	Artificial Path	Yes	AS	-150.17523	62.1756758	923
ST_677.4	Unknown	Perennial	Yes	OC	-150.09915	62.1361024	34
ST_680.7	Montana Creek	Perennial	Yes	AS	-150.0603	62.1044462	97
ST_683.7	Goose Creek	Perennial	Yes	IOC	-150.061	62.0615291	72
ST_685.4	Susitna Slough	Perennial	Yes	IOC	-150.08856	62.0419631	93
ST_687.3	Susitna Slough	Perennial	Yes	IOC	-150.09726	62.0163175	148
ST_690.4	Sheep Creek Slough	Perennial	Yes	IOC	-150.08054	61.9744484	132
ST_692.5	Caswell Creek	Perennial	Yes	IOC	-150.07531	61.9458283	69
ST_694.5	Kashwitna River	Artificial Path	Yes	TD	-150.08094	61.9200951	194
ST_695.8	197 1/2 Mile Creek	Perennial	Yes	OC	-150.06377	61.9070928	251
ST_696.4	Unknown	Intermittent	No	OC	-150.0625	61.8997041	16
ST_697	196 Mile Creek	Perennial	Yes	IOC	-150.06449	61.8910044	309
ST_702.7	North Fork Little Willow Creek	Perennial	Yes	OC	-150.11232	61.8156389	9

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ST_702.9	Little Willow Creek	Perennial	Yes	IOC	-150.1152	61.8139099	78
ST_703	Little Willow Creek Slough	Perennial	Yes	OC	-150.11713	61.8124038	33
ST_705.5	Willow Creek	Artificial Path	Yes	TD	-150.12284	61.7769499	169
ST_713.1	Rolly Creek	Perennial	No	IOC	-150.15897	61.6786595	35
ST_719.7	Fish Creek	Perennial	Yes	IOC	-150.22536	61.5918018	175
ST_729.1	Little Susitna River	Artificial Path	Yes	IOC	-150.14125	61.4708419	197

Notes:

AS = Aerial Span (Bridge)
IOC = Isolated Open Cut
OC = Open Cut
TD = Trenchless Drilling (HDD)

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B. Fairbanks Lateral

Fairbanks Lateral Stream ID	Stream Name	NHD Stream Type	Anadromous	Proposed Crossing Method	Long. (DD 83)	Lat. (DD 83)	OHW Width (ft)
ST_1.4	Unknown	Intermittent	No	OC	-148.648	64.9484	4
ST_7	Hard Luck Creek	Perennial	No	IOC	-148.4813	64.9494	3
ST_21.3	West Fork Moose Creek	Perennial	No	IOC	-148.0518	64.9464	3
ST_24.8	Goldstream Creek	Perennial	No	IOC	-147.9794	64.9158	49
ST_25.3	Happy Creek	Perennial	No	OC	-147.9732	64.9091	10
ST_29.2	Sheep Creek	Perennial	No	OC	-147.9031	64.8688	4
ST_30.3	Ace Creek	Perennial	No	IOC	-147.8753	64.8602	24

Notes:

IOC = Isolated Open Cut
OC = Open Cut

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C. Off-ROW Features

Crossing Description							
Access Rd Stream Crossing ID	Stream Name	Anadromous	Long. (DD 83)	Lat. (DD 83)	Road Name	Type	Crossing Type
0000-01	Unknown	No	-148.573	70.3268	GCF Access Road	Perm.	Culvert
0000-02	Unknown	No	-148.582	65.3535	AR-N-409.6	Perm.	Culvert
0000-03	Unknown	Yes	-149.468	63.073	AR-NSF-595.5	Perm.	Culvert
0000-04	Unknown	Yes	-149.116	64.5566	AR-BV-YD-E-472.73	Perm.	Bridge
0000-05	Unknown	No	-149.634	62.9769	AR-YD-N-604.36	Perm.	Culvert
0000-06	Unknown	No	-148.774	63.6886	AR-BV-MS-536.86	Perm.	Culvert
0000-07	Unknown	No	-149.473	63.0743	AR-NSF-595.5	Perm.	Culvert
0032-01	Unknown	No	-148.704	70.0425	Ar_BV-20.27	Perm.	Culvert
0385-01	Unknown	No	-149.436	68.1666	AR-N-166.24	Perm.	Culvert
0410-01	Unknown	No	-149.533	68.1153	AR-171.37	Temp.	Bridge
0460-01	Dietrich River	No	-149.709	68.0242	AR-MS-180.03	Perm.	Bridge
0465-01	Dietrich River	No	-149.74	68.0101	AR-181.36	Temp.	Bridge
0466-01	Unknown	No	-149.739	68.0083	AR-181.36	Temp.	Culvert
0466-03	Unknown	No	-149.744	68.0054	AR-181.76	Temp.	Culvert
0785-01	Unknown	No	-150.631	66.8242	AR-CAMP-YD-277.83	Perm.	Bridge
0845-02	Unknown	No	-150.78	66.5355	AR-MS-299.52	Perm.	Bridge
1049-01	West Fork Tolo-vana River	Yes	-148.666	65.4602	AR-MS-401.56	Perm.	Bridge
1049-05	Tolovana River	No	-148.639	65.4587	AR-MS-401.56	Perm.	Bridge
1135-04	Unknown	Yes	-149.168	64.4884	AR-MS-477.94	Temp.	Bridge
1135-06	Unknown	No	-149.163	64.4883	AR-MS-477.94	Temp.	Culvert

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Crossing Description							
Access Rd Stream Crossing ID	Stream Name	Anadromous	Long. (DD 83)	Lat. (DD 83)	Road Name	Type	Crossing Type
1180-02	Unknown	No	-149.322	64.2846	AR-BV-MS-492.73	Perm.	Culvert
1321-03	Yanert Fork	No	-148.771	63.6822	AR-MS-543.1	Perm.	Bridge
1321-05	Unknown	No	-148.777	63.695	AR-MS-543.1	Perm.	Culvert
1321-06	Unknown	No	-148.788	63.6979	AR-MS-543.1	Perm.	Culvert
1321-08	Montana Creek	No	-148.858	63.7237	AR-BV-MS-536.86	Perm.	Bridge
1321-09	Unknown	No	-148.777	63.688	AR-BV-MS-536.86	Perm.	Culvert
1329-02	Unknown	No	-148.807	63.5619	AR-550.72	Temp.	Culvert
1491-02	Unknown	No	-149.575	63.0053	AR-MR-601.78	Perm.	Culvert
1491-03	Unknown	No	-149.588	63.0084	AR-MS-601.78	Perm.	Culvert
1600-01	Queer Creek	Yes	-150.22	62.1914	AR-MS-671.36	Perm.	Bridge
1612-03	Unknown	Yes	-150.097	62.1436	AR-MS-676.59	Perm.	Culvert
1636-01	Sheep Creek Slough	Yes	-150.067	61.9879	MS-689.51	Perm.	Bridge
1669-01	Unknown	Yes	-150.11	61.8156	AR-MS-702.65	Perm.	Culvert
1692-02	Unknown	No	-150.222	61.5975	AR-BV-718.7	Perm.	Culvert
1692-03	Fish Creek	Yes	-150.211	61.5946	AR-BV-718.7	Perm.	Bridge
1695-08	Unknown	Yes	-150.109	61.5658	AR-BV-MS-721.68	Perm.	Bridge
1695-09	Little Susitna River	Yes	-150.098	61.5642	AR-BV-MS-721.68	Perm.	Bridge
1695-10	Unknown	Yes	-150.012	61.5518	AR-BV-MS-721.68	Perm.	Bridge
1695-11	Unknown	Yes	-150	61.5508	AR-BV-MS-721.68	Perm.	Culvert
1695-12	Unknown	Yes	-149.978	61.5616	AR-BV-MS-721.68	Perm.	Culvert

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5.6.2.1 Construction

Water Withdrawals

Significant quantities of water will be used during construction to maintain ice roads; to supply construction camps; and for material compaction, dust abatement, hydrostatic testing of the pipeline, and a variety of other uses.

Winter water withdrawal proposals are carefully reviewed and permitted by the ADF&G and Alaska Department of Natural Resources (ADNR) for all water withdrawal in fish-bearing water. Winter water withdrawal can deplete oxygen and available habitat for overwintering fish, which can be the limiting factor to fish populations and productivity, particularly in the Arctic Region. Winter water withdrawal from the flowing waters (streams and rivers) in the Arctic Region is generally not permitted by the ADF&G to protect critical overwintering fish habitat.

Water withdrawal from lakes in the Arctic Region are permitted by ADF&G and ADNR with the rigorous criteria discussed in the FEIS (USACE, 2012), which is different than the criteria for winter water withdrawal for lakes in the Interior or Southcentral.

Ice Roads

Ice road construction across fish-bearing rivers and streams will require an ADF&G Title 16 Permit. These permits generally require mitigation measures and the use of Best Management Practices to minimize impacts to fishery resources. The fisheries impacts described in the FEIS remain valid with the project revisions (USACE, 2012).

Vessel Use

The increased level of vessel use for the module delivery to West Dock is not expected to impact the fishery resources of the nearshore or marine waters of the project area. Vessels traffic by itself does not represent an activity that is considered harmful to fish resources.

Pipeline Right-of-Way

The overall reduction in fish stream crossings will result in proportional reduction in the potential direct impacts to the fishery resources from pipeline stream crossing construction activities. The rerouting of the Fairbanks Lateral significantly reduced the number of stream crossings and potential fishery impacts. The previous Fairbanks Lateral route was located almost entirely within the upper Goldstream Creek drainage, which is a known resident fish stream. The new Fairbanks Lateral alignment completely avoids the upper portions of the Goldstream Creek drainage and places the pipeline in mostly upland areas to minimize stream crossings. The current Fairbanks Lateral alignment has no anadromous fish stream crossings.

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The final decision on stream crossing methods has not yet been determined for all crossings. A Pipeline Stream Crossing Construction Mode Determination document has been developed and is shown in Attachment 11. Additional field data and input from resource agencies will be a factor in the final stream crossing method determination for a particular crossing site. All open-cut stream crossing methods will require a permit from ADF&G.

The proposed Horizontal Directional Drilling (HDD) crossing of the Yukon River will reduce potential impacts from a bridged crossing alternative, which was the preferred crossing method discussed in the FEIS (USACE, 2012). A successful HDD crossing of the Yukon River would not require water work in the river channel or associated impacts, while a bridged crossing would likely require work in the river channel to construct a series of piers needed for this crossing.

Bridge crossings are under consideration for the Putuligayuk River, the Susitna River, and possibly the Nenana River. Existing bridges may be used for the crossings of the Nenana River and the Susitna River. Potential impacts associated with bridge crossings generally depend on the location and number of bridge piers required for the crossing. Smaller bridge crossings may be accomplished without the need for work in the river channel associated with bridge piers. Large bridges may require several piers to safely support the pipeline. Bridge piers can be constructed at low water levels when the pier footing is dewatered or can be completely isolated for the flowing water of the river or stream. For many of the larger streams and rivers, it is not possible to construct bridge pier footings in dewatered areas.

Construction impacts associated with a bridged crossing depend on final design of the crossing, timing of construction, and bridge pier location. Pile driving associated with bridge pier construction could result in injury to fish in the immediate vicinity of pile-driving activity.

Wastewater discharge locations associated with hydrostatic testing have not been identified; thus, impacts to fish cannot be fully evaluated and determined. Although wastewater discharge locations have not been finalized, these discharges will be planned at locations that avoid waterbodies and during periods that minimize potential impacts to fishery resources.

West Dock Construction Phase Activities

The construction phase of the Project has the potential to impact arctic marine fish. Much of the construction will occur in winter, but a temporary bridge comprising two ballasted barges will be used to support offload of GCF modules. The impacts are expected to be minimal and short term due to the short duration of the offloading period. Additionally, the cumulative 72.5 ft of gap space at the seafloor around the barges should accommodate fish passage and waterflow. The temporary barge bridge will only be in operation for a portion of one ice-free season, which should further lessen potential fish passage concerns. Specifics of the dredge, disposal and construction activities and the potential impacts to arctic marine fisheries are discussed in detail in the attached Dredge and Disposal Plan and its attachments, along with a review of West Dock and Beaufort Sea fisheries (Attachment 3).

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West Dock Dredging

West Dock dredging will be conducted in the winter. The dredging will be conducted through and beneath the bottomfast ice or the shorefast ice, depending on the depth of water and the thickness of the ice.

Dredged materials will be disposed as a beneficial use on the West Dock Causeway and to replace eroded materials along the West Dock Causeway side slopes. Excess dredged materials will be placed on top of the ice in the nearshore areas and will, therefore, enter the water column intermittently as nearshore ice melts in the summer.

Winter dredging, the beneficial use of dredged materials on the West Dock Causeway, and the on ice disposal of dredged material will mitigate potential impacts to the fishery resources of the area. Winter operations avoid nearshore anadromous fish movements, which occur in the West Dock area in the late spring and early summer. Marine fish species potentially using the dredged area have hundreds of miles of usable habitat beneath the shorefast ice.

The nearshore disposal of dredged material on top of the ice will minimize the likelihood of a sediment plume and limit discharges to the nearshore area. Most of the dredged material is expected to be intermittently discharged in the nearshore area where bottomfast ice in the winter and wave action in the ice-free months significantly limit benthic productivity.

Access Roads

The number and length of access roads has increased as a result of the revisions to the proposed project, and the number of associated stream crossings is expected to increase from what was assessed in the FEIS (USACE, 2012). The exact locations and extent of access roads are being developed by AGDC.

Permanent access roads crossing a fish stream may impact the stream by placing culverts at the crossing. Temporary or permanent culverts in fish streams will require Title 16 permits from the ADF&G and will be required to maintain fish passage.

Material Sites

A number of material sites have been identified that are associated with rivers and streams. Some examples are the Dietrich River, Middle Fork Koyukuk River, and Chulitna River (AGDC, 2015). A substantial increase in the amount of materials required for project construction may result from the three major shifts in the proposed pipeline alignment. The first 28 miles of the pipeline alignment (MP 0 to MP 28) are moved to the west of the Dalton Highway corridor. Near Nenana, the alignment from MP 467 is shifted to the west away from the George Parks Highway until it crosses the highway at MP 497.6. The alignment shifts across the George Parks Highway from MP 668 to MP 733.5 at the terminus. These changes will also require building access roads that will result in additional streams crossings.

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5.6.2.2 Operations and Maintenance

No additional Environmental Consequences are expected from Right-of-Way (ROW) maintenance under the new project description and pipeline alignment.

5.6.3 References

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5.7 MARINE MAMMALS

The primary project revision that may affect marine mammals is the addition of West Dock modifications to the proposed project. Dredging in the navigation channel and construction to modify the existing West Dock infrastructure are required to support construction of the Gas Conditioning Facility (GCF). This section addresses the effects of these changes on marine mammal species that are not listed as endangered, threatened, or candidate species under the Endangered Species Act (ESA) of 1973, that may occur within or adjacent to the proposed project areas.

This section updates species descriptions presented in the Final Environmental Impact Statement (FEIS) with the most current biological data (for example, population estimates), as relevant to the proposed project revisions (USACE, 2012).

5.7.1 Affected Environment

Species range data for marine mammals presented in the FEIS remain valid. There have been no changes to the regulatory setting pertaining to marine mammals since the FEIS. The revised project design does not affect the project area at the Port of Anchorage and Cook Inlet or Port of Seward (POS); however, updated information regarding harbor seals in Alaskan waters has changed since the FEIS was issued (USACE, 2012).

Arctic marine environments provide food and habitat for various species of algae, plants, invertebrates, fishes, birds and mammals. Eastern Beaufort Sea habitats include coastal marshes, barrier islands, shoreline, nearshore waters and marine habitat. The marine habitats extend seaward from the coastline to perform important functions that include the active filtration or assimilation of sediments, nutrients, and pollutants originating from upland watersheds before entering the open ocean. The marine habitats in and around Prudhoe Bay are classified as either subtidal or intertidal.

Subtidal marine habitats are characterized by continuous submersion (Cowardin et al., 1979) and are differentiated based upon substrate classifications. Rocky bottom subtidal wetlands typically endure higher wave action resulting in well-aerated water and plants strongly attached to rocks by holdfasts. In comparison, unconsolidated benthic subtidal habitats are considered relatively stable and are characterized by rooted plants. Aquatic bed subtidal habitats are characterized by plants that grow on and below the surface water level and are either attached to the seafloor or freely float in the water column. Various coldwater algae and rooted vascular plant species, such as sea grass, are also present in these areas.

Intertidal marine habitats are characterized by intermittent aquatic submersion due to tidal action (Cowardin et al., 1979). More than 48,000 acres in Alaska have been classified as intertidal marine habitat (Hall et al., 1994), and many are associated with river outlets. The mercurial water regime characteristic of these habitats results in myriad environments ranging from substrates barren of vegetation to others dominated by aquatic algae and eelgrass (Hall 1988). Often, these habitats are associated with emergent wetlands. Northern Alaskan intertidal environments are often underlain by rocky substrates.

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The Prudhoe Bay area is generally located between the outlets of two major River systems: the Colville River (to the West) and the Sagavanirktok ('Sag') River (immediately to the east). It is also fed by the smaller Putuligayak ('Put') River and other drainages.

The coastal area along the Arctic Coastal Plain is generally low and flat, and barrier islands and alongshore spits are frequently present, although these formations usually support little vegetation (USACE, 2012b). Lagoons often form behind them.

The Beaufort Sea continental shelf is relatively narrow, extending for 35 to 50 miles offshore with depths up to 600 feet, before steeply dropping off into the Arctic Ocean Basin. The overall surface circulation of the Beaufort Sea is dominated by a clockwise gyre in the Arctic Ocean Basin. (USACE, 2012b). During the short summer "ice free" (open water) season, currents along the coastline can be highly variable as a result of local wind patterns; prevailing winds at this time strongly influence sea ice movement, and Easterly winds produce offshore currents that can result in a seaward movement of pack ice (USACE, 2012b). Westerlies produce onshore currents that bring ice towards shore and, occasionally restricting ship traffic around Barrow. (Colonell and Niedoroda 1990, cited in USACE 2012b).

Prudhoe Bay is home to some biologically important areas, including the migration route for arctic cisco returning to the Colville River from the MacKenzie River, habitat for various species of whales and eiders, denning locations for polar bear and ice seals, and benthic communities such as clam habitat or "the boulder patch" (a unique area of boulders that provides habitat for multiple species in an otherwise habitat poor environment ("the boulder patch"). Nearshore areas are known for having bottomfast ice, and further out, shorefast ice. The spring and fall seasons are quite turbid for nearshore environments. Ice gauging of sediments at "ice in" and "ice out" is probably a factor that limits productivity and biodiversity of the benthic nearshore habitat.

The impacted areas around the Dredge and Disposal areas are nearshore environments that are disturbed by regular storms, freeze-thaw events, churning sea ice, and wind and ocean currents. Coastal erosion around West Dock occurs regularly, and industry users have long replenished its beach with marine sediment to mitigate erosion. The dredge material, being too great in volume and too fine in composition, to be used as suitable beach nourishment at West Dock, will be disposed of over bottomfast ice. The material will settle in the subtidal area of Prudhoe Bay in spring at break up once the sea ice melts and is churned up by winter storms. Sediments in the project footprint are disturbed by bottomfast and shorefast ice at break up and freeze up, wave / ocean current activity and wind activity. Within the Project Footprint and Action area, there have been some, but few, sightings of marine mammals and threatened bird species. During the whaling season, subsistence whalers from Nuiqsuit typically hunt seaward of Cross Island, thereby not overlapping with the Project's action area. The 650-ft breach through the West Dock Causeway is utilized by migratory fish, such as the anadromous Arctic cisco, and by marine fishes, such as juvenile arctic cod. Fish migrate both through the breach and around the West Dock causeway as they migrate from Canadian waters to the Colville River (AGDC, 2015).

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5.7.1.1 Regulatory Setting

The FEIS identified three stocks of harbor seals in Alaskan waters (USACE, 2012a). Since then, the National Marine Fisheries Service (NMFS) and their co-management partners finalized their decision to restructure the harbor seal stock definitions, based on genetic findings. Formerly, 3 stocks (Bering Sea, Gulf of Alaska, and Southeastern Alaska), Alaskan harbor seals are now classified as 12 stocks: Aleutian Islands, Pribilof Islands, Bristol Bay, North Kodiak, South Kodiak, Prince William Sound, Cook Inlet/Shelikof, Glacier Bay/Icy Strait, Lynn Canal/Stephens, Sitka/Chatham, Dixon/Cape Decision, and Clarence Strait. The Gulf of Alaska population, hereafter summarized as the Prince William Sound and Cook Inlet/Shelikof stocks, is still relatively small compared to its previous stock size in the 1970s and 1980s. The current population estimate for Alaska harbor seals (all 12 stocks) is 152,602, and the portion of this comprising the revised Gulf of Alaska stock population is estimated at 54,403 (Allen and Angliss, 2014).

The following marine mammal species (that are not listed under the ESA) are found in the vicinity of West Dock and may be affected by project activities there: gray whale (*Eschrichtius robustus*), beluga whale (*Delphinapterus leucas*), and killer whale (*Orcinus orca*). The estimated population for eastern North Pacific gray whales has not been revised since the FEIS (USACE, 2012a). The 2006 to 2007 estimate remains at 19,126 (Laake et al., 2012; Allen and Angliss, 2014). The estimated population for the Beaufort Sea population of beluga whales has not been revised since the FEIS. The 2010 estimate remains at 39,258 (Allen and Angliss, 2014). The FEIS highlights the AT1 pod's transient population of seven killer whales (USACE, 2012; Matkin et al., 2008). The Gulf of Alaska Transient and Alaska Resident populations of killer whales also may occur in waters adjacent to the southern project areas. The Alaska Resident killer whales (population estimate of 2,347) occur from southeastern Alaska to the Aleutian Islands and Bering Sea. The most current population estimate for the Gulf of Alaska Transient killer whales is 136 (Allen and Angliss, 2014).

The National Oceanic and Atmospheric Administration (NOAA) Fisheries has announced a positive 90-day finding on a petition to designate the Central North Pacific stock of the endangered humpback whale as a Distinct Population Segment and delist it under the Endangered Species Act. Under the ESA, a positive 90-day finding on such a petition requires the agency to conduct a status review for the species.

5.7.2 Environmental Consequences

The abundance estimates for marine mammals (not listed as threatened or endangered under the ESA) did not show considerable differences (if any) from those reported in the FEIS. Therefore, environmental consequences pertaining to animal abundance do not require updating from the original FEIS (USACE, 2012a). As the project areas at the Port of Anchorage and Cook Inlet or the POS did not require additional assessment, environmental consequences are not relevant for these areas. This section focuses on the project revisions pertaining to West Dock modifications and their impact on marine mammals in that area. In addition, a Biological Assessment for the Project has been compelted and is attached for reference (Attachment 6).

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5.7.2.1 Construction

The construction phase of the proposed project is the only period that port activity is planned at West Dock. Channel dredging and West Dock construction activities are planned for winter months to minimize disturbance and impacts. Module offload will occur during the open water season (August and September), following dredging and construction, using 23 barges. Vessel descriptions and construction details can be found in Appendix H of the JAfP (AGDC, 2015).

Increasing vessels numbers increases the potential for disturbance to marine mammals, including vessel noise and the potential to 'mask' marine mammal sounds used for communication and detection of their environment. During module offload, the vessels will be staged offshore from West Dock. During this period, the vessels will be on anchor, if possible. In times of poor weather, captains may be required to have barges in tow. Vessels anchored offshore during August and September may coincide with marine mammal migration paths and subsistence hunting.

5.7.2.2 Operations

There will be no impacts to marine mammal resources associated with operations and maintenance as part of the revised project design.

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5.8 THREATENED AND ENDANGERED SPECIES

This section summarizes the most current and relevant data pertinent to species listed as endangered, threatened, or candidate under the Endangered Species Act (ESA) of 1973 that may occur within or adjacent to the proposed project areas, including changes to species status, species relative abundance, critical habitats, and references.

The primary project revision that may affect ESA-listed species is the addition of West Dock modifications to the proposed project, including winter channel dredging and modifications to the existing infrastructure. This section addresses the effects of these changes on ESA-listed species in the project area. These updates are captured within the ASAP Biological Assessment (BA) (Attachment 6; see also the 2014 U.S. Fish and Wildlife Service (USFWS) *Programmatic Biological Opinion* (BiOp) (USFWS, 2014b)).

5.8.1 Affected Environment

Updated ESA species lists were obtained from the Information, Planning, and Conservation System (IPaC) web site (USFWS, 2014d), a web-based tool for generating official species lists for project areas. The official lists for the area of revised project components (West Dock action area and the Mainline route) were generated September 12, 2014. As the activities at the Port of Anchorage, Cook Inlet, and the Port of Seward (POS) have not changed, the information herein is consistent with that presented in the BA (see Attachment 6) and FEIS (USACE, 2012), and it does not need to be re-analyzed in the Supplemental Environmental Impact Statement (SEIS).

5.8.1.1 Regulatory Setting

Since the FEIS (USACE, 2012), the U.S. District Court remanded critical habitat for polar bear (*Ursus maritimus*); therefore, critical habitat is no longer designated for the polar bear (USFWS, 2014a). No other changes to the regulatory setting pertaining to marine mammals have occurred.

On October 1, 2014, the USFWS published their 12-month finding on the petition to list the yellow-billed loon (*Gavia adamsii*) under the ESA. The USFWS concluded that listing the yellow-billed loon as threatened or endangered was not warranted at this time (USFWS, 2014c). While the USFWS is not listing the species, the yellow-billed loon remains a conservation priority of the agency.

NOAA Fisheries has announced a positive 90-day finding on a petition to designate the Central North Pacific stock of the endangered humpback whale as a Distinct Population Segment (DPS) and delist it under the Endangered Species Act. Under the ESA, a positive 90-day finding on such a petition requires the agency to conduct a status review for the species.

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5.8.1.2 Summary of Endangered Species Act Protected and Candidate Species in Proposed Project Area

Most of the ESA species potentially affected by the project are found within the marine environment. As noted, polar bear critical habitat was remanded in January 2013 (Attachment 6; USFWS, 2014a). Table 5.8-1 updates information on ESA-listed species and critical habitat designated in or near the project area.

Table 5.8-1 Endangered Species Act Protected and Candidate Species Potentially Occurring In or Near the Proposed Project Area

Common Name	Scientific Name	Federal Status	Critical Habitat Designated in or near Project Area	Preliminary Findings Summary	Population Level Effect	Change from FEIS (USACE, 2012)
Mammal						
Bearded seal (Beringia DPS)	*Erignathus barbatus*	Threatened	No	NLAA	Negligible	Changed from proposed to threatened
Bowhead whale	*Balaena mysticetus*	Endangered	No	NLAA	Negligible	None
Cook Inlet beluga whale (DPS)	*Delphinapterus leucas*	Endangered	Yes	NLAA/ NAM	Negligible/ No Effect	None
Fin whale	*Balaenoptera physalus*	Endangered	No	NLAA	Negligible	None
Humpback whale	*Megaptera novaeangliae*	Endangered	No	NLAA	Negligible	None
Pacific walrus	*Odobenus rosmarus divergens*	Candidate	No	NLAA (BA) NLJE (BiOp)	No Effect	Preliminary Findings changed from No Affect (BA) to NLAA (BA)
Polar bear	*Ursus maritimus*	Threatened	No	MAA	Negligible	Critical habitat changed from Yes to No
Ringed seal (Arctic DPS)	*Phoca hispida*	Threatened	No	NLAA	Negligible	Defined DPS; changed from proposed to threatened
Steller sea lion (WDPS)	*Umatopias jubatus*	Threatened	No	NLAA	Negligible	Defined DPS
Sea otter-Northern (Southwest Alaska DPS)	*Enhydra lutris kenyoni*	Threatened	No	NLAA	No Effect	Defined DPS

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Common Name	Scientific Name	Federal Status	Critical Habitat Designated in or near Project Area	Preliminary Findings Summary	Population Level Effect	Change from FEIS (USACE, 2012)
Avian						
Eskimo curlew	*Numenius borealis*	Endangered	No	No Effect (Considered Extinct)	No Effect	None
Spectacled eider	*Somateria fischeri*	Threatened	No	NLAA	Negligible	None
Steller's eider	*Polysticta stelleri*	Threatened	No	MAA (BA) NLAA (BiOp)	No Effect	None

Sources: BA (Attachment 6), and Biological Opinion (USFWS, 2012).

The 2014 BA and 2014 BiOp have the same conclusions except for the Pacific walrus and Steller's eider, as noted in the table.

DPS – Distinct Population Segment

MAA – May Adversely Affect, but not likely to jeopardize the continued existence of

NAM – No Adverse Modification (applies to critical habitat)

NLAA – May affect, Not Likely to Adversely Affect

NLAM – Not Likely to Adversely Modify (applies to critical habitat)

NLJE – Not Likely to Jeopardize Existence

WDPS – Western Distinct Population Segment

5.8.1.3 Species Descriptions

Updated biological data on ESA species in the project area is provided in the following paragraphs and is based on recently available data, the 2014 BA, and 2014 USFWS Programmatic BiOp.

Bearded Seal

In the FEIS, the Beringia DPS was under consideration to be threatened (USACE, 2012). This species was listed as threatened on December 28, 2012 (77 Federal Register [FR] 249 76739) (NMFS, 2012a). The FEIS listed an abundance estimate of 2,100 seals in the Beaufort Sea. This estimate was from the 1970s and uncorrected for animals in the water. The most recent stock assessment report states that population estimates are outdated and unreliable, and therefore currently unavailable for this species (Allen and Angliss, 2014).

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Bowhead Whale

Based on the most recent abundance estimates, approximately 10,314 bowhead whales make up the Western Arctic stock (Allen and Angliss, 2014), which differs slightly from the 10,545 whales listed in the FEIS (USACE, 2012; Angliss and Outlaw, 2008).

Cook Inlet Beluga Whale

Results from the most recent abundance survey by the National Marine Fisheries Service (NMFS) indicated a population size of 312 in 2012 and a negative trend (-0.006 per year) from 2002 to 2012 (Hobbs et al., 2012).

Fin Whale

Currently, the population of fin whales in Alaskan waters west of the Kenai Peninsula is estimated to be a minimum of 5,700 (Allen and Angliss, 2013).

Humpback Whale

The populations of two stocks of humpback whales have changed. The Central North Pacific stock is currently estimated to be 5,833 whales (Allen and Angliss, 2014). The Western North Pacific population estimate has increased from 394 individuals in 2009 (Angliss and Allen, 2009) to 732 (Allen and Angliss, 2014), although there are indications this second estimate is high.

Pacific Walrus

No accurate abundance estimates are available for this species (Attachment 6).

Polar Bear

The polar bear critical habitat designation was challenged by the State of Alaska (SOA) and others, ultimately resulting in a rejection ruling by the U.S. District Court in January 2013 (Attachment 6). Therefore, no critical habitat for the polar bear exists at this time. The FEIS was written prior to this ruling when polar bear critical habitat existed (USACE, 2012).

Ringed Seal

Ring seals were proposed to be listed as an ESA species in the FEIS (USACE, 2012), and have since been listed as threatened (December 28, 2012; 77 FR 249:76705) (NMFS, 2012b). The abundance estimates will not change for the ringed seal; however, the most recent stock assessment reports indicate that reliable abundance estimates of the Arctic ringed seal population are not available (Allen and Angliss, 2011). The NMFS suggested in 2010 that the population numbers are in the millions (FR 75:77492).

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Steller Sea Lion

Critical habitat nearest to the POS is associated with a major haul-out at Outer Island and haul-outs at Gore Point located in the Gulf of Alaska waters outside of Resurrection Bay. However, there is no designated critical habitat in the Alaska Stand Alone Pipeline (ASAP) action areas (Attachment 6).

Sea Otter

The sea otter is not considered likely to occur within the boundary of the proposed project by USFWS; therefore, is not addressed in the BA (Attachment 6).

Eskimo Curlew

The Eskimo curlew is widely believed to be extinct. It is not considered likely to occur within the boundary of the proposed project by USFWS; therefore, is not addressed in the BA (Attachment 6).

Spectacled Eider

In both the previous and current design configurations, West Dock construction and module of-floading will overlap with spectacled eider summer/fall presence in the Beaufort Sea when eiders are limited to nearshore waters. More recent eider density data is available since the FEIS and indicates low to medium-low densities in the West Dock action area (USACE, 2012). This density data is also presented in the BA (Attachment 6).

Steller's Eider

Updated information on Steller's eiders indicates continued low density in Prudhoe Bay (Attachment 6).

State-protected Animals

This revised project design will have no new effects on habitat of state-protected animals, which include the short-tailed albatross, Eskimo curlew, blue whale, humpback whale, and right whale. Of these animals, the Eskimo curlew and humpback whales are both State and Federally listed (ADF&G, 2014).

5.8.2 Environmental Consequences

This section summarizes environmental consequences of the revised project design as it pertains to species listed as endangered, threatened, or candidate under the ESA that may occur within or adjacent to the proposed project areas. The potential effects to ESA-listed species will primarily be limited to the action area at West Dock and the marine environment (AGDC, 2015). Adverse effects

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of the revised project design and West Dock components will require continued NMFS consultation.

The primary project revisions requiring an update to the impact assessment in the FEIS are the result of the decrease in total pipeline length and new project design elements at West Dock (USACE, 2012). Specifically related to activities at West Dock, the revised design includes the following changes that will affect ESA species:

- An increased number of vessels for module offload from 9 to 23 (plus tugs)
- Winter dredging and screeding at West Dock and the navigation channel
- Modification of West Dock infrastructure to support offload
- Placement of temporary barge bridge between West Dock Head (DH)2 and West DH3 for module transport

There are no new environmental consequences for threatened and endangered species associated with the revised project's pipeline alignment and plan. The Gas Conditioning Facility (GCF) location changed slightly under the revised project design; however, the impacts will not change to threatened and endangered species. Similarly, under the revised project design, the first 7 miles of pipeline is planned to be buried, rather than aboveground; however, impacts to threatened and endangered species are not expected to change substantially. Pipeline burial is planned for winter; therefore, there is potential to affect denning polar bears.

5.8.2.1 Construction

The West Dock construction and barging to facilitate module offload increases the size of the project action area, increases vessel traffic in Prudhoe Bay, and lengthens the overall duration of these temporary activities relative to the activities assessed in the FEIS (USACE, 2012, Attachment 6). The activities associated with module offload may potentially affect ESA-listed species, including bearded seal, bowhead whale, Pacific walrus, polar bear, ringed seal, and spectacled and Steller's eiders. Such activities include dredging, construction, and upgrades at West Dock to accommodate a 23-barge sealift, ballasting 2 temporary barges to support transportation on the causeway, GCF module offload, and supporting activities.

Activities associated with construction at West Dock have the potential to affect ESA-listed species, including marine mammals and eiders. Winter activities will occur in polar bear denning habitat. Summer activities, including the ballasting of the barges and module offload, will result in increased vessel activity, which increases the potential for disturbance to marine mammals, including vessel noise and the potential to 'mask' marine mammal sounds used for communication and detection of their environment. The number of vessels anticipated for module offloading has increased from 9 to 23 barges (plus supporting tugs). Disturbance to nesting eiders may occur along the West Dock Causeway during construction and module offload activities. To minimize impacts to threatened and endangered species, mitigation measures, such as those listed in the BA (Attachment 6) may be required.

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5.8.2.2 Species Descriptions

The following species were assessed in the FEIS and will not be affected by the project revisions, negating the need for revision to environmental consequences: Cook Inlet beluga whale, fin whale, humpback whale, sea otter, Steller sea lion, and Eskimo curlew (USACE, 2012).

Environmental consequences for the remaining ESA-listed species are described in the following paragraphs.

Bearded Seal

Bearded seals are unlikely to occur in the West Dock action area. However, marine vessel traffic associated with activities at West Dock may temporarily displace bearded seals if present in the area.

Bowhead Whale

This revised project design will have no effect on bowhead whales during long-term operations. Construction activities at West Dock may disturb migrating whales because of increased vessel activity and noise. Increased vessel traffic, including transiting to and from West Dock, may occur during bowhead whale migration (AGDC, 2015; 2014; Attachment 3; Attachment 6).

Pacific Walrus

Low numbers of Pacific walrus occur in the Beaufort Sea (Attachment 6). There has been documentation of walrus hauling-out in Kaktovik, but sightings in Prudhoe Bay are rare. Due to the infrequent sightings, there are no environmental consequences to walrus associated with the revised project alignment and plan.

Polar Bear

The action area defined in the BA is approximately 281 square miles and includes West Dock, the navigation channel and turning basin, the barge marshalling area and buffer zones, the West Dock staging pad, GCF and related camp and facility pads, and the first 50 miles of the pipeline corridor having a 1-mile buffer around the centerline. Polar bears are expected to occur within the action area infrequently (Attachment 6).

In the FEIS, the project area included 55.3 acres of sea ice critical habitat, 16.4 acres of barrier island critical habitat, and 70.3 acres of denning critical habitat for polar bears (USACE, 2012). Polar bear critical habitat has since been removed, meaning each of these values is reduced to zero. This is noteworthy because polar bear critical habitat no longer overlaps the proposed West Dock action area.

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Ringed Seal

Ringed seals may occur in the West Dock action area. Increased marine vessel traffic associated with activities at West Dock may temporarily displace ringed seals if present in the area.

Spectacled and Steller Eiders

Modular transport, modular offloading, and construction of the GCF (and associated roads) will occur during the summer and fall when eiders may be nesting in the area. Most environmental consequences associated with the revised project are consistent with the FEIS assessment (USACE, 2012). In addition to the FEIS analysis, the revised project design will increase activity along the West Dock Causeway, resulting in increased potential to encounter nesting eiders. Disturbing nesting eiders may cause nest abandonment.

There are no substantial environmental consequences for threatened and endangered species associated with the revised project's pipeline alignment and plan. The GCF location changed slightly under the revised project design; however, the impacts will not change to threatened and endangered species. Similarly, under the revised project design, the first 7 miles of pipeline is planned to be buried, rather than aboveground; however, impacts to threatened and endangered species are not expected to change substantially. Buried pipeline construction is planned for winter; therefore, there is potential to affect denning polar bears.

5.8.2.3 Operations

No additional impacts to ESA-listed species are anticipated compared with those identified in the FEIS (USACE, 2012).

5.8.3 References

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5.9 LAND USE

This section describes the known changes to the affected environment for land use since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012) and describes the anticipated changes in impacts to land use based on the revised project description (AGDC, 2015). Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project, such as changes in the alignment of the Mainline pipeline and the Fairbanks Lateral (see AGDC, 2015), result in changes to the previous assessment of the effects of the proposed project on land use.

Information pertaining to ancillary facilities, including material sites, camp locations, false Rights-of-Way (ROWs), and additional access roads were developed to a greater level of detail since release of the FEIS (USACE, 2012), and the potential impacts associated with those facilities is provided in greater detail in this section.

5.9.1 Affected Environment

The proposed project revision has reduced the Mainline ROW length from 737 to 733 miles, a reduction of 4 linear miles; and reduced the length of the Fairbanks Lateral from 34 to 30 miles, a reduction of 4 miles. The cumulative reduction in linear ROW length is 8 miles. Land ownership along the revised alignment is listed in Table 5.9-1.

5.9.1.1 Regulatory Environment

In 2015, a change within the state regulatory environment occurred under Senate Bill 70 (SB70), which authorized the Department of Natural Resources to issue a right-of-way lease under AS 38.35, the Pipeline Right of Way Leasing Act, for a gas pipeline within a specified corridor through four legislatively-designated state park and recreation areas: Denali State Park, Willow Creek State Recreation Area, and Nancy Lake State Recreation Area, and Captain Cook State Recreation Area (Attachment 12). The current ASAP pipeline alignment crosses three of these areas (Denali, Willow Creek, and Nancy Lake), and legislative action was necessary to facilitate construction and operation of the project. The action was necessary, as these lands had been previously designated as special use areas, and removed from the public domain by the legislature pursuant to Article VIII, Sec. 7 of the Alaska Constitution. SB 70 provided the authority necessary to open an approximately 27,000 acre corridor thorough these state lands within which a right-of-way may be selected under AS 38.35 and clarifies that a pipeline right-of-way lease is a compatible use within the reserves.

SB 70 requires the planning corridor to be managed as parks and recreational areas until the DNR Commissioner issues a lease under 38.35, and the land within the leasehold be returned to park and recreation land upon termination of the pipeline lease. It further provides supplemental requirements to maintain the public's traditional means of accessing the land and to minimize the impact of a pipeline on the specific values that distinguish these lands as parks and recreational areas. The recreational, scenic, cultural, historical, and habitat values consistent with the original intent of these special use areas must be preserved under SB 70.

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The bill clarified that the DNR Commissioner's power to delegate condemnation authority to the lessee does not apply within the bounds of these areas. The bill also required that a gas pipeline lease must be issued before Jan. 1, 2020 for these new authorizations to apply.

Table 5.9-1 provides a summary of ASAP's land ownership data underlying the Project's centerline that has been provided to the USACE. Table 5.9-2 provides a breakdown of total land use by ecoregion and expected impact; this is consistent with data in Section 5.4 (Wetlands), above. Specific land use details by Project component are summarized in that section.

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Table 5.9-1 Land Ownership Crossed by the Proposed Alaska Stand Alone Pipeline Project Centerline in Miles – Comparing Final Environmental Impact Statement Alignment to Revised Alignment

Route	Ownership Mileage[a]							
	SOA[b,c]	Federal[c]	Municipal or Borough	Native Corp.	Private	Native Allotment	River or Stream Crossing	Totals
ASAP Mainline Pipeline – FEIS Alignment (USACE, 2012)	584.70	100.20	23.50	16.10	7.30	2.20	2.30	736.30
ASAP Mainline Pipeline – Revised Alignment (AGDC, 2015)	392.49	232.61	56.93	31.95	19.04	0.00	0.45	733.48
ASAP Mainline Revision Difference	-192.21	132.41	33.43	15.85	11.74	-2.20	-1.85	-2.82
ASAP Mainline Percent Difference	-32.87%	132.15%	142.25%	98.48%	160.86%	-100.00%	-80.24%	-0.38%
Fairbanks Lateral – FEIS Alignment (USACE, 2012)	20.30	0.00	6.10	0.00	8.10	0.00	0.00	34.50
Fairbanks Lateral – Revised Alignment (AGDC, 2015)	21.39	0.05	4.69	0.00	4.20	0.00	0.00	30.33
Fairbanks Lateral Difference	1.09	0.05	-1.41	0.00	-3.90	0.00	0.00	-4.17
Fairbanks Lateral Percent Difference	5.38%	-	-23.08%	-	-48.10%	-	-	-12.07%
Total Difference	-191.12	132.46	32.02	15.85	7.85	-2.20	-1.85	-6.98
Total Percent Difference	-27.49%	132.15%	119.17%	98.48%	112.76%	-100.00%	-80.24%	-12.46%

Notes:

Key: Green fill indicates a decrease in mileage or negative percent change.

[a]The mileage values for Revision 5 are taken from the FEIS, Table 5.9-1(a) (USACE, 2012). The mileage values for Revision 6.1 are taken from the POD, Tables 4 and 5, respectively (AGDC, 2014).

[b]SOA lands for the purposes of this table include those lands owned or managed by the University of Alaska, the ARRC, the Alaska Mental Health Trust Land Office, as well as the ADNR.

[c]The major contributory factor in the difference between SOA and federal land ownership between Revisions 5 and 6.1 is that Revision 5 identified less-than-fee ADOT ROW over federal fee lands as SOA land. Revision 6.1 calculations are based on identifying such lands as federal.

ADNR - Alaska Department of Natural Resources
ARRC - Alaska Railroad Corporation
POD - Plan of Development
SOA - State of Alaska

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Table 5.9-2 Total Land Use - ASAP Project Footprint (Acres)

Ecoregion	Use of Wetland Areas (Acres)	Use of Upland Areas (Acres)	Total Land Use (Acres)
Northern	**3,971.26**	**1,304.05**	**5,275.31**
Arctic Coastal Plain	**1,253.94**	**192.41**	**1,446.35**
Permanent Impact	651.87	0.00	651.87
Temporary Impact/Minimization	602.07	0.00	602.07
Uplands/Avoidance	0.00	192.41	192.41
Arctic Foothills	**1,083.08**	**356.06**	**1,439.13**
Permanent Impact	1,047.25	0.00	1,047.25
Temporary Impact/Minimization	35.83	0.00	35.83
Uplands/Avoidance	0.00	356.06	356.06
Brooks Range	**1,299.17**	**657.95**	**1,957.12**
Permanent Impact	1,297.01	0.00	1,297.01
Temporary Impact/Minimization	2.16	0.00	2.16
Uplands/Avoidance	0.00	657.95	657.95
GCF	**335.08**	**97.63**	**432.71**
Permanent Impact	334.96	0.00	334.96
Temporary Impact/Minimization	0.12	0.00	0.12
Uplands/Avoidance	0.00	97.63	97.63
Interior	**4,411.11**	**7,485.84**	**11,896.95**
Permanent Impact	4,008.09	0.00	4,008.09
Temporary Impact/Minimization	403.02	0.00	403.02
Uplands/Avoidance	0.00	7,485.84	7,485.84
Southcentral	**524.64**	**3,540.43**	**4,065.08**
Permanent Impact	406.31	0.00	406.31
Temporary Impact/Minimization	118.34	0.00	118.34
Uplands/Avoidance	0.00	3,540.43	3,540.43
Land Use in Uplands (Wetlands Avoidance Areas) (All Ecoregions)	0.00	12,330.33	12,330.33
Land Use in Areas with Permanent Impacts to Wetlands (All Ecoregions)	7,745.49	0.00	7,745.49
Land Use in Areas with Temporary Impacts to Wetlands (Minimization) (All Ecoregions)	1,161.53	0.00	1,161.53
Total Land Use (All Ecoregions)	**8,907.01**	**12,330.33**	**21,237.34**

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5.9.2 Environmental Consequences

5.9.2.1 Construction

The overall ASAP Project Footprint has been defined, in comparison to what was reported in the 2012 FEIS. The current Project Footprint is a cohesive and complete representation of the Project, whereas previously some design features were only conceptually realized. Construction impacts are clearly described in Section 5.4, above, and in the Joint Application for Permit (JAfP) (AGDC, 2015). Historic construction impacts associated with compressor stations, the Cook Inlet Natural Gas Liquid Extraction Plant (NGLEP), metering stations, and the Straddle and Offtake Facility were eliminated with the conceptual design revisions.

5.9.2.2 Operations

Construction and Operational ROWs are described above in Section 2.6. The effects on total pipeline construction and operational acreage are provided in Table 5.9-2, in Section 5.4, and in the ASAP JAfP (AGDC, 2015). The current pipeline centerline intersects twenty RS2477 historic trails (Table 5.9-3), as well as six railroad crossings. Tables 5.9-3 and 5.9-4 summarize the impact of the revised Project on Revised Statute (RS) 2477, rights-of-way.

Table 5.9-3 Revised Statute 2477 Right-of-Way Intersected by the Proposed Project

SEGMENT	RS 2477 TRAIL ROW	FILE NO.	Approximate MP
GCF to MP 530	Hickel Highway	RST 450	181.925
	Wiseman-Chandalar	RST 254	218.4; 218.5
	Caro-Coldfoot	RST 262	240.9*; 241.6*
	Coldfoot-Junction Trail 49 (east route)	RST 591	240.9*; 241.0*; 241.5*
	Coldfoot-Chandalar Lake Trail	RST 9	240.9*; 241.0*; 241.5*
	Slate Creek	RST 412	241.6*; 241.9*; 244.5
	Hunter Creek-Livengood	RST 468	399.75
	Dunbar-Brooks Terminal	RST 66	401.15; 438.7; 442.9
	Dunbar-Minto-Tolovana	RST 1595	454.675
	Nenana-Kantishna	RST 346	472.8
	Kobi-McGrath (via Nikolai & Big River)	RST 345	496.2
	Rex-Roosevelt	RST 491	497.1

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	Kobi-Kantishna	RST 343	497.1
	Lignite-Kantishna	RST 344	522.2
	Lignite-Stampede	RST 340	522.2
	Healy-Diamond Coal Mine Dirt Road	RST 709	525.9
Fairbanks Lateral	None	-	-
MP 530 to MP 545	None	-	-
MP 545 to MP 733.48	Cantwell Small Tracts Road (Lovers Lane)	RST 625	564.3
	Goose Creek Road	RST 1506	685.3
	Nancy Lake-Susitna	RST 149	717.1
	Knik-Susitna	RST 118	728.5
DNP Route Variation	None	-	-
*The Coldfoot-Chandalar Lake Trail, Caro-Coldfoot, Coldfoot-Junction Trail 49 (east route), Slate Creek trails have coincident routes at these crossings.			

Table 5.9-4 describes the minimal changes in impacts on RS 2477 ROWs from the FEIS (USACE, 2012) to the revised Project.

Table 5.9-4 Changes in Revised Statute 2477 Intersections from Final Environmental Impact Statement to Revised Project

SEGMENT	FILE NO.	APPROXIMATE MP	STATUS
Lignite-Kantishna	RST 344	522.2	Added
Lignite-Stampede	RST 340	522.2	Added
Ester Dome - Nugget Creek Trail	RST 1602	-	Dropped
Ester-Dunbar	RST 70	-	Dropped

5.9.1 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014 *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf.

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement*. *Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

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5.10 RECREATION

This section describes changes to the affected environment for recreation resources since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012), and describes the anticipated changes in impacts to recreation based on the revised project description (AGDC, 2015). Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project, such as changes in the alignment of the Mainline pipeline and the Fairbanks Lateral (see AGDC, 2015), result in changes to the previous assessment of the effects of the proposed project on recreation.

5.10.1 Affected Environment

As a result of shifts in the proposed pipeline alignment during project design refinements, the distances between the pipeline and known recreational facilities have changed. In most areas, the shifted alignment remains more than 5 miles from recreation resources in the study area, and no changes in impacts are anticipated. The pipeline is now, however, closer to the following recreational facilities:

- Five sites near Mile Post (MP) 231.8
  1. Kiosk
  2. Sign (Welcome to Marion Creek Campground!)
  3. Camper's Information
  4. Dalton Highway Map
- Overlook Deck
- Arctic Circle Bureau of Land Management (BLM)
- Sign (Fall – Before the Light Goes Out)
- Arctic Circle Campground
- Montana Creek Campground
- Willow Creek Campground
- Nancy Lake State Recreation Area

No new parks or recreation facilities were identified in the vicinity of the proposed pipeline. The descriptions of the parks and recreation areas in Section 5.10.1.4 of the FEIS remain valid (USACE, 2012).

The current alignment bisects the Willow Creek State Recreation Area from north to south, traversing it for 1.6 miles; whereas, the previous route crossed the southeastern portion of the Willow Creek State Recreation Area, moving south and westward across it for 2.1 miles. In the vicinity of the Montana Creek State Recreation Area the alignment parallels the west side of the Parks Highway approximately 65 ft from the centerline.

There are no known parks or recreational sites close to the proposed new alignment of the Fairbanks Lateral. Murphy Dome and Old Murphy Dome Roads are popular with all-terrain vehicle riders, snow machine users, hikers, dog mushers, and other recreational users. Hunting, fishing, and camping are popular recreation activities in this area.

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5.10.1.1 Regulatory Setting

- The Denali Park Improvement Act (P.L. 113-33, described later in this document) was a major change to the regulatory setting since the development of the FEIS (USACE, 2012).

- The Nancy Lake State Recreation Area Master Plan was updated, and the draft plan was made available for public review (ADNR, 2013).

- SB 70 was passed by the Alaska legislature and signed into law (Attachment 12). The legislation authorized the Department of Natural Resources to issue a right-of-way lease under AS 38.35, the Pipeline Right of Way Leasing Act, for a gas pipeline within a specified corridor through four legislatively-designated state park and recreation areas; the ASAP alignment would cross three of these areas (Denali State Park, Willow Creek Recreation Area, and Nancy Lake Recreation Area). The planning corridor will be managed as parks and recreational areas until the DNR Commissioner issues a lease, and the land within the leasehold will be returned to park and recreation land upon termination of the pipeline lease. The bill provides requirements to maintain the public's traditional means of accessing the land and to minimize the impact of a pipeline on the specific values that distinguish these lands as parks and recreational areas. The recreational, scenic, cultural, historical, and habitat values consistent with the original intent of these special use areas must be preserved.

5.10.2 Environmental Consequences

As a result of conceptual design changes to the proposed project, multiple compressor stations, the Straddle and Offtake Facility, and the Cook Inlet Natural Gas Liquid Extraction Plant (NGLEP) are no longer included in the project; nor are the construction and operational impacts to recreation associated with these facilities.

During design refinement, Alaska Gasline Development Corporation (AGDC) shifted the pipeline alignment and avoided recreation areas to the greatest extent practicable. The shifted Mainline pipeline will still cross, or be located within 1 mile of, the key recreation features identified in the FEIS (USACE, 2012). ASAP will still be within 1 mile of multiple BLM-administered interpretative sites and waysides, and within 0.1 mile of multiple interpretative sites. The proposed location of the Mainline pipeline is now more than 0.1 mile from the interpretive sites identified near MP 246 in the FEIS, which corresponds to MP 241 in the current alignment, although now shifted west. For example, 'Black Gold Brings Coldfoot to Life' and 'Stories Lost in Time' are now approximately 0.5 mile away from the proposed pipeline instead of less than 0.1 mile. The distance between the Farthest North Spruce Tree and the proposed pipeline has increased by less than 0.01 mile.

The revised alignment crosses into the Minto Flats State Game Refuge (SGR), as it did in the FEIS. In the FEIS, south of the Fairbanks Lateral tie-in, the pipeline was located outside the Minto Flats SGR (USACE, 2012). This particular segment of the pipeline was moved slightly west and now is

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partially within the SGR boundaries, as it is North of the tie-in. However, the revised alignment moved east in a few segments where it moved outside the SGF. The net result of these revisions was almost a mile less of the route within the SGR (22.8 miles currently, as opposed to 23.6 miles previously) and substantial reductions in impacts to wetlands.

In the FEIS, approximately 1.2 miles of the pipeline were located in the Willow Creek State Recreation Area (SRA) (USACE, 2012). The pipeline location roughly followed the southwestern edge of the Willow Creek SRA. In the current alignment, approximately 0.7 additional mile of pipeline (approximately 2.1 miles total) are located in the Willow Creek SRA; however this area was designated as specific to a pipeline ROW by 2015 State of Alaska legislation in SB 70 (See above). There are currently no camps or material sources planned for this immediate area near or in Willow Creek SRA.

The Preferred Option for the Yukon River Crossing has changed to Horizontal Directional Drilling (HDD). This option will place the proposed pipeline more than 0.1 mile away from the BLM-administered interpretive signs and overlook deck near MP 361 in the FEIS (corresponds to MP 357 in the current alignment, although shifted west) [USACE, 2012]).

The design refinements to the pipeline have resulted in moving the Fairbanks Lateral from the Alaska Railroad (ARR) corridor along Goldstream Valley to Murphy Dome Road. This pipeline segment will still transect or be located less than 1.0 mile from the following recreation features: Minto Flats SGR, Tanana Valley State Forest (TVSF), and Goldstream Public Use Area. The shifted alignment has the greatest impact to the TVSF, as the length of pipeline in the forest has increased by over 5 miles. The types of impacts are expected to remain the same, but they are anticipated to occur over a greater distance. The shifted location of the Fairbanks Lateral increases its distance from the Goldstream Public Use Area by approximately 0.5 mile, which will reduce the potential impact to recreation activities there.

The revised pipeline design has two additional Mainline Block Valves (MLBVs) and one additional pig launcher site along the Mainline pipeline. These facilities will be located within or less than 1 mile from the same recreational facilities as those identified in the FEIS (USACE, 2012). The revisions to the proposed project eliminate the need for a MLBV or pig launcher/receiver within 1 mile of the Arctic National Wildlife Refuge. One new MLBV was added along the Fairbanks Lateral (at MP FL 19), which is more than 1 mile to the closest known recreational facility.

5.10.2.1 Construction

The ASAP Project was designed with consideration of cross slope, terrain type, and avoidance and minimization of impacts to environmental resources where possible. The ASAP Project will require a variable-width temporary construction right-of-way (ROW) that matches the project footprint. The mainline construction ROW will range from a 120’ easement at its narrowest point to a 350’ easement at its widest point, which includes temporary workspaces and other lands required for constructing the pipeline. The Fairbanks Lateral construction ROW will range from a 100’ easement at its narrowest point to a 350’ easement at its widest point. The ASAP Project will require a

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permanent operational ROW that will range from a 53' easement at its narrowest point to a 350' easement at its widest point; this maximum distance will be required during the Operations and Maintenance phase of the Project to maintain certain side slope cuts performed during the Construction Phase of the Project. The Fairbanks Lateral Operational ROW will range from a 30ft easement at its narrowest point to 350' easement at its widest point to access and maintain the land.

Refinements to the ASAP route and the inclusion of new GIS and field information has eliminated several dozen Mainline and Fairbanks Lateral drainage crossings from the previous design (see the 'Streams' section, above and the 2015 JAfP). This will eliminate or reduce impacts to recreational use of these waterways. The alignment changes will also reduce the number of anadromous stream crossings for the project centerline by 25, from 75 to 50 streams (Table 2-1; Section 5.6).

During construction, activity will be visible to visitors of the Denali National Park (DNP) and travelers along the Parks Highway. As noted in the FEIS (USACE, 2012), these impacts will be minimized because most of this construction will occur during the winter when there is little commercial and recreational activity in DNP.

The number of Pipe Storage Yard (PSYs) has increased from 26 to 29, and the number of construction camps was reduced from 15 to 13, eliminating impacts to recreation facilities from camps at two locations. The proposed construction camps vary in size from 15 to 40 acres instead of 12 to 24 acres, as described in the FEIS. Each construction camp also has a higher capacity compared to the FEIS (ranging from 600 to 1,000 construction workers, versus 250 to 500) (USACE, 2012). Increasing the number of construction workers at each camp has the potential to increase overcrowding and competition for recreational facilities near each construction camp.

The proposed construction camps and PSYs are within 1 mile of a number of recreation features, as noted in the FEIS (USACE, 2012). These include interpretive sites and waysides along the Dalton Highway, the Arctic Interagency Visitor Center, Minto Flats SGR, TVSF, DNP, and Denali State Park. One camp and PSY has moved and is now within 0.1 miles of the Minto Flat SGR. Construction camps and PSYs also will be within 0.1 mile of multiple BLM-administered interpretive signs, the Galbraith Lake Campground, and 5 Mile Campground.

The number of potential material sites that will be developed was reduced from 546 to 89. The locations of the material sites to be used for the project have not been identified. Impacts to recreation resources are no longer anticipated from the sites that are not being considered for the project. The material sites could still be located within or adjacent to (less than 1 mile from) a number of recreation sites, as identified in the FEIS (USACE, 2012). Recreational impacts could be greater, as the amount of material needed for the project has increased. The impacts to recreation resources will depend on the proximity of the material site to the resource and the amount of material extracted.

Mitigation measures will be implemented to minimize construction impacts on recreation and tourism. These measures may be related to restricting access, avoiding high-use periods and areas, and coordinating between the public and the recreation and tourism industry.

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5.10.2.2 Operations

The effects of operating the proposed project on recreation activities and facilities are the same as those presented in the FEIS. Enactment of the Denali Park Improvement Act allows routing the pipeline following the Parks Highway within the DNP, which was considered as part of the DNP Route Variation. AGDC's preferred route in the FEIS, bypassing the park to the east, remains the preferred alternative (USACE, 2012).

5.10.3 References

Alaska Department of Natural Resources (ADNR). 2013. Nancy Lake State Recreation Area Master Plan. Public Review Draft. Division of Parks and Outdoor Recreation. May. http://dnr.alaska.gov/parks/plans/nancylake/draft6may2013/nlsra_prd_preface.pdf. Accessed October 17, 2014.

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5.11 VISUAL RESOURCES

This section describes the known changes to the affected environment for visual resources since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012) and describes the anticipated changes in impacts to visual resources based on the revised project description (AGDC, 2015). Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project, such as changes in the alignment of the Mainline pipeline and the Fairbanks Lateral (see AGDC, 2015), result in changes to the previous assessment of the effects of the proposed project on visual resources.

5.11.1 Affected Environment

There were minor changes to the affected environment since the FEIS (USACE, 2012). Those changes are the result of shifts to the pipeline alignment, placing it in a different visual context. With the shift of the Mainline pipeline alignment, the length of the proposed project crossing lands managed under the Bureau of Land Management (BLM) East Alaska Resource Management Plan (RMP) has decreased by 5.4 miles (federally managed lands as defined by the FEIS data; ~ 239.9 miles; current revision ~ 234.5 miles). Table 5.11-1 shows the length of pipeline in the East Alaska RMP by Visual Resource Management (VRM) inventory class, comparing the FEIS data with the revised design information from the POD (AGDC, 2014).

Table 5.11-1 Miles of Pipeline in the East Alaska Resource Management Plan by Visual Resource Management Inventory Class

Visual Resource Management Inventory Class	FEIS (USACE, 2012)	2012 POD (AGDC, 2012)	2015 JAfP (AGDC, 2015)	Difference
Class II	0.3	0.3	0.4	+0.1
Class III	6.0	6.3	6.4	+0.1
Class IV	1.1	2.1	2.1	0
Total	7.4	8.7	8.9	+0.2

As was noted in the FEIS, the VRM class objectives will be met for the Project (USACE, 2012). The overall description of the existing landscape in the FEIS remains valid, with a few exceptions. Those exceptions are related to the proximity of the pipeline to travel routes, intersections, and observation points. While the number and locations of pipeline viewing opportunities have changed since the FEIS, the overall existing visual environment remains the same (USACE, 2012).

The visual corridor for the Fairbanks Lateral has changed from the Alaska Railroad Corporation (ARRC) corridor in the Goldstream Valley to the Murphy Dome and Old Murphy Dome Roads. The proposed route in this area will still pass through a visual landscape of rolling hills covered with dwarf scrub vegetation and spruce stands. There are multiple existing roads in the area. Some of the roads also have overhead utility lines along one side.

Since the FEIS, passage of the Denali Park Improvement Act in September 2013 (Public Law [PL] 113-33) allows the National Park Service to approve a right-of-way (ROW) through the Denali

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National Park (DNP) for a natural gas transmission pipeline. However, ASAP's proposed route has not changed. It still bypasses DNP to the east.

5.11.2 Environmental Consequences

Revisions to the proposed project that change the visual impact assessment from what was presented in the FEIS include (USACE, 2012):

- Burying the first 7 miles of the pipeline belowground
- Increasing the pipeline diameter from 24 to 36 inches and minimum permanent ROW to 53 ft.
- Decreasing the length of proposed Mainline pipeline that passes through population areas
- Using Horizontal Directional Drilling (HDD) beneath the Yukon River
- Use of the Fairbanks Lateral near Murphy Dome and Old Murphy Dome Roads instead of along the ARRC corridor
- The compressor stations, Straddle and Offtake Facility, and Cook Inlet Natural Gas Liquid Extraction Plant (NGLEP) are no longer included in the proposed project, so there will not be impacts to visual resources associated with these facilities

The Project requires use of 298 new access roads totaling 174.4 miles and 23 ice access roads totaling 22.9 miles. The gravel access roads will be visibile in some areas, however, this is not a departure from impacts reported in the FEIS.

Passage of the Denali Park Improvement Act in September 2013 (Public Law [PL] 113-33) allows the National Park Service to approve a ROW through the Denali National Park (DNP) for a natural gas transmission pipeline; however, the proposed route bypasses the park, and its impact will be minimal compared to a route through the park in more direct view of the public (USACE, 2012).

5.11.2.1 Construction

The Mainline construction ROW width has been redefined as a minimum of 120' for the mainline and 100' for the Fairbanks Lateral, out to a maximum of 350 feet in certain areas where side slopes require additional space for cutting and maintenance. Temporary workspaces may require a ROW of up to 800 ft.

In the FEIS, almost all construction activities were to be contained within existing transportation ROWs. While there are locations where the proposed pipeline will be contained within existing highway corridors, the updated location generally falls outside of these existing disturbed areas; therefore, construction activities will generally occur farther from existing highways than described in the FEIS, and the level of visual disturbance to the public will be less, often obscured by forest and shrub cover over the additional distance. The updated location is also generally farther from the ARRC tracks, with some exceptions. The effect on visual resources will be variable. In general, construction activities will be less visible because of the increased distance between the highway, the ARRC corridor, and the proposed pipeline; however, as noted in the FEIS, the visual contrast

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of construction activities is expected to be greater in previously undeveloped areas than in previously disturbed areas (USACE, 2012). Most of the landscape changes caused by the proposed project pipeline facilities will be visible as linear strips of contrasting vegetation or exposed soil or rock on hill cuts. Impacts to vegetation are displayed in Section 5.3, above.

The number of Pipe Storage Yards (PSYs) has increased from 26 to 29, and the number of construction camps was reduced from 15 to 13. Visual impacts associated with the PSYs are expected to remain the same but will occur at three additional locations. The reduction in camp sites eliminates impacts to visual resources at two locations. With the project revisions, the proposed construction camps vary in size from 15 to 40 acres, instead of 12 to 24 acres, as described in the FEIS. Each construction camp also has a higher capacity compared to the FEIS (ranging 400 to 1,200 construction workers versus 250 to 500) (USACE, 2012). Increasing the size increases the visual impact from these facilities.

The number of potential material borrow sites was reduced from 546 to 89 (Table 2-1), and the estimated volume of sand and gravel material needed for project development has increased with project components becoming more defined. The locations of the material sites to be used for the project have not been identified. As the specific locations of the material sites are not known, it is not possible to identify the specific visual resource impacts of these sites. The number of areas potentially affected by a visual impact from borrow activity will be reduced; however, the total area likely to be disturbed for material extraction; thus, the effects on visual resources at those sites, will be more than was described in the FEIS (USACE, 2012).

5.11.2.2 Operations

With proposed Project revisions, the permanent Mainline ROW for the pipeline will now be 53 ft wide, nominally for its entire length. The Fairbanks Lateral ROW will be 100 ft, nominally. There is no discernible additional impact on visual resources for federal land. The 53-foot-wide ROW will be 23 ft wider than the ROW proposed on state and private land in the FEIS. While the ROW will be wider, long-term visual impacts are expected to be limited because the proposed pipeline will be located underground, and the ROW will be re-vegetated. The ROW is now farther from the highway and will generally be less visible. The ROW may be more visible from certain elevations or road and trail angles. The visual simulations presented in the FEIS remain valid (USACE, 2012).

The proposed Mainline pipeline potentially will be visible at six aboveground waterbody crossings (Table 5.2-1) to avoid impacts to streams. Because the pipeline diameter has increased as a result of the project design refinements, it will increase its visibility slightly at these locations.

The Fairbanks Lateral route traverses Murphy Dome, paralleling Old Murphy Dome and Murphy Dome Roads instead of the ARRC corridor. It will not be visible by rail passengers with expected high viewer sensitivity. The revised lateral pipeline route will still transect or be located less than 1 mile from the following recreation features: Goldstream Public Use Area, Tanana Valley State Forest (TVSF), and Minto Flats State Game Refuge (SGR). Although the locations of the visual impacts will be shifted with the pipeline alignment, the types of impacts are expected to remain the

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same as what was reported in the FEIS (USACE, 2012). The revised alignment of the Fairbanks Lateral has only one railroad crossing, rather than two. The number of road and driveway and trail crossings may change.

Approximately 5.7 miles of the Fairbanks Lateral will be within populated areas, a reduction of approximately 12 miles from what was reported in the FEIS (USACE, 2012). Therefore, the visual impact from the Fairbanks Lateral to populated areas will be reduced.

Since the proposed project is no longer contained within existing transportation ROWs, above-ground infrastructure, such as pig launcher/receiver facilities and Mainline Block Valves (MLBVs), will generally be farther away from highways and the railroad and less visible. Some of the MLBVs will no longer be collocated with other, much larger facilities (because those facilities were eliminated from the project) and will, therefore, have a smaller visual impact than the impact presented in the FEIS (USACE, 2012). At the southern terminus, a Mainline connection to ENSTAR Natural Gas Company's (ENSTAR's) existing natural gas pipeline distribution system will replace the Cook Inlet NGLEP facility, resulting in reduced visual impact at that location.

The GCF has increased in size, and its proposed location has moved slightly to the west; however, its overall visual impact will remain the same as the impact presented in the FEIS (USACE, 2012). The facilities at the end of the Fairbanks Lateral (MP FL 30) no longer include a pig launcher (receiver only), and there will be only one metering station, potentially resulting in a reduced visual impact at that location.

As in the FEIS, some of the valves will still be located adjacent to a highway travel route (Attachment 1). The visual impacts reported in the FEIS for these MLBVs remain valid (USACE, 2012).

5.11.3 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015 (Submitted to the U.S. Army Corps of Engineers on January 13, 2016).

AGDC. 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

AGDC. 2012. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 2.

U.S. Army Corps of Engineers (USACE). 2012. Final Environmental Impact Statement. Alaska Stand Alone Pipeline. October. http://asapgas.agdc.us/documents.html.

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5.12 SOCIOECONOMICS

The conceptual design changes to the Alaska Stand Alone Pipeline (ASAP) Project propose the transport of lean natural gas rather than gas enriched with natural gas liquids (NGLs). The transport of natural gas through the proposed pipeline increases the potential for use of gas by several communities, projects, and government entities because lean gas is transported under low pressure compared to gas rich in NGLs, making gas offtakes more economically feasible. This gas could potentially be used for commercial, industrial, and residential heating needs, as well as for additional electrical generation capacity.

This section describes the known changes to the affected environment for socioeconomic resources since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012) and describes the anticipated changes in impacts to socioeconomics based on the revised project description (AGDC, 2015). This analysis focuses on the conceptual design change to leaner gas and the associated socioeconomic impacts of accessible gas in the potentially affected communities. It identifies communities that could access natural gas via a spur line tie-in, via the Fairbanks Lateral or Beluga Pipeline tie-ins, or by truck or barge transport.

5.12.1 Communities that could Access Natural Gas via a Spur Line Tie-in

With certain exceptions, this analysis evaluated the potential of all communities located within 60 miles of the Mainline pipeline to access gas via spur line tie-ins. The exceptions are those communities that could access gas via the Fairbanks Lateral line tie-in or Beluga Pipeline tie-in and other communities, such as Deadhorse/Prudhoe and Nuiqsut, which already have gas service. The 30 communities included in this part of the analysis are shown in Figure 5.12-1.

For the purposes of this analysis, the term “community” includes cities, communities, and places of interest, as defined by the Alaska Department of Commerce, Community and Economic Development (2014a, b).

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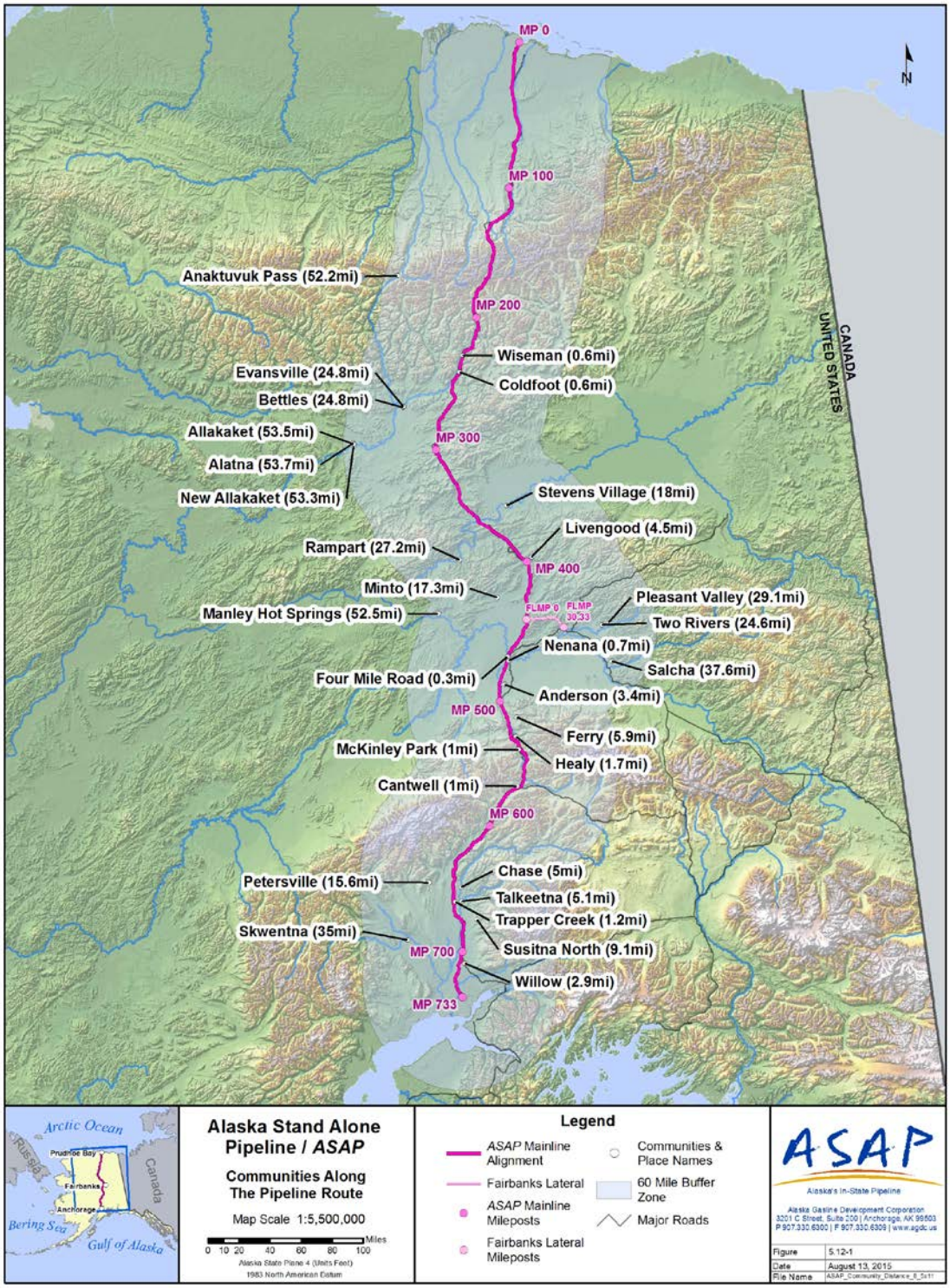
Figure 5.12-1 Communities Located within 60 Miles of the Mainline Pipeline[a]



[a] Straight line distance between community and Mainline is provided in parentheses.

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While this analysis focuses on communities, we expect that some government entities (for example, National Park Service offices, State Troopers offices, State of Alaska Department of Transportation and Public Facilities maintenance stations, and the Clear Air Force Station), as well as some current and proposed natural-resource-based projects (Usibelli Coal, Fort Knox Mine, and Ambler Mineral District) might also express interest in the purchase and use of gas.

5.12.2 Communities that could Access Gas via the Fairbanks Lateral Tie-in or ENSTAR Tie-in

This analysis assumed that the Fairbanks Lateral will transport gas to the existing and planned distribution systems of both Fairbanks Natural Gas LLC (FNG) and the Interior Gas Utility (IGU), a municipally owned utility formed in 2012 by the Fairbanks North Star Borough (FNSB), City of Fairbanks, and City of North Pole (IGU, 2014).

It was further assumed that communities located entirely or partially within the FNG and IGU service areas will receive gas via the Fairbanks Lateral line tie-in. These communities are shown in Figure 5.12-2. It is anticipated that the FNG and IGU distribution systems will supply gas to most residents in the FNSB.

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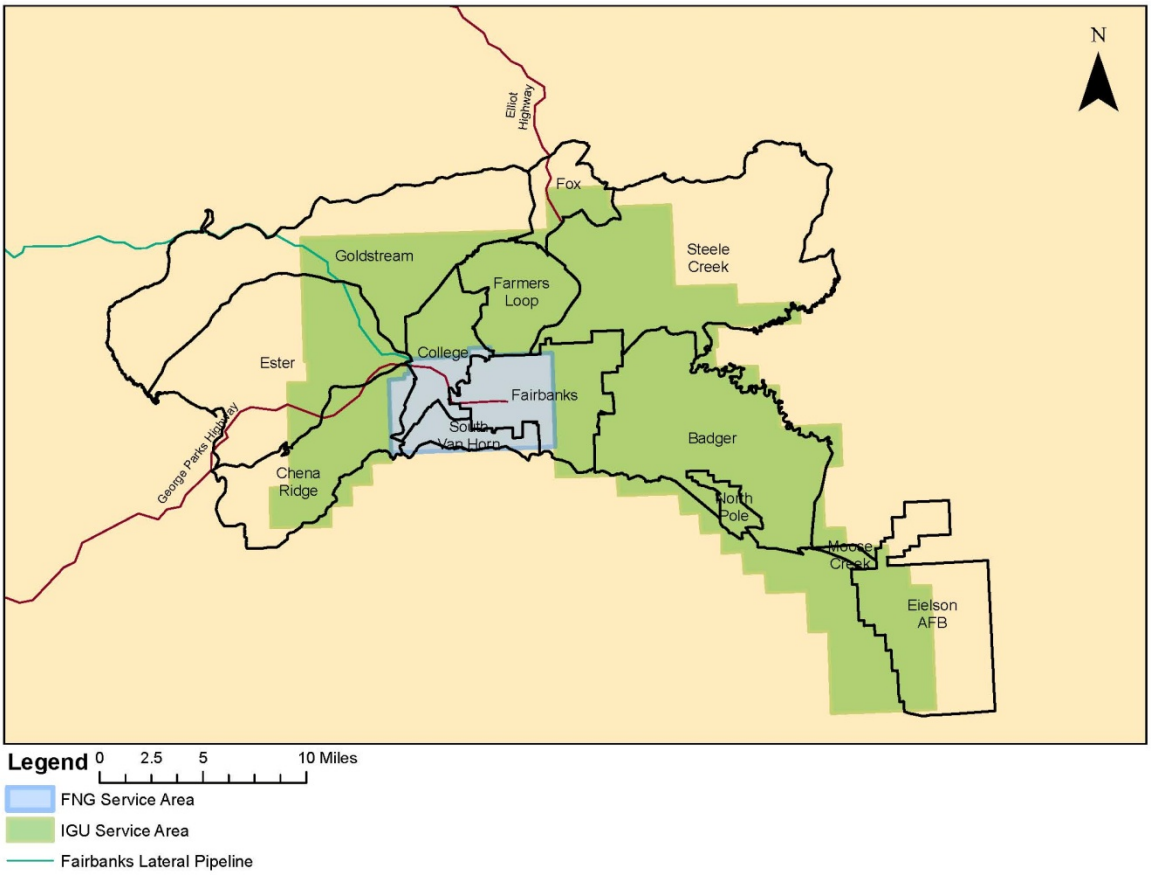
Figure 5.12-2 Communities that could Access Natural Gas via the Fairbanks Lateral Line Tie-in



The proposed project will connect into ENSTAR Natural Gas Company's (ENSTAR's) distribution system at Mile Post (MP) 39 of the Beluga Pipeline southwest of Big Lake. ENSTAR serves much of the Southcentral region (Southcentral), including the Municipality of Anchorage and communities in the Matanuska-Susitna Borough (MSB) and Kenai Peninsula Borough (Figure 5.12-3).

The ENSTAR pipeline system also delivers natural gas to the utilities that provide electical power in Southcentral, including Chugach Electric Association, Inc. (CEA); Municipal Light and Power (ML&P); Homer Electric Association (HEA); and Matanuska Electric Association (MEA). This analysis assumed that locations located entirely or partially within the ENSTAR service area will receive gas through a distribution system connected to the Mainline pipeline by this tie-in, with one exception: the community of Willow.

While Willow is within the ENSTAR service area, a pipeline to deliver natural gas to the community has not yet been constructed. Since Willow is closer to the proposed ASAP Mainline pipeline

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than it is to the current ENSTAR pipeline system (which extends to Houston), Willow could possibly withdraw from the ENSTAR service area, form its own service area, and seek to obtain gas from the ASAP Mainline pipeline via a spur line tie-in. While that was the assumption of this analysis, it is also possible that ENSTAR could connect to the ASAP Mainline close to Willow and build a distribution system in the community.

It is important to note that the available information is too uncertain to permit credible estimates of the likelihood that either one of these outcomes will occur.

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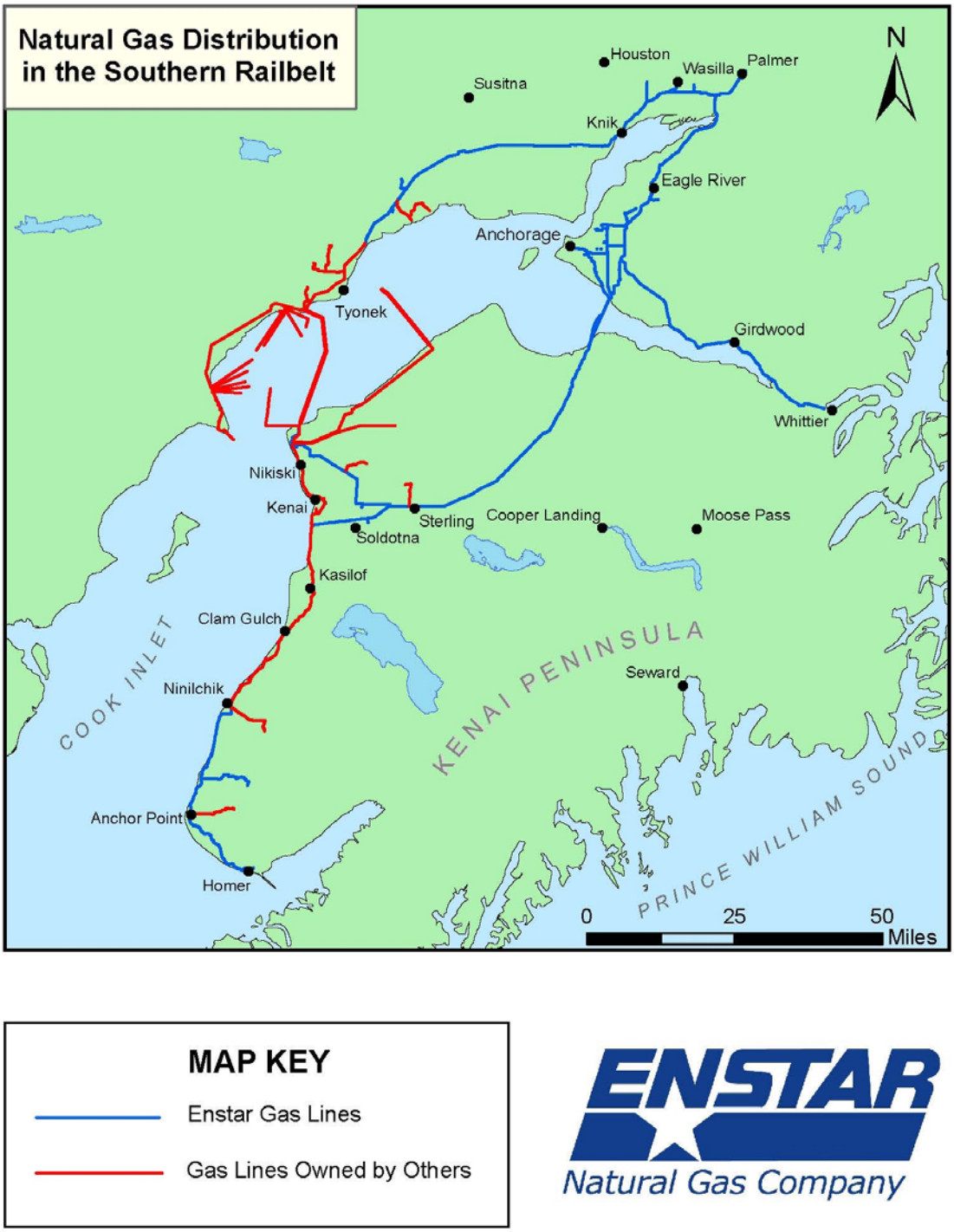
Figure 5.12-3 ENSTAR Natural Gas Company Service Area



(With permission, ENSTAR, 2014a)

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5.12.3 Communities that could Access Compressed Natural Gas via Truck or Barge

As described in the FEIS, the NGL fractionation facility that was part of the original project design could produce fuel products for customers along the Alaska Highway system in the form of propane and butane (USACE, 2012). Under the current ASAP Project design, the NGL fractionation facility will not be constructed; therefore, propane and butane will not be produced.

However, the transportation of Compressed Natural Gas (CNG) by truck to highway-accessible communities in the state is similar to the delivery of propane described in the FEIS and is considered a method of access in this analysis (USACE, 2012). Figure 5.12-4 shows the major routes of the Alaska Highway system and the connected communities. CNG could also be distributed to rural Alaska communities via the Yukon and Tanana Rivers or by marine barges from Cook Inlet. As described in the project POD (AGDC, 2014), the ASAP Project supply of gas could promote CNG as a substitute for gasoline and diesel fuel.

CNG could be used by cars and trucks in Fairbanks; by communities along the Parks and Dalton Highways, including tour buses in Denali National Park (DNP); and by Anchorage and other communities on the Kenai Peninsula.

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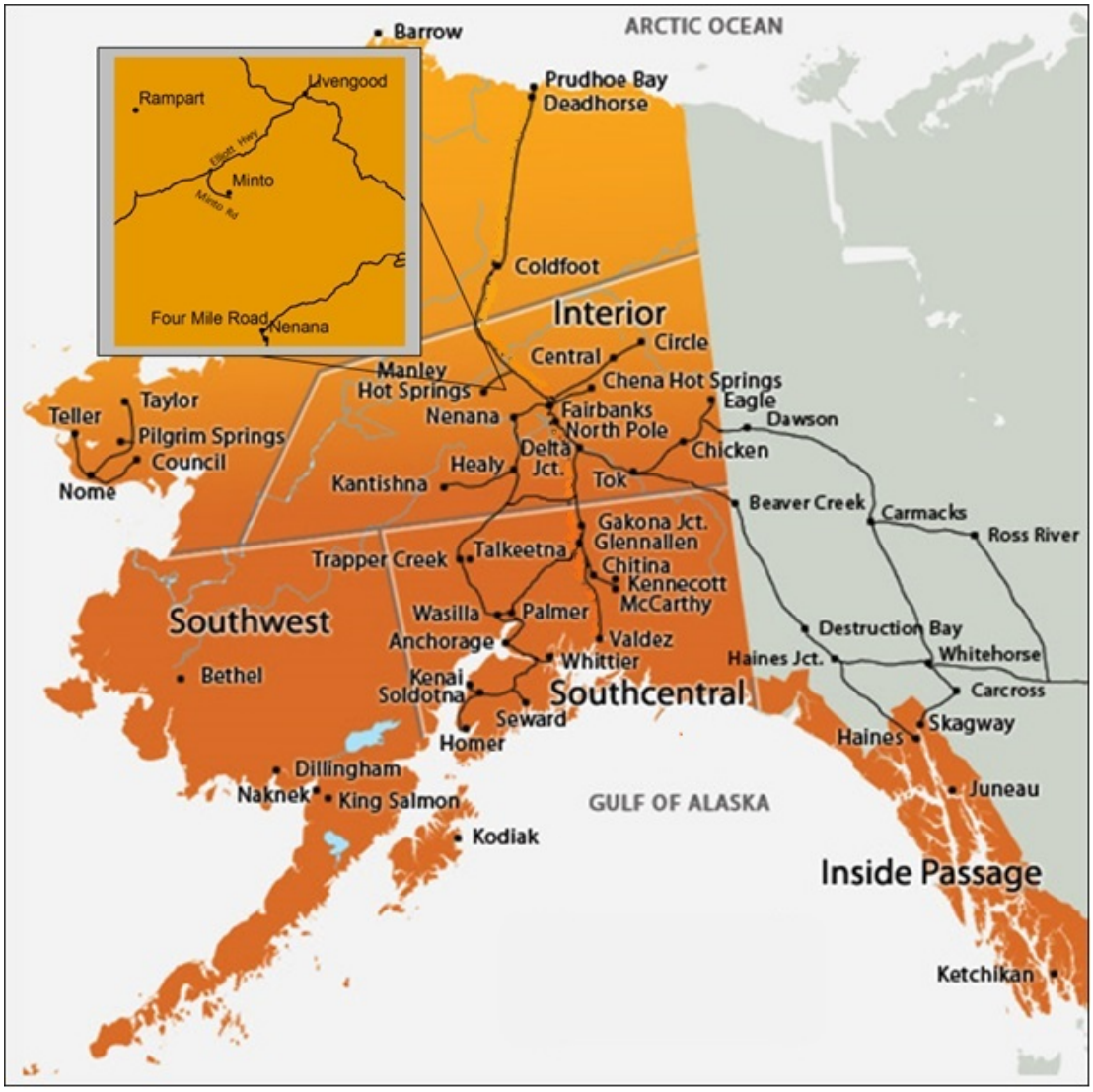
Figure 5.12-4 Alaska Highway System



(With permission, TravelAlaska.com, 2014)

5.12.4 Affected Environment

This section describes baseline socioeconomic conditions in the 30 communities that could potentially access natural gas transported by the ASAP Project via a spur line tie-in. Key socioeconomic resources addressed include population and housing, income and economy, local government revenue, and public infrastructure and services.

This section updates the baseline socioeconomic conditions in the entire North Slope Borough (NSB), Yukon-Koyukuk Census Area, FNSB, Denali Borough, and MSB, as described in the FEIS (USACE, 2012).

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With respect to communities that could potentially access natural gas transported by the ASAP Project via the Fairbanks Lateral line tie-in, the FEIS describes baseline socioeconomic conditions in the FNSB and Denali Borough (USACE, 2012). In addition, CardnoENTRIX (2014a) and Northern Economics (2012) provide socioeconomic descriptions of the Fairbanks area served by the existing and planned FNG and IGU gas distribution systems, and these descriptions are incorporated by reference.

With respect to communities that could potentially access natural gas transported by the ASAP Project via the Beluga Pipeline tie-in, the FEIS describes baseline socioeconomic conditions in the MSB (USACE, 2012). The socioeconomic environment in the Municipality of Anchorage and Kenai Peninsula Borough, as described by CardnoENTRIX (2010) is incorporated by reference. Also incorporated by reference are descriptions of the ENSTAR gas distribution system provided in the FEIS, and the descriptions provided by Black & Veatch (2008, 2010) of the Railbelt electric utilities, including those serving Southcentral.

With respect to communities that could potentially access CNG via truck or barge, the overview of socioeconomic conditions in rural Alaska communities provided by Goldsmith (2008) is incorporated by reference. For descriptions of energy use in rural Alaska, the studies by Fay et al. (2013), Northern Economics (2007), and WHPacific (2012) are incorporated by reference, as well as studies that have examined the potential of using propane in rural communities in Western and Interior Alaska, including Alaska Energy Authority (2010), Fuhs (2010), PND, Inc. (2005), R.W. Beck (2011), and Schwörer and Fay (2010).

Population and Housing

As shown in Table 5.12-1, communities in the study area are predominantly rural and sparsely populated. The largest communities are Willow and a grouping of residences known as Susitna North, with populations of 2,118 and 1,380, respectively, in 2013 (U.S. Census Bureau, 2014a). Both communities consist of a number of dispersed homes and cabins near the Parks Highway.

Evansville, the smallest community, had an official population in 2010 of only 15 residents (U.S. Census Bureau, 2014b), though it is within walking distance of Bettles, with a 2010 population of 12. Current 2013 estimates, from the Alaska Department of Labor and Workforce Development (ADOLWD), are 2 residents (Evansville) and 14 residents (Bettles), respectively (ADOLWD).

ADOLWD maintains a population gateway to federal population numbers, specifically the decennial figures, as well as American Community Survey estimates calculated more frequently than every 10 years. For these two communities, both 2010 and 2013 figures are reported as counted and may reflect presence (or absence) on April 1, known as Census Day.

Many study area communities lost population between 2000 and 2013. Residents of rural Alaska villages, especially those located on the road system, appear to be migrating to Fairbanks or South-

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central in search of better employment opportunities (Williams, 2010). In some communities, population losses led to closure of the local school due to low enrollment, which, in turn, caused further outmigration.

All of the communities have low population densities. The highest population density occurs in Anaktuvuk Pass, which had a density of about 74 persons per square mile. By comparison, Fairbanks had a density of around 1,000 persons per square mile in 2013 (ADOLWD, 2014a).

Table 5.12-1 Population and Housing

Community	Population			Population Density (persons per square mile)	Number of Housing Units	Occupied Housing Units (percent)
	2000[a]	2013[b]	Percent Change	2013[b]	2010[a]	2010[a]
Alaska	626,932	736,399	17.5	1.3	306,967	84.1
NSB						
Anaktuvuk Pass	282	358	27.0	74.1	118	83.9
Yukon-Koyukuk Census Area						
Wiseman	21	15	-28.6	0.2	25	20.0
Coldfoot	13	11	-15.4	0.3	11	54.5
Bettles	43	14	-67.4	8.0	25	36.0
Evansville	28	2	-92.9	0.1	25	48.0
New Allakaket	36	68	88.9	27.8	20	90.0
Allakaket	97	108	11.3	35.9	58	75.9
Alatna	35	26	-25.7	0.7	19	63.2
Stevens Village	87	65	-25.3	5.6	52	50.0
Livengood	29	14	-51.7	0.1	34	20.6
Rampart	45	32	-28.9	0.2	43	23.3
Manley Hot Springs	72	127	76.4	2.3	116	35.3
Minto	258	214	-17.1	1.6	94	69.1
Four Mile Road	38	26	-31.6	22.6	17	82.4
Nenana	402	399	-0.7	67.6	215	79.5
FNSB						
Salcha	854	1,041	21.9	14.1	585	73.3
Two Rivers	482	725	50.4	26.2	348	85.1
Pleasant Valley	623	717	15.1	23.1	396	78.8
Denali Borough						
Anderson	367	235	-36.0	5.4	145	62.1
Ferry	29	32	10.3	0.5	43	39.5
Healy	1,000	1,066	6.6	1.6	711	61.0
McKinley Park	142	179	26.1	1.0	422	25.8
Cantwell	222	196	-11.7	1.7	200	52.0
MSB						

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Community	Population			Population Density (persons per square mile)	Number of Housing Units	Occupied Housing Units (percent)
	2000[a]	2013[b]	Percent Change	2013[b]	2010[a]	2010[a]
Chase	41	42	2.4	0.2	209	8.6
Petersville	27	3	-88.9	0.0	179	2.2
Trapper Creek	423	475	12.3	1.5	499	45.1
Talkeetna	772	861	11.5	32.1	744	60.3
Susitna North	956	1,380	44.4	5.0	1,403	40.6
Skwentna	111	33	-70.3	0.1	353	5.7
Willow	1,658	2,118	27.7	3.1	1,912	46.7

[a](U.S. Census Bureau, 2014b)
[b](ADOLWD, 2014a)

A housing unit is defined by the U.S. Census Bureau as a house, apartment, group of rooms, or single room occupied or intended for occupancy as separate living quarters. The communities with the largest number of housing units are Willow and Susitna North, with a total of 1,912 and 1,402 units, respectively. However, less than half of the units in these communities are occupied year-round; most of the other units are for seasonal, recreational, or occasional use.

Income and Economy

Income statistics in the study area are provided in Table 5.12-2. There is a marked variation in income across communities, but the average annual income in most communities is less than the average of the state as a whole.

The average yearly wages across all communities was $34,600 in 2013. These data reflect trends in personal income in small, rural Alaskan villages, which often lack significant job opportunities. Unemployment is especially high in small, rural Alaska villages, particularly during the winter when there is little alternative market-based activity (U.S. Department of the Interior, 2002). Moreover, the higher cost of living in rural areas of Alaska exacerbates the negative economic effect of lower incomes, although many rural Alaskans continue to secure subsistence harvests (for example, hunt and fish), which substantially reduces their food costs.

Table 5.12-2 Average Wages per Worker, 2013

Community	Wages Per Employee[a]
Alaska	$41,146
NSB	
Anaktuvuk Pass	$25,152
Yukon-Koyukuk Census Area	
Wiseman	$46,011

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Community	Wages Per Employee[a]
Coldfoot	$35,170
Bettles	$42,977
Evansville	-
New Allakaket	-
Allakaket	$11,012
Alatna	$14,120
Stevens Village	$16,658
Livengood	$45,105
Rampart	$22,193
Manley Hot Springs	$27,613
Minto	$16,609
Four Mile Road	$59,677
Nenana	$31,190
FNSB	
Salcha	$36,494
Two Rivers	$41,627
Pleasant Valley	$40,661
Harding Birch	$40,787
Denali Borough	
Anderson	$43,336
Ferry	$29,166
Healy	$45,819
McKinley Park	$34,571
Cantwell	$39,042
MSB	
Chase	$48,719
Petersville	$43,162
Trapper Creek	$27,408
Talkeetna	$33,978
Susitna North	$29,820
Skwentna	$42,329
Willow	$39,593

[a]Data are for Alaska residents only; nonresidents are not included. In addition, federal workers, military, and the self-employed are not included in this data.

(ADOLWD, 2014b)

Table 5.12-3 summarizes employment as measured by the number of jobs and percentage of jobs by the top three industries. Government (federal, state, and local) is among the top employers in most study area communities. It is especially common for government to account for a large share of jobs in rural Alaska communities, as even the smallest village tends to have its own public services, such as a post office, utilities, a health clinic, and a school.

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Government services tend to be duplicated across communities because a government employee cannot efficiently travel long distances to serve residents of other communities (Shanks and Rasmussen, 2010). Another reason for the large percentage of government employment is that private sector jobs are limited in most communities. Usibelli Coal Mine, Inc.'s mining operation in Healy is the only large industrial employer among the communities. The mine employs about 144 workers (Usibelli Coal Mine, Inc., 2014).

Although not disclosed by the ADOLWD data presented in Table 5.12-3, another important employer for some communities is the federal government.

Approximately 100 Air Force National Guard personnel are stationed at Clear Air Force Station near Anderson. In addition to these uniformed personnel, the U.S. Department of Defense employs an additional 250 civilians and private contractors at the facility.

Furthermore, there are nearly 80 National Park Service employees located at the DNP. McKinley Park Village, which is located near the DNP's eastern entrance, has developed around National Park Service employment, as well as tourism-related leisure and hospitality facilities (Alaska Department of Commerce, Community, and Economic Development, 2014c).

Table 5.12-3 Employment and Workers by Industry, 2013

Community	Residents Employed[a]	Percent of Total Employed[a]
Alaska	307,987	Trade, Transportation, and Utilities (20%)
		Educational and Health Services (15%)
		Local Government (14%)
NSB		
Anaktuvuk Pass	152	Local Government (66%)
		Professional and Business Services (21%)
		Construction (5%)
Yukon-Koyukuk Census Area		
Wiseman	7	Construction (43%)
		Natural Resources and Mining (43%)
		State Government (14%)
Coldfoot	12	Leisure and Hospitality (83%)
		Natural Resources and Mining (8%)
		Professional and Business Services (8%)
Bettles	14	Professional and Business Services (43%)
		Local Government (29%)
		Leisure and Hospitality (14%)
Evansville	-	-
New Allakaket	-	-
Allakaket	113	Local Government (77%)
		Trade, Transportation, and Utilities (7%)
		Educational and Health Services (6%)

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Community	Residents Employed[a]	Percent of Total Employed[a]
Alatna	8	Local Government (88%)
		Leisure and Hospitality (13%)
Stevens Village	34	Local Government (47%)
		Construction (26%)
		Leisure and Hospitality (26%)
Livengood	8	Natural Resources and Mining (50%)
		State Government (38%)
		Professional and Business Services (13%)
Rampart	8	Local Government (50%)
		Construction (13%)
		Natural Resources and Mining (13%)
Manley Hot Springs	57	Local Government (47%)
		Construction (14%)
		Trade, Transportation, and Utilities (12%)
Minto	108	Local Government (57%)
		Leisure and Hospitality (10%)
		Educational and Health Services (8%)
Four Mile Road	14	Local Government (50%)
		Leisure and Hospitality (14%)
		Educational and Health Services (14%)
Nenana	236	Local Government (33%)
		Leisure and Hospitality (18%)
		Trade, Transportation, and Utilities (14%)
FNSB		
Salcha	333	Trade, Transportation, and Utilities (20%)
		Local Government (15%)
		Construction (12%)
Two Rivers	330	Trade, Transportation, and Utilities (22%)
		Local Government (12%)
		Educational and Health Services (12%)
Pleasant Valley	264	Trade, Transportation, and Utilities (24%)
		Construction (13%)
		Leisure and Hospitality (12%)
Denali Borough		
Anderson	91	Local Government (35%)
		Professional and Business Services (24%)
		Trade, Transportation, and Utilities (13%)
Ferry	10	Trade, Transportation, and Utilities (40%)
		State Government (20%)
		Professional and Business Services (10%)
Healy	476	Natural Resources and Mining (25%)
		Leisure and Hospitality (20%)

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Community	Residents Employed[a]	Percent of Total Employed[a]
		Trade, Transportation, and Utilities (15%)
McKinley Park	100	Leisure and Hospitality (47%)
		Trade, Transportation, and Utilities (17%)
		Educational and Health Services (9%)
Cantwell	90	State Government (22%)
		Local Government (20%)
		Leisure and Hospitality (18%)
MSB		
Chase	16	Natural Resources and Mining (31%)
		Leisure and Hospitality (25%)
		Trade, Transportation, and Utilities (19%)
Petersville	5	Natural Resources and Mining (40%)
		Local Government (20%)
		Leisure and Hospitality (20%)
Trapper Creek	175	Trade, Transportation, and Utilities (33%)
		Local Government (17%)
		Leisure and Hospitality (13%)
Talkeetna	428	Trade, Transportation, and Utilities (27%)
		Leisure and Hospitality (21%)
		Local Government 13%
Susitna North	473	Trade, Transportation, and Utilities (24%)
		Leisure and Hospitality (17%)
		Educational and Health Services (10%)
Skwentna	14	Leisure and Hospitality (29%)
		Natural Resources and Mining (21%)
		Local Government (14%)
Willow	766	Trade, Transportation, and Utilities (22%)
		Educational and Health Services (15%)
		Construction (12%)

[a] Data are for Alaska residents only; nonresidents are not included. In addition, federal workers, military, and the self-employed are not included in this data.

(ADOLWD, 2014b)

Table 5.12-4 shows the number of establishments in each community that are licensed as businesses. Alaska Statutes (ASs) define a "business" as a for-profit or non-profit entity engaging or offering to engage in a trade, a service, a profession, or an activity with the goal of receiving a financial benefit in exchange for the provision of services, or goods, or other property (AS 43.70.110(1)). These numbers reflect licenses listed by community at the State of Alaska's (SOA's) Department of Commerce, Community, and Economic Development website (2011).

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The amount of business activity across study area communities is generally limited. Some communities have small, resource-based activities, such as sport fishing and hunting lodges and guiding, as well as other tourism and recreation activities, but sparsely populated, remote communities cannot support most of the service businesses found in urban areas (Goldsmith, 2008).

Table 5.12-4 Alaska Business Licenses

Community	Number of Business Licenses
NSB	
Anaktuvuk Pass	9
Yukon-Koyukuk Census Area	
Wiseman	6
Coldfoot	0
Bettles	9
Evansville	0
New Allakaket	0
Allakaket	3
Alatna	0
Stevens Village	1
Livengood	3
Rampart	4
Manley Hot Springs	17
Minto	4
Four Mile Road	0
Nenana	84
FNSB	
Salcha	87
Two Rivers	61
Pleasant Valley	1
Denali Borough	
Anderson	16
Ferry	0
Healy	150
McKinley Park	0
Cantwell	45
MSB	
Chase	0
Petersville	2
Trapper Creek	77
Talkeetna	289
Susitna North	1
Skwentna	25
Willow	282
Alaska Department of Commerce, Community, and Economic Development (2014c)	

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Public Infrastructure and Services

Table 5.12-5 shows the electric power source and primary home heating fuels of study area communities. Alaska's electrical energy infrastructure differs from that in the rest of the United States (U.S.) in that there is no extensive infrastructure of transmission interties that spans the state. Nevertheless, the electrical needs of the larger communities in the study area are currently served by public utilities connected to a regional transmission line owned by the Alaska Energy Authority.

This grid extends from Fairbanks south through Anchorage and eventually reaches the tip of the Kenai Peninsula. The utilities connected to the grid include CEA, Anchorage ML&P, Golden Valley Electric Association (GVEA), MEA, and HEA. As shown in Table 24, nine study area communities are in the GVEA service area, and four communities are in the MEA service area.

However, in the smaller, more remote study area communities, electricity is generated by standalone diesel generators that are not tied into the regional grid. These isolated power generation facilities create a need to build bulk fuel tanks and require backup generators in almost every village.

Some study area communities have centralized utilities operated by small entities that specialize in providing electrical service to rural Alaska, such as Alaska Power and Telephone Company (AP&T) and Alaska Village Electric Cooperative. However, a few communities, such as Coldfoot, Wiseman, Livengood, and Skwentna, have no centralized utility; households in these communities either have their own private generators or have no electricity.

For heating, homes and businesses in study area communities consume a combination of fuel oil, kerosene, electricity, propane gas, wood, and coal. Space heating consumes the majority of energy use for residential and non-residential buildings in rural Alaska (WHPacific, 2012).

Table 5.12-5 Electric Power Source, Power Cost Equalization Program, and Home Heating Fuels

Community	Electric Utility Operator	PCE (2014)	Top 3 House Heating Fuels (percent of total households)	
			2000	2008-2012 Average
NSB			Fuel oil, kerosene, etc. (35.5%)	Fuel oil, kerosene, etc. (34.5%)
			Bottled, tank, or LPG (57.9%)	Bottled, tank, or LPG (62%)
			Electricity (4.7%)	Electricity (3.2%)
Anaktuvuk Pass	North Slope Borough	Y	Fuel oil, kerosene, etc. (100%)	Fuel oil, kerosene, etc. (84.9%)
			-	Electricity (12.8%)
			-	Other fuel (2.3%)
Yukon-Koyukuk Census Area			Fuel oil, kerosene, etc. (56.3%)	Fuel oil, kerosene, etc. (49.4%)
			Wood (42%)	Wood (47.6%)
			Electricity (0.7%)	Bottled, tank, or LPG (1.1%)
Wiseman	Individual generators	N	Bottled, tank, or LPG (42.9%)	-
			Fuel oil, kerosene, etc. (28.6%)	-

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Community	Electric Utility Operator	PCE (2014)	Top 3 House Heating Fuels (percent of total households)	
			2000	2008-2012 Average
			Wood (28.6%)	-
Coldfoot	Individual generators	N	Fuel oil, kerosene, etc. (100%)	-
			-	-
			-	-
Bettles	AP&T	Y	Fuel oil, kerosene, etc. (100%)	Fuel oil, kerosene, etc. (81.8%)
			-	No fuel used (18.2%)
			-	-
Evansville	AP&T	Y	Fuel oil, kerosene, etc. (73%)	Fuel oil, kerosene, etc. (100%)
			Wood (26.7%)	-
			-	-
New Allakaket	AP&T	Y	Fuel oil, kerosene, etc. (100%)	Fuel oil, kerosene, etc. (70.6%)
			-	Wood (29.4%)
			-	-
Allakaket	AP&T	Y	Fuel oil, kerosene, etc. (100%)	Fuel oil, kerosene, etc. (70.6%)
			-	Wood (29.4%)
			-	-
Alatna	AP&T	Y	Fuel oil, kerosene, etc. (66.7%)	Fuel oil, kerosene, etc. (100%)
			Wood (33.3%)	-
			-	-
Stevens Village	Stevens Village Energy Systems	N	Wood (65.7%)	Wood (100%)
			Fuel oil, kerosene, etc. (34.3%)	-
			-	-
Livengood	individual generators	N	Fuel oil, kerosene, etc. (63.6%)	Wood (68.8%)
			Wood (36.4%)	Fuel oil, kerosene, etc. (31.3%)
			-	-
Rampart	Rampart Village Council	Y	Wood (63.2%)	Wood (100%)
			Fuel oil, kerosene, etc. (36.8%)	-
			-	-
Manley Hot Springs	Manley Utility Company, Inc.	Y	Fuel oil, kerosene, etc. (53.7%)	Wood (63%)
			Wood (46.3%)	Fuel oil, kerosene, etc. (37%)
			-	-
Minto	Alaska Village Electric Cooperative	Y	Fuel oil, kerosene, etc. (86.1%)	Fuel oil, kerosene, etc. (81.2%)
			Wood (9.7%)	Wood (18.8%)
			Other fuel (4.2%)	-
Four Mile Road	GVEA	N	Fuel oil, kerosene, etc. (89.5%)	Fuel oil, kerosene, etc. (100%)
			Wood (10.5%)	-
			-	-
Nenana	GVEA	N	Fuel oil, kerosene, etc. (78.1%)	Fuel oil, kerosene, etc. (68.9%)
			Wood (19.8%)	Wood (27.7%)
			Electricity (2.1%)	Coal or coke (1.7%)

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Community	Electric Utility Operator	PCE (2014)	Top 3 House Heating Fuels (percent of total households)	
			2000	2008-2012 Average
FNSB			Fuel oil, kerosene, etc. (76.7%)	Fuel oil, kerosene, etc. (76.7%)
			Electricity (9.6%)	Electricity (6.4%)
			Coal or coke (3%)	Wood (5.6%)
Salcha	GVEA	N	Fuel oil, kerosene, etc. (66.7%)	Fuel oil, kerosene, etc. (59.4%)
			Wood (18.1%)	Wood (30.1%)
			Bottled, tank, or LPG (6.5%)	Bottled, tank, or LPG (6.5%)
Two Rivers	GVEA	N	Fuel oil, kerosene, etc. (76.3%)	Fuel oil, kerosene, etc. (89.3%)
			Wood (13%)	Wood (10.7%)
			Bottled, tank, or LPG (5.9%)	-
Pleasant Valley	GVEA	N	Fuel oil, kerosene, etc. (96.8%)	Fuel oil, kerosene, etc. (58.3%)
			Bottled, tank, or LPG (3.2%)	Wood (41.7%)
			-	-
Denali Borough			Fuel oil, kerosene, etc. (71.7%)	Fuel oil, kerosene, etc. (54.3%)
			Wood (11.3%)	Wood (24%)
			Coal or coke (8.7%)	Coal or coke (14.1%)
Anderson	GVEA	N	Fuel oil, kerosene, etc. (79.6%)	Fuel oil, kerosene, etc. (76.4%)
			Electricity (8.2%)	Wood (14.6%)
			Wood (6.1%)	Coal or coke (6.7%)
Ferry	Individual generators	N	Coal or coke (57.1%)	Wood (100%)
			Wood (33.3%)	-
			Fuel oil, kerosene, etc. (9.5%)	-
Healy	GVEA	N	Fuel oil, kerosene, etc. (69.4%)	Fuel oil, kerosene, etc. (45.7%)
			Coal or coke (12.3%)	Wood (25%)
			No fuel used (9.5%)	Coal or coke (24%)
McKinley Park	GVEA	N	Fuel oil, kerosene, etc. (84.1%)	Fuel oil, kerosene, etc. (67%)
			Wood (10.1%)	Wood (20%)
			Bottled, tank, or LPG (2.9%)	Bottled, tank, or LPG (13%)
Cantwell	GVEA	N	Fuel oil, kerosene, etc. (79.2%)	Fuel oil, kerosene, etc. (71.6%)
			Wood (20.8%)	Wood (27.3%)
MSB			Bottled, tank, or LPG (59.8%)	Bottled, tank, or LPG (69.3%)
			Fuel oil, kerosene, etc. (24.2%)	Fuel oil, kerosene, etc. (15.3%)
			Wood (6.4%)	Wood (7.2%)
Chase	Individual generators	N	Wood (100%)	Wood (100%)
Petersville	Individual generators	N	Bottled, tank, or LPG (100%)	-
			-	-
			-	-
Trapper Creek	MEA		Fuel oil, kerosene, etc. (71.8%)	Fuel oil, kerosene, etc. (52.7%)

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Community	Electric Utility Operator	PCE (2014)	Top 3 House Heating Fuels (percent of total households)	
			2000	2008-2012 Average
		N	Wood (23.3%)	Wood (30.9%)
			Bottled, tank, or LPG (5.3%)	No fuel used (8%)
Talkeetna	MEA	N	Fuel oil, kerosene, etc. (66.1%)	Fuel oil, kerosene, etc. (63%)
			Wood (26.3%)	Wood (31%)
			Other fuel (5.7%)	No fuel used (3.3%)
Susitna North	MEA	N	-	Fuel oil, kerosene, etc. (40.7%)
			-	Wood (33.8%)
			-	Bottled, tank, or LPG (12.5%)
Skwentna	Individual generators	N	Wood (57.1%)	Wood (100%)
			Fuel oil, kerosene, etc. (21.4%)	-
			Bottled, tank, or LPG (21.4%)	-
Willow	MEA	N	Fuel oil, kerosene, etc. (75.4%)	Fuel oil, kerosene, etc. (56.5%)
			Wood (9.2%)	Wood (26.4%)
			Bottled, tank, or LPG (6.1%)	Electricity (6.6%)

(U.S. Census Bureau, 2014a,b; Alaska Energy Authority, 2014)
LPG – Liquefied Petroleum Gas
PCE - Power Cost Equalization

Table 5.12-6 shows the significant differences in energy prices across study area communities, with some communities - generally those least able to afford it - paying among the highest prices in the state. Most study area communities depend on fuel oil for both electricity generation and space heating. Consequently, high fuel oil prices increase both the cost of electricity and space heating; thus, magnifying financial pressure on households (Fay et al., 2012).

In contrast, Anchorage residents pay lower energy prices because natural gas is far less expensive than fuel oil (Table 5.12-6). Anchorage residents are connected to the ENSTAR gas distribution system, and the municipality's utilities, ML&P and CEA, use Cook Inlet natural gas to generate most of their power. GVEA charges a higher rate than other utilities connected to the regional grid, reflecting the utility's heavy reliance on oil-fired generation.

There are high fixed costs associated with operating an electric utility, and if the number of customers or levels of consumption are low, these costs must be spread over few customers and kilowatt-hours (kWh). The lack of economies of scale leads to costly electricity per unit produced (Fay et al., 2012). However, as shown in Table 24, several study area communities participate in the PCE program, under which the SOA pays a portion of the electric bills for consumers served by utilities participating in the program. The PCE program is effective at lowering residential electricity rates in participating communities so that they are comparable to communities connected to the regional grid.

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PCE program eligibility depends on having a centralized utility. Consequently, villages such as Coldfoot are ineligible to participate in the program. Further, PCE disbursements per customer are limited to 500 kWh per month, and commercial customers are disallowed from receiving PCE program assistance. It is also important to note that funding the program was a challenge in years when state revenues were low (Fay et al., 2012).

Table 5.12-6 Estimated Household Heating and Electricity Costs

Community	Heating			Electricity			
	Primary Fuel	Cost of Fuel # 1 ($/Gal) (2014)	Estimated Energy Cost ($/MMBTU)	Utility Operator	Average Residential Rate ($/KWH) (2013)	PCE Adjustment	Effective Average Residential Rate ($/KWH) (2013)
Alatna	Fuel oil	$7.0	$51	AP&T	$0.77	-$0.55	$0.22
Coldfoot	Fuel oil	$5.3	$38	Individual generators[a]	$0.62	-	$0.62
Minto	Fuel oil	$5.0	$36	Alaska Village Electric Cooperative	$0.61	-$0.41	$0.19
Cantwell	Fuel oil	$4.4	$34	GVEA	$0.23	-	$0.23
Talkeetna	Fuel oil	$3.8	$28	MEA	$0.15	-	$0.15
Anchorage	Natural gas	-	$10	ML&P	$0.15	-	$0.15

[a]Rate is calculated based on specifications of a typical home generator and local fuel prices.

(Alaska Energy Data Gateway, 2014; U.S. Energy Information Administration, 2014)

$ - dollar

gal - gallon

MMBTU - million British thermal units

Local Government Revenue

The Alaska Constitution permits delegation of the state's taxation power to local governments, but limits delegation of that power to only boroughs and incorporated cities. Five of the 30 communities in the study area are incorporated, and 16 are in boroughs; the remaining 9 communities are unincorporated and are located within what is commonly referred to as the "unorganized borough." The areas of the unorganized borough in which these communities are located are the Yukon-Koyukuk Census Area and Southeast Fairbanks Census Area.

Table 5.12-7 identifies sources and levels of revenues collected by those study area communities that are incorporated. Nenana levies a property tax along with a sales tax, Anderson levies an 8 percent utility tax, and Anaktuvuk Pass levies a cigarette tax. Some city governments also impose household user fees to operate services such as water, sewer, and washaterias, and have established enterprise funds for that purpose. In addition, a number of city governments use gaming activities, such as bingo and pull tabs, to raise revenue.

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Table 5.12-7 Local Government Revenue Sources, 2012

Area	Property Tax (including Oil and Gas Property Tax)	Other Taxes	Other Fees and Charges	Intergovern-mental Transfers	Other General Fund Revenues	Non-General Fund Revenues	Enterprise / Business Funds	Total
	$ Thousands							
NSB	314,358	0	6,198	21,579	74,985	517	36,838	454,476
Anaktuvuk Pass	0	4	29	175	301	0	496	1,015
Yukon-Koyukuk Census Area								
Allakaket	0	0	0	245	397	0	0	643
Bettles	0	2	0	139	0	0	0	141
Nenana	297	0	173	640	25	62	348	1,546
FNSB	99,344	3,622	2,002	16,196	2,135	32,311	14,057	169,667
Denali Borough	0	2,685	0	1,076	27	260	352	4,400
Anderson	0	0	25	149	1	0	112	287
MSB	76,352	4,224	3,417	24,457	237	64,162	6,293	179,141

(Alaska Department of Commerce, Community, and Economic Development, 2014d,e)

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5.12.5 Environmental Consequences

5.12.5.1 Communities that could Access Natural Gas via a Spur Line Tie-in

This section evaluates the potential of study area communities to access natural gas transported by the ASAP Project via one or more spur line tie-ins. Among the factors considered are a community's location, population and population density, average household income, and industry base. Also included in the evaluation is a description of the potential public infrastructure costs of converting local utilities to natural gas. Lastly, this section examines the role of local and state government in supporting construction of gas distribution systems.

Community Location, Population, and Infrastructure Needs

The capital cost of a transmission spur pipeline and distribution system, coupled with the revenue to be generated, are critical to the economic feasibility of extending natural gas service to study area communities. Costs are a function of many factors, but principally, the distance of the community from the Mainline, the length of the distribution system within the community, and the terrain and soil conditions along the spur line route and in the community. Revenue is a function of gas sold, which in turn, is determined by the number of customers, average consumption, and price paid (Gardner Pinfold Consulting Economists, 2002).

Accessing natural gas will require an offtake point on the Mainline pipeline, as well as a transmission spur pipeline to the community. The average distance from the Mainline pipeline is around 20 miles. It was beyond the scope of this analysis to describe topological and environmental factors that could affect construction costs of a spur line and distribution system.

However, the distance of the line and extent of the distribution system directly impact cost. Although transmission piping costs will depend on the size of pipe used, construction methodology, materials used and other factors, these costs can be in the order of $300,000 per mile (MWH Americas, 2014). Based on an average distance of 20 miles from the Mainline, piping cost will be approximately $6 million. Costs will increase for road-inaccessible study area communities; for example, an order-of-magnitude cost of $4.5 million per mile of road construction was estimated by developers of a different project proposing to build a road from the Dalton Highway to Umiat (Brehmer, 2012).

Winter construction of a transmission pipeline is possible, but the additional cost of building ice roads and pads are high. In 2008, the cost to construct an ice road in the NPR-A region of the North Slope was estimated to be about $100,000 per mile, not including maintenance costs (Arctic Economics, 2008).

The actual offtake procedure is relatively straight forward: a valve is installed in the Mainline and connected to a (lateral) transmission line with pressure adjustment (if needed). The same unit meters gas flow and adds odorizer to the gas, as required.. After this treatment, transmission lines feed gas to distribution lines and, eventually, to service lines connected to each home, business or

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facility. Cost-efficiency will be gained by adding these value units when the Mainline pipeline is constructed.

A recent estimate of the construction costs of the pipeline layout network for the IGU gas distribution system in Fairbanks was $287,000 per mile (CardnoENTRIX, 2014b). The length of the distribution system within a community is a function of residential and non-residential building numbers and density. As described earlier, all of the communities are small, with populations ranging from 2 to 2,118, and averaging 350 residents. Moreover, many communities are experiencing low or negative population growth. Smaller communities typically have only have a few business establishments.

With the exception of Nenana and possibly Talkeetna, none of the communities have high-density residential or commercial neighborhoods. Housing and businesses tend to be geographically dispersed. These population and geographic characteristics suggest that the unit cost of delivering natural gas to customers within study communities will be relatively high.

Household Income

The primary benefit of using natural gas as an alternative space heating fuel is the potential for substantial operating cost savings. As discussed earlier, space heating is often the largest household energy expense in rural Alaska. Households relying on fuel oil for heating pay far more than those that have natural gas service.

However, the interest of households in converting to natural gas heating if a gas distribution system was available may be tempered by conversion costs. These conversion costs may include the cost of building the distribution system, the fee for a service line, and the expense of converting space and water heating systems and appliances to gas.

A recent household survey conducted in the FNSB by Northern Economics (2013) found that respondents with higher incomes are significantly more likely to connect.

A similar survey conducted in rural and urban areas of Pennsylvania by Ready (2013) also found a direct correlation between household income and the probability of households converting to natural gas service.

The cost to customers of connecting to the recently constructed 22.3-mile pipeline that allows ENSTAR to deliver natural gas from the Anchor Point area through Homer to Kachemak exemplifies the level of costs that households in the study area could incur.

The Cities of Homer and Kachemak are paying part of the costs of constructing local gas distribution systems through loans from the Kenai Peninsula Borough and other sources, which will be repaid by Homer and Kachemak residents through a special property assessment regardless of whether or not the property owner elects for natural gas service.

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Given the number of lots in Homer and Kachemak, each property owner will be responsible for paying approximately $3,200 for each lot/parcel that they own. Residents can either pay this assessment upfront or finance this amount at 4 percent interest over a 10-year period, which is a $33 per month payment. In addition, each customer in the two cities has to pay the cost of constructing a service line, which is $1,290 for the first 100 ft and $2 for every additional foot, plus the cost of installing a meter, which is approximately $200 (CardnoENTRIX, 2014a).

A recent analysis evaluated the cost of converting home heating systems for Homer households and illustrates the broad range of conversion costs for area residents. The cost of converting a home heating system to natural gas varies widely, ranging from approximately $851 to $8,547, depending on the size of the house and type of fuel and equipment currently used (Smith, 2012).

Converting appliances that use electricity, fuel oil, or wood to natural gas tends to be more costly than changing propane-fired appliances; however, fuel oil/kerosene and wood are the dominant home heating fuels in most study area communities.

Totaling all the costs described, Homer and Kachemak customers are likely paying between $5,500 and $13,200 to construct and connect to a natural gas distribution system. As described in earlier sections, the average income in project communities is less than the average of the state as a whole. Based on the amount paid by Homer and Kachemak residents, the costs of delivering gas to a typical household in a study area community could represent 15 to 40 percent of the household's total annual income. In communities where incomes are especially low, such as Allakaket, Alatna, and Stevens Village, it is likely that gas service will be cost-prohibitive for most households. Household incomes appear insufficient to finance the upfront conversion costs.

Independent of the sometimes high conversion or connection costs, increased access to natural gas through a piped transmission system will reduce costs substantially for typical residential uses, primarily due to lower delivered energy costs per unit and economies of scale when compared to fuel oil, propane, or coal. Ultimately, residential conversion to natural gas will depend on connection and conversion costs, projected costs savings, and the time horizon expected for repayment or recouping of their initial investment.

Larger communities, especially those with local governments and local utility companies, could conduct initial cost analyses for each project-area community, much like those done for Fairbanks and Homer. If costs at the burner tip suggest natural gas is cost-competitive based on tariffs to an offtake point, there are ways to reduce or minimize connection and conversion costs.

One example is the ability of Homer property owners to defer capital costs from immediate payment to a 10-year term, estimated at $30 to $35 per month. Connection and conversion loans could be offered by agencies, commercial banks, or even the utilities themselves, in an effort to maximize natural gas demand and generate lower per-unit costs overall. Another possibility is a turnkey utility connection and conversion, with additional monthly payments until these costs are repaid.

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The PCE program, which subsidizes rural power costs, up to 500 kWh per month, is another possible model. For example, households that meet certain income thresholds might receive payment for home heating. Homes that meet certain energy standards might receive more as an incentive to lower space heating costs.

Industry

In assessing market potential, natural gas Local Distribution Companies (LDCs) look to large energy users (energy-intensive industries, electrical generating stations, large institutional users) to provide what is known as an anchor load for a distribution system. Without such load centers, the economics of serving an area tend to be weak because recovering the costs of investing in spur lines and distribution systems in a timely manner is difficult (Gardner Pinfold Consulting Economists, 2002).

Gas utilization by industrial consumers is not only greater than that of residential and small commercial consumers, it also tends to be more uniform throughout the year. Residential demand, in contrast, tends to be highly responsive to temperatures.

Currently, the coal mine in Healy, McKinley Park Village, and Clear Air Force base near Anderson are the largest potential industrial users of natural gas in the study area. However, the coal mine's onsite power plant is fueled by coal produced by the mine. While DNP is open year-round, bus service within the park operates only from late May to mid-September, and the hotel and most visitor services at McKinley Park Village are closed during winter months. Clear Air Force Station is currently powered by a coal-fired power plant, but the Air Force and GVEA are planning to connect the military base to the Railbelt electric power grid and shut down the power plant.

Large potential institutional users of natural gas are also absent in the study area communities. Most of the communities have small schools (for example, Cantwell's one school has fewer than 30 students at a variety of grade levels), and some communities (for example, Wiseman) have no schools. Further, there are no hospitals in any of the rural communities, only small health clinics. Most transport patients to Fairbanks (or Anchorage) if additional medical care is needed.

The absence of significant industrial and institutional anchors to move gas into the study area communities may reduce the economic feasibility of constructing a gas distribution system in those communities.

Public Infrastructure and Services

A transmission spur pipeline could also potentially deliver natural gas transported by the ASAP Project to public utilities for centralized electricity generation and heating. It is possible that public utilities could negotiate directly with natural gas producers and the Mainline pipeline owner to access pipeline gas via a spur line.

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The primary benefit of using natural gas for power generation fuel is the potential for substantial savings in operating costs, especially relative to the costs of using diesel. The result would be reduced power cost per kWh for residential and commercial users.

Access to natural gas would enable a local utility to modify its existing generator systems and use a combination of diesel fuel and natural gas to generate electricity for the community. Gas can be injected through the air intake of diesel generators to reduce diesel fuel requirements and reduce fuel costs with a low capital conversion cost. The retrofit equipment can be fitted to most diesel engines. Power plant dual-fuel capability depends on a number of factors, including the type and age of the current generation systems. Generally, dual-fuel power generation systems start with diesel, and once they reach operating temperature, computerized controls increase the amount of natural gas, up to 70 percent of the total energy required.

Caterpillar, Inc., which manufactured many of the diesel power plants in rural Alaska communities, noted the following on dual-fuel planning (Caterpillar Power Systems, 2012):

- If natural gas is available, a natural gas engine is the best solution.
- If natural gas is 2 to 5 years out, consider conversion to dual fuel at that time.
- Schedule any conversion for the first major overhaul.
- Note that dual-fuel conversion will pay for itself in 2 to 3 years.

It is estimated that conversion to dual-fuel use will cost around $100,000 per generator set (based on Caterpillar 3500 model series engines) (Anderson, 2014). Plants could also purchase dual-fuel engines. For example, Matanuska Electric Association is constructing a power plant in Eklutna with a series of 10 Wärtsilä 50DF generating sets that operate primarily on natural gas. However, in case of interruption to the gas supply, dual-fuel technology allows the engines to switch operations to light fuel oil (Wärtsilä Corporation, 2014). Each 17.1-megawatt (MW) generator cost $10.6 million (Wellner, 2012).

It is also possible that major utitlies that supply electricity to some study area communities will buy natural gas transported by the ASAP Project.

GVEA generators currently burn petroleum products; however, GVEA's North Pole Expansion Power Plant, which currently generates nearly three-quarters of the utility's electricity, is capable of burning natural gas, and GVEA has expressed interest in buying gas from the North Slope (Brehmer, 2014). If the utility was able to access gas transported by the ASAP Project, it is likely that residents of those study area communities within GVEA's service area will experience a decrease in electricity rates.

With respect to public infrastructure that provides centralized heating, it is possible that residences and businesses in study area communities could tie into a district heating network, with natural gas as the fuel source for the heating plant. A district heating scheme comprises a network of insulated pipes used to deliver heat, in the form of hot water or steam, from the heating plant to an end-user. A heat network enables valuable energy, which currently is all too often wasted in power generation

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or industrial processes, to be harnessed and delivered to a point of use. District heating plants allow for economies of scale and can provide better pollution control, as the generation of heat in one large plant can often be more efficient than production in multiple localized boilers (Combined Heat & Power Association, 2014).

The feasibility of a district heating system depends on relatively high densities of end-users, along with distances that permit return condensate (from steam) and cooled water (from hot water loops) to the heating point for re-use.

In 2012 and 2013, AP&T evaluated potential district heating for the Tok area, in combination with a biomass-fuel power generation plant. The proposed district heating loop would provide heat to customers located along the Alaska Highway within 2 miles of the plant, with businesses in the area as a principal target (AP&T, 2012). Project feasibility studies are under review by Alaska Energy Authority (Plentovich, 2014). The available information is too uncertain to estimate the likelihood that construction of a district heating system fueled by natural gas (or, at Tok, biomass) would be economically or technically feasible in any of the study area communities.

Local Government

Local governments can participate in the financing package arranged to cover the capital costs of a gas distribution system. In addition, a municipality may serve as an LDC; for example, Interior Gas Utility (IGU) was formed by the FNSB, City of Fairbanks, and City of North Pole.

Typically, municipal LDCs are organized in areas where the potential rates of returns on investment are not attractive enough for privately owned utilities to build a distribution network (U.S. Energy Information Administration, 2008).

The ability of study area communities to assist in paying the costs of a distribution system may be limited. Fourteen of the 30 communities are not in an organized borough; as a result, the communities themselves will be responsible for raising revenue to pay for a distribution system. However, only five of the communities in the study area have city governments; therefore, possess the authority to levy a tax or special assessment. As discussed earlier, Homer and Kachemak City contributed to the costs of their distribution systems through a special property assessment.

The NSB provides an example of a local government that arranged to pay some of the capital costs of a community's gas distribution system and is the LDC for the system. That community was Nuiqsut, which recently completed a conversion from diesel to natural gas for power generation, space heating, and cooking purposes. Nuiqsust had 380 residents when its gas distribution system began operations in 2008. By 2009, service was available to 122 homes and 30 commercial buildings (ADNR, 2014). The gas for the distribution system originates from the Alpine oil field, which is located about 14 miles from Nuiqsut.

The NSB used bonds to fund construction of the main pipeline that transports gas from the oil field to Nuiqsut, while construction of the pipeline system within the community was funded by National

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Petroleum Reserve-Alaska impact aid grant funds. The borough also used grant funds to place gas-burning boilers and furnaces in homes and other buildings (NSB, 2005). The borough owns the gas distribution system infrastructure, which includes the main pipeline and distribution system, a skid at Alpine which removes any NGL in the gas, a module in Nuiqsut to reduce pressure before the gas goes into the distribution system, and a backup system for NGL removal (Nelson, 2006). The total conversion cost was reported to be more than $20 million. This conversion included all primary and ancillary equipment associated with power generation, thermal heating, and cooking (Alaska Energy Authority, 2010).

It is noteworthy that the NSB is second only to the Municipality of Anchorage in terms of the amount of local tax revenues collected by an Alaska municipality—and on a per-capita basis, it is the wealthiest municipality in Alaska and among the wealthiest regional governments in the U.S. (Goldsmith, 2008). Anaktuvuk Pass is the only study area community located in the NSB.

It is uncertain if other boroughs in the study area have the financial capability to help pay the capital cost of a gas distribution system. , the revenues collected by these other boroughs are substantially lower than those of the NSB. Given the low household incomes in many study area communities, simply raising the local tax rate or levying a special assessment to cover the municipal portion of a system's captal costs may not be economically feasible. One possible solution involves a combination of issuing debentures, to be paid off by capturing incremental tax revenues from the gas system itself and a small tax increase (Gardner Pinfold Consulting Economists, 2002). If the Mainline, spur line, distribution system, or a combination are subject to property taxes, the municipalities in which these facilities are located will experience an immediate increase in property tax revenues.

State and Municipal Government

The SOA could support construction of gas distribution systems on the grounds that they will generate both environmental and economic benefits. The environmental benefits will come in the form of reduced emissions of sulphur dioxide, carbon dioxide (CO_2), and Particulate Matter of 2.5 µ in diameter or smaller ($PM_{2.5}$) (smaller particulate matter) when natural gas replaces fuel oil as the energy source for power generation and space heating. The FNSB began investigating and developing its natural gas distribution system partly in response to severe air pollution at the North Pole, primarily generated by wood burning during air inversions (Northern Economics, 2012). Failure to meet air quality standards can cost local governments signficant penalities and potential lawsuits, including loss of federal grants.

Potential economic benefits include the following:

- Energy cost savings to commercial-industrial users and residents; thereby, increasing the profitability of commercial establishments and lowering the costs of living for households
- Economic development efffects—to the extent that gas influences the decision of businesses and industries to locate in an area, communities with gas may have an economic advantage over those without it

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- Savings on energy costs to publicly funded buildings, for example, schools, hospitals, and washaterias
- Increased employment associated with construction, installation, and maintenance of the pipeline systems, including the transmission and distribution of gas
- Increased energy security by providing an alternative energy fuel source

There are indications that Alaska's State Government places a priority on gas service for rural areas. The state legislature included $18.15 million in the fiscal year 2013 State Capitol Budget for construction of the gas pipeline from Anchor Point to Homer and Kachemak City (City of Homer, 2014).

Recent legislation passed by the Alaska Senate stipulated the state's participation in the Alaska Liquefied Natural Gas (LNG) Project and also created the Alaska Affordable Energy Fund, which will be used to develop energy infrastructure in areas that do not have direct access to a North Slope gas pipeline. Support of the AK LNG project (primarily for export) is in addition to the legislature's approval of the ASAP Project (primarily for in-state use).

If the project is constructed, the fund will receive 20 percent of all revenue received from the state's royalty gas transported in the Alaska LNG Project, after paying the Alaska Permanent Fund its share of that royalty. The legislation also directs the Alaska Energy Authority to develop a plan extending energy infrastructure to parts of the state without direct access to a North Slope natural gas pipeline (AGDC, 2014c).

Aside from direct legislative appropriations to cover the capital cost of gas distribution systems, there are other ways the state could support the provision of natural gas. These include subsidizing gas tariffs, establishing a fund to cover operating deficits of LDCs in early years of operation, and helping obtain grants from the Federal Government and other sources to develop gas distribution facilities.

5.12.5.2 Communities that could Access Natural Gas via the Fairbanks Lateral Line Tie-in or Beluga Pipeline Tie-in

The Fairbanks Lateral pipeline will provide natural gas to the FNG and IGU gas distribution systems at a lower price than truck haul and in greater quantity. In 2006, for example, FNG was unable to secure sufficient natural gas from Cook Inlet to allow expansion of its distribution system in Fairbanks. Attempts to establish an LNG plant on the North Slope have encountered delays due to difficulties in negotiating gas supply contracts and securing anchor tenants (Lidji, 2014).

FNG currently buys Cook Inlet gas from Hilcorp Alaska LLC at a base price of $6.86 per million cubic ft (MCF) and a swing price of $8.58 per MCF, with these rates increasing to $7.13 and $8.19, respectively, in 2015. With operational and transportation charges, FNG expects its base cost to be $15.06 per MCF through the end of 2014 (Lidji, 2014; cost based on non-interruptable natural gas from FNG's plant at Port MacKenzie). IGU proposes a delivered cost to the customer of $15 per MCF (MWH Americas, 2014), though higher prices for truck-transported gas are possible.

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IGU has developed a six-year plan that discusses the phased approach to complete the distribution system for the various areas of the greater Fairbanks area for which service will be provided (IGU, 2014). The final phase (6) is scheduled for completion in 2020. The Fairbanks Daily News Miner reported on November 1, 2015 that 135 miles of natural gas distribution piping have been install by IGU and Fairbanks Natural Gas (FDNM, 2015).

Natural gas delivered by pipelines is generally less expensive than trucking. As an example, ENSTAR delivers gas to residential users for $8.77 per MCF as of July 1, 2014, excluding a customer charge of $13.50 per month per account and 0.295 percent of the total bill for regulatory cost charges (ENSTAR, 2014b).

Current industrial users at the North Pole, such as the the Petro Star refinery, could also benefit from natural gas delivered by the Fairbanks Lateral pipeline. If natural gas were piped into the area through infrastructire developed by this community, cheaper energy would mean a quick conversion from current energy sources to natural gas. It is also important to recognize that operation of the Fairbanks Lateral (and the spur lines previously discussed) could potentially have a negative economic effect on the Petro Star refinery and regional heating oil distribution companies due to the decrease in heating oil demand. However, given the variety of products currently being produced at the Petro Star refinery, it is reasonable to assume that Petro Star will respond to decreased regional heating oil demand by producing more diesel and jet fuel to compensate for the lost home heating fuel market share. In contrast, reduced heating oil demand is expected to adversely affect heating oil distributors, since it is unlikely these companies can readily develop other markets to offset the loss (CardnoENTRIX, 2014b).

Connecting the Mainline to ENSTAR's distribution system at MP 39 of the Beluga Pipeline could generate significant cost savings for residences and businesses in the ENSTAR service area, depending on the actual delivered cost to the ENSTAR system. Cook Inlet producers currently sell natural gas for approximately $8.50 per MCF (the 'swing' price, a higher cost), according to a Revenue Requirement Study and Cost of Service Study files with the Regulatory Commission of Alaska (RCA). The projected price for LNG landed in Fairbanks from an interruptible supply in Nikiski is $17.35/MCF (cost based on use of ConocoPhillips plant at Nikiski, that provides gas when it is available); the difference between the cost of gas and its delivered cost in Fairbanks is approximately $8.85/MCF, an amount that includes truck haul of loads averaging 9,212 gallons of LNG (RCA, 2014).

5.12.5.3 Communities that could Access Compressed Natural Gas via Truck or Barge

CNG could allow expansion of natural gas services to customers who are not currently within economical extension distance of existing pipeline systems. These customers can be within a current franchise area of an LDC but be beyond the existing distribution pipeline reach or can even be outside the current franchise area of the LDC (Concentric Energy Advisors, 2013).

A distributed CNG system generally starts with a common interest from a customer or set of geographically clustered customers to switch to lower-cost natural gas. Interest can come from the

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customer itself (or themselves, in the case of a cluster of customers), the LDC operating in the franchise area or wishing to operate in a new franchise area, or a third-party supplier of distributed fuels offering natural gas (Concentric Energy Advisors, 2013).

Currently, there is one public CNG refueling site in Alaska, at Anchorage's Ditch Witch plant location. In addition, there are two other CNG refueling sites: one is located at the Municipality of Anchorage's Tudor Avenue vehicle maintenance site and the other is located in Fairbanks at the FNG plant site. At all three sites, natural gas is distributed by pipe and then compressed near end-user fueling points.

CNG truck transport does not currently exist in Alaska; further, a large natural gas utility in the Pacific Northwest indicated that it is unaware of any CNG distribution systems for home heating in the western U.S. (Smith, 2014). CNG gas delivery by truck is possible with internal trailer-mounted tanks, but there are no delivery-specific trucks in general use, such as those used by propane companies for rural home delivery.

An analysis prepared by R.W. Beck (2011) evaluated the economic feasibility of shipping propane to off-road communities as an alternative energy source. The analysis selected Tanana as a representative river community and Seldovia as a representative marine community. The analysis concluded that in communities where propane delivery is accomplished by barge, propane will be more expensive that barge-delivered fuel oil due to substantially higher intermodal transportation, storage, and distribution costs.

CNG has 65 percent less energy, in the form of British thermal units (BTUs) per gallon, than propane; consequently, CNG is even less likely than propane to be an economically feasible alternative energy sources for off-road communities. Further, whereas propane may be shipped by International Organization for Standardization (ISO)-certified tanks capable of holding 6,400 gallons per unit, there are no equivalent standard containers for waterborne delivery of CNG. While integrated tug and barge systems for CNG shipment are being developed, the costs of these systems are still very high (Sea NG, 2012).

It is also important to note that rural Alaska has a fuel supply chain system based upon private sector economic efficiencies. There is little, if any, direct government support associated with this supply system. The traditional rural fuel supply chain is based on a transportation system originating in the Lower Continental 48 U.S. States (Lower 48), often times with the entire shipment coming with one barge delivery (Alaska Energy Authority, 2010).

Finally, the costs of fuel, whether CNG or propane, change rapidly. Newer distribution systems, such as ISO-certified tanks loaded and unloaded from barges or flatbed trailers by cranes or large, front-end loaders, could be tested as a possible means of CNG energy distribution.

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5.13 CULTURAL RESOURCES

The Final Environmental Impact Statement (FEIS) discusses the affected environment and environmental consequences from the Alaska Stand Alone Pipeline (ASAP) Project to cultural resources (USACE, 2012). Recent revisions to the ASAP Project affecting cultural resources are the realignment of the Mainline pipeline and the Fairbanks Lateral. Additionally, new surveys and data were collected regarding cultural resources since the publication of the FEIS. This section describes the anticipated changes in impacts to cultural resources, and changes to cultural resource baseline information, as they relate to the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act (NHPA) (36 Code of Federal Regulations [CFR] 800).

5.13.1 Affected Environment

The baseline affected environment has changed since the FEIS, with numerous additional surveys completed in the 2 years since the release of the FEIS, and additional, newly recorded sites located in the project area alignment Alaska Heritage Resources Survey (AHRS) (USACE, 2012). Consistent with the analysis in the previously published FEIS, the proposed changes to the project will continue to cross three ecological regions of the state: the North Slope (approximately Mile Post [MP] 0 to MP 169.5), the Interior (approximately MP 169.5 to MP 577.5), and the Southcentral Region (Southcentral) (approximately MP 577.5 to MP 736.4).

5.13.1.1 Previously Documented Cultural Resources– North Slope Region

Prior to the 2014 field season, there were 251 documented AHRS sites located within 1 mile of the proposed project area in the North Slope region. A total of 25 documented AHRS sites are intersected directly by the proposed construction Right-of-Way (ROW), associated ancillary facilities, or a combination. These confidential data are on file with the Alaska Department of Natural Resources' Office of History and Archeology and State Historic Preservation Office and accessible to the USACE.

The Iñupiat History, Language and Culture Division (IHLC) of the North Slope Borough (NSB) Department of Planning and Community Services maintains a Traditional Land Use Inventory (TLUI) that identifies locations of documented cultural use within the NSB. TLUI data will need to be updated based on the proposed design changes to the alignment and ancillary facilities.

Previously Documented Cultural Resources – Interior Region

Prior to the 2014 field season, there were over 550 documented AHRS sites located within 1 mile of the proposed project area in the Interior region; a total of 81 documented AHRS sites are intersected directly by the proposed project ROW, ancillary facilities, or both. These confidential data are on file with the Alaska Department of Natural Resources' Office of History and Archeology and State Historic Preservation Office and accessible to the USACE.

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Previously Documented Cultural Resources – Southcentral Region

Prior to the 2014 field season, there were over 249 documented AHRS sites within 1 mile of the proposed project area in Southcentral; 26 documented AHRS sites were located directly within the proposed project ROW ancillary facilities, or both. These confidential data are on file with the Alaska Department of Natural Resources' Office of History and Archeology and State Historic Preservation Office and accessible to the USACE.

5.13.2 Environmental Consequences

Alaska Gasline Development Corporation (AGDC) is conducting cultural resources field surveys to identify and document potential historic properties within the project corridor (a 90-meter or 300-foot corridor centered on the proposed pipeline centerline; some cultural resources work was done using a 200-ft corridor) to comply with the NHPA. Proposed changes to Project impacts to cultural resources since the 2012 FEIS include the refinement or definition of Project Design components provided in Table 2-1, above.

Consistent with the FEIS (USACE, 2012), direct effects are those that occur within the proposed corridor and footprint of proposed project components' Area of Potential Effect (APE). The geographic area within which the proposed project could indirectly alter the character or use of a cultural resource (indirect APE) was defined as within 1 mile on either side of the ROW centerline. This indirect APE is consistent with the scope of the previously identified APE in the FEIS, and remains unchanged for purposes of this analysis (USACE, 2012). The indirect and direct APE may be modified following consultation conducted under the NEPA and the NHPA with Alaska Native Tribal governments and organizations, the State Historic Preservation Officer (SHPO), state and federal agencies, local governments, and other identified consulting parties.

5.13.2.1 Pipeline Facilities

5.13.2.1.1 Mainline

The Mainline construction corridor under the proposed changes will be approximately 733 miles long and 120 ft wide, nominally, with several sections may be wider to construct the pipeline (see Section 2). For tundra, normal and rock ditching within approximately 80 ft of the corridor will be used for storing sediment from the 10-foot-wide pipeline excavation; on the opposite side of the excavation, 40 ft will be used for ditching and pipe laying equipment, and 25 ft for vehicles to deliver pipe and supplies.

A summary of the number of documented cultural resources that may be potentially affected by construction and operations phases of the proposed project is provided in this document. Table 5.13-1 shows the number of AHRS sites located within the proposed project ROW (direct APE) and those located within 1 mile of the proposed project ROW (indirect APE).

As discussed, the IHLC Division of the NSB Department of Planning and Community Services maintains a TLUI database that identifies locations of documented cultural use within the NSB.

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TLUI data will need to be updated based on the proposed design changes to the alignment and ancillary facilities.

Table 5.13-1 Documented Alaska Heritage Resources Survey Sites Located within the Proposed Project Corridor (Direct Area of Potential Effect) and within 1 Mile (indirect Area of Potential Effect) of Proposed Project Ancillary Facilities

Pipeline Segment	AHRS Sites within Direct APE	AHRS Sites within Indirect APE
Pipeline MP 0 to MP 182	8	737
Fairbanks Lateral	2	29
MP 183 to MP 577.5	20	401
MP 578 to MP 733	10	126
Source: ADNR, OHA 2013		

There are at least 40 documented AHRS sites located within the indirect APE of the proposed project, and 1,293 (Table 5.13-1).

North Slope Region (Mile Post 0 to Mile Post 182)

This section of the pipeline will extend from pipeline MP 0 to MP 182. This segment intersects with 8 documented AHRS sites that fall within the direct APE from the proposed project construction, and 191 documented AHRS sites that fall within the indirect APE (Table 5.13-1).

Interior Region (Mile Post 182 to Mile Post 577.5 and Fairbanks Lateral)

This section of the proposed project will diverge from the Parks Highway at pipeline MP 536 and continue southeast of the Nenana River, approximately parallel to an existing power line ROW, crossing Lynx Creek, Montana Creek, and Yanert River en route to MP 577.5. This section of the alignment will intersect with 20 documented AHRS sites within the direct APE, and 430 documented AHRS sites within the indirect APE (Table 5.13-1)..

Southcentral Region (Mile Post 577.5 to Mile Post 733)

For the MP 577.5 to the MP 733 segment, there are a total of 10 documented AHRS sites that intersect with the direct APE, and 126 documented AHRS sites that fall within the indirect APE (Table 5.13-1).

The FEIS describes the potential direct and indirect impacts of construction and operations on documented cultural resources, and this analysis remains valid, including provisions for survey of as yet unsurveyed project areas and inadvertent discovery procedures cited in Appendix A of the FEIS (USACE, 2012).

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Yukon River Crossing Options

Since the FEIS, AGDC's Preferred Option for the Yukon River Crossing has changed. The preferred option is now using Horizontal Directional Drilling (HDD) beneath the Yukon River. This Preferred Option will result in no impacts to cultural resources, consistent with the analysis for this option, as described in the FEIS (USACE, 2012).

Fairbanks Lateral

The length of the Fairbanks Lateral alignment is reduced by 4 miles and now follows Murphy Dome Road, rather than the ARR ROW. The FEIS describes the potential direct and indirect impacts of construction and operations of the Fairbanks Lateral on documented cultural resources. This analysis remains valid, including provisions for survey of as yet unsurveyed project areas and inadvertent discovery procedures cited in Appendix A of the FEIS (USACE, 2012).

Gas Conditioning Facility

Construction of the Gas Conditioning Facility (GCF) and related working areas will require a gravel pad covering 90.6 acres near existing facilities. A 20.2 acre camp will also be constructed near the GCF. Consistent with the FEIS (USACE, 2012), no known documented cultural resource sites are located within the proposed construction footprint for these facilities, while two sites are located within the indirect APE of the GCF.

Consistent with findings outlined in the FEIS, no effects to documented cultural resources are anticipated from the construction or operations of the GCF. However, consistent with the FEIS (USACE, 2012), an increased number of people will be active on the landscape at the time of construction, increasing the potential for increased access (and possible visiting, discovery, or damage) to two documented AHRS sites located in the indirect APE of the GCF.

Mainline Block Valves and Pig Launcher/Receivers

Approximately 40 Mainline Block Valves (MLBVs), as well as pig launcher and receiver stations, were proposed along the pipeline with collocation where feasible with other aboveground facilities along the route (Table 2-1).

The FEIS describes the potential adverse effects of the construction and operations of the MLBVs and pig launchers and receivers on documented cultural resources, and this analysis remains valid, including provisions for survey of as yet unsurveyed project areas and inadvertent discovery procedures cited in Appendix A of the FEIS (USACE, 2012).

Consistent with findings outlined in the FIES, the appearance of the MLBVs could potentially present an incompatible visual and architectural element on the landscape. The range of this impact will be reduced in forested areas of the ROW and greatest on tundra landscapes.

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Access Roads

Construction activity could have an adverse effect on cultural resource sites, as well as the potential to affect undocumented cultural resource sites adjacent to proposed access roads. Several hundred documented AHRS sites are located within the indirect APE of proposed access roads.

Consistent with the FEIS, runoff, erosion, and redeposition of sediment due to road construction activities could expose, disturb, or bury evidence of cultural resources (USACE, 2012). Access to areas previously unsurveyed for cultural resources will be increased as personnel build the access roads, increasing the likelihood of inadvertent discovery and potential damage or looting.

Findings in the FEIS regarding direct and indirect effects to cultural resources for Operations and Maintenance (O&M) of access roads remains valid (USACE, 2012).

5.13.2.2 Support Facilities

Operations and Maintenance Buildings

Support facilities will occur within the footprint of the GCF at Prudhoe Bay, near the terminus of the Fairbanks Lateral, and near the terminus of the pipeline near Big Lake; direct and indirect effects to documented cultural resources will be the same as described under the GCF discussion.

Construction Camps and Pipeline Storage Yards

Construction camp mobilization and siting could affect unidentified cultural resource sites in the footprint of the camps and Pipe Storage Yards (PSYs). The number of construction camps was reduced from 15 in the FEIS (USACE, 2012) to 13 (12 on the pipeline and 1 at the GCF) under the proposed design changes presented in the POD (AGDC, 2014). The proposed construction camps will vary from 15 to 40 acres, an increase from the 12 to 24 acres described in the FEIS. The Project proposes 29 PSYs, which will be collocated with camps.

Consistent with the findings of the FEIS (USACE, 2012), potential adverse effects to cultural resources could occur during the construction phase of the project, based on the camp construction/mobilization, as well as an increased number of people who will be active on the landscape near the construction camps and PSYs at the time of construction, increasing the likelihood that cultural resource sites in the vicinity could be visited, discovered, or damaged.

Consistent with the findings of the FEIS (USACE, 2012), no direct or indirect effects to cultural resources are anticipated during the operations phase of the project, as the construction camps and PSYs will not be used during this phase.

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Material Sites

Approximately 25 million cubic yards (MCY) of material may be required for proposed project construction. A total of 89 existing material sites have been identified for the Project and are characterized in Table 2-4, above. Construction and extraction at these material sites could affect cultural resource sites through site disturbance or removal. An increased number of people will be active on the landscape near the material sites at the time of construction, increasing the likelihood that indirect effects to cultural resource sites could occur through discovery or damage.

Consistent with findings outlined in the FEIS (USACE, 2012), no effects to documented cultural resources are anticipated from O&M for material sites, as material sites will not be used during construction.

Denali National Park Route Variation

When the 2012 FEIS was prepared, the Project did not have authorization to construct the pipeline through Denali National Park (DNP). Since that time, the Denali Park Improvement Act (Public Law [PL] 113-33) was signed in September 2013, enabling the National Park Service to approve a ROW through the DNP for a natural gas transmission pipeline. There were 14 documented AHRS sites located within the DNP alternative route indirect APE, with 2 documented AHRS sites located within the direct APE (USACE, 2012). The DNP alternative was described in Section 4.0, Alternatives, of the FEIS (USACE, 2012), and has been made current in Section 4, above.

Despite the approved legislation, the route proposed by AGDC will avoid all direct disturbance to the DNP, minimizing project impacts by routing the pipeline to the east, outside of park boundaries and away from direct proximity to visitors, visual resources, and wildlife in the DNP boundaries. Consistent with the FEIS (USACE, 2012), direct and indirect effects from construction and operations of the DNP Route Variation will be the same as those described under Mainline, including those presented by newly identified access roads and material site locations as outlined in the POD (AGDC, 2014).

5.13.3 References

Alaska Department of Natural Resources, Office History and Archaeology (ADNR, OHA). 2014. *Alaska Heritage Resource Survey*. Database on file at Office of History and Archaeology. Anchorage, Alaska.

Alaska Department of Transportation and Public Facilities (ADOT&PF). 2010. "Alaska Roads Treated as Eligible for the National Register (11/30/10)." *Alaska Highway System Roads Programmatic Agreement.*

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5.14 SUBSISTENCE

The Final Environmental Impact Statement (FEIS) discusses the affected environment of and environmental consequences from the Alaska Stand Alone Pipeline (ASAP) Project to subsistence (USACE, 2012).

Recent revisions to the ASAP Project affecting subsistence are the realignment of the Mainline pipeline and Fairbanks Lateral, elimination of compressor stations, use of the Port of Seward (POS) as the primary port of entry, and addition of the West Dock for port of entry for prefabricated GCF modules (AGDC, 2015; 2014). Additionally, new baseline data were documented regarding subsistence harvest and use since the publication of the FEIS (USACE, 2012). This section describes the anticipated changes in impacts to subsistence resources, and updated subsistence harvest and use baseline information, as they relate to the National Environmental Policy Act (NEPA) and Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA).

5.14.1 Affected Environment

There were no changes to the regulatory environment affecting subsistence from that reported in the FEIS (USACE, 2012). There are no changes to the 46 communities identified for subsistence analysis in the Final Environmental Impact Statement (FEIS) (USACE, 2012); however, community baseline subsistence harvest and use data was collected and updated between 2011 and 2014 by the Alaska Department of Fish and Game (ADF&G) for the following 15 communities:

1) Anaktuvuk Pass (ADF&G, 2012, 2014a)
2) Alatna (ADF&G, 2012, 2014a)
3) Allakaket (ADF&G, 2012; 2014a)
4) Beaver (ADF&G, 2012; 2014a)
5) Bettles (ADF&G, 2012; 2014a)
6) Coldfoot (ADF&G, 2012; 2014a)
7) Evansville (ADF&G, 2012; 2014a)
8) Minto (ADF&G, 2014a)
9) Manley Hot Springs (ADF&G, 2014a)
10) Wiseman (ADF&G, 2012; 2014a)
11) Skwentna (ADF&G, 2014a; Holen et al., 2014)
12) Susitna/Alexander (ADF&G, 2014a; Holen et al., 2014)
13) Talkeenta (ADF&G, 2014a; Holen et al., 2014)
14) Trapper Creek (ADF&G, 2014a; Holen et al., 2014)
15) Cantwell (ADF&G, 2014a; Holen et al., 2014)

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5.14.2 North Slope Region

5.14.2.1 Subsistence Use Areas

Subsistence use areas for the community of Anaktuvuk Pass were mapped in 2011 and reported on in 2012 by the ADF&G Subsistence Division for the Alaska Pipeline Project (APP) (ADF&G, 2012). The subsistence use areas documented in 2011 for residents of Anaktuvuk Pass are more refined than those reported in the FEIS (USACE, 2012). Use areas are centered on the community, and radiate south, along the John River into the Brooks Range, east and north along the Anaktuvuk River, west around Chandler Lake, and north along the Siksikpuk and Chandler Rivers. Use is also recorded east of Anaktuvuk Pass, at Itkillik Lake. Subsistence use areas are located within 10 miles of the Mainline alignment.

5.14.2.2 Subsistence Harvest Patterns

For the community of Anaktuvuk Pass, updated harvest and use data and patterns have not significantly changed from those reported in the FEIS. Caribou were reported to comprise 86 percent (Figure 5.14-1) of the community's overall harvest, rather than 83 percent as discussed in the FEIS, and moose surpassed grayling to round out the top three species harvested by Anaktuvuk residents (Figure 5.14-2). It should be noted that non-salmon fish harvest did comprise a larger percentage of the harvest than moose. Per capita harvest of resources increased to 317 pounds in 2011, and previously unavailable information on household sharing indicate that 95 percent of households received subsistence resources from other households, while 76 percent of Anaktuvuk Pass households gave resources away (Figure 5.14-3). With the new data for Anaktuvuk Pass taken into account, bowhead whales and caribou still represent over 70 percent of the North Slope region's total subsistence harvest (measured in edible pounds) for all four communities as reported in the FEIS (USACE, 2012).

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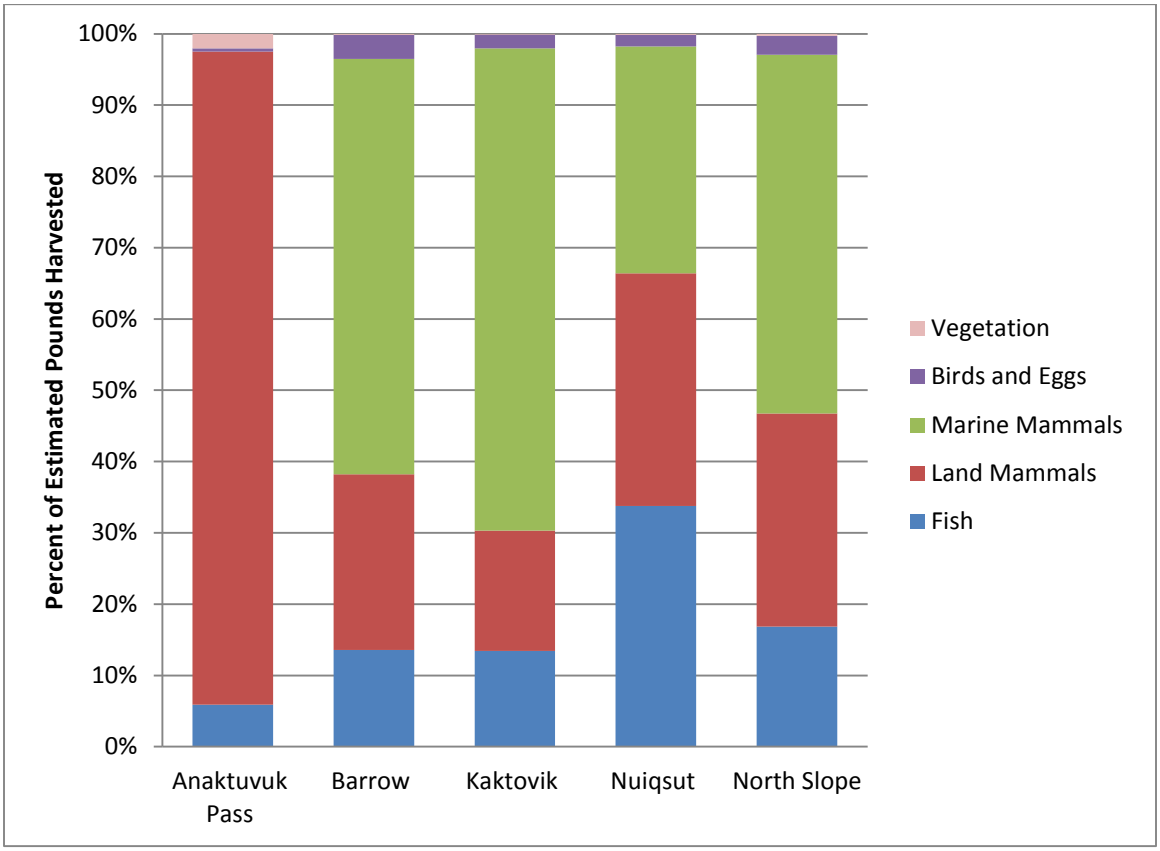
Figure 5.14-1 Percent of Harvest by Resource Category – North Slope Region



Notes: Most Representative Study Year shown for all study communities.

Sources: ADFG, 2012; ADFG, 2014; SRB&A and ISER, 1993

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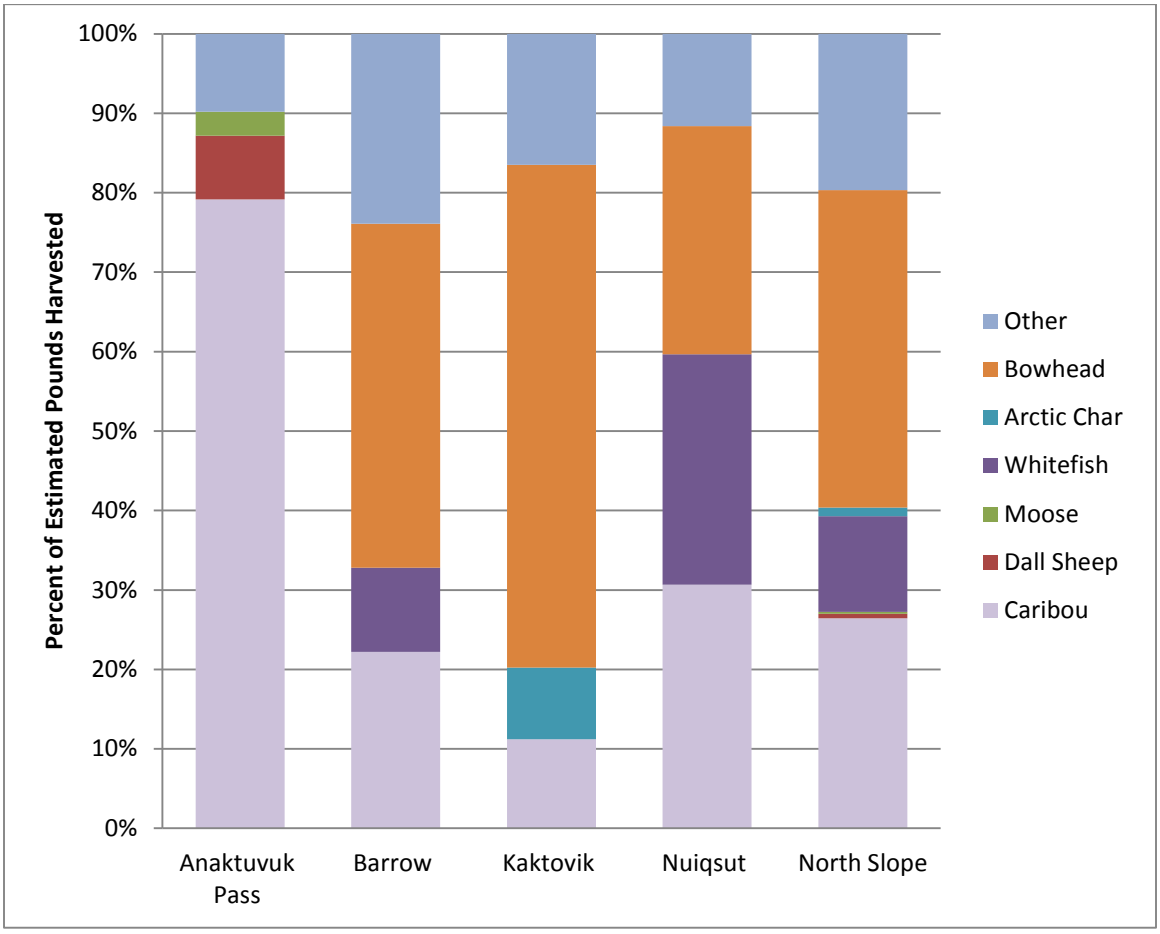
Figure 5.14-2 Percent of Harvest by Top Three Species – North Slope Region



Notes: Most Representative Study Year shown for all study communities.

Sources: ADFG 2012; ADFG 2014; SRB&A and ISER, 1993

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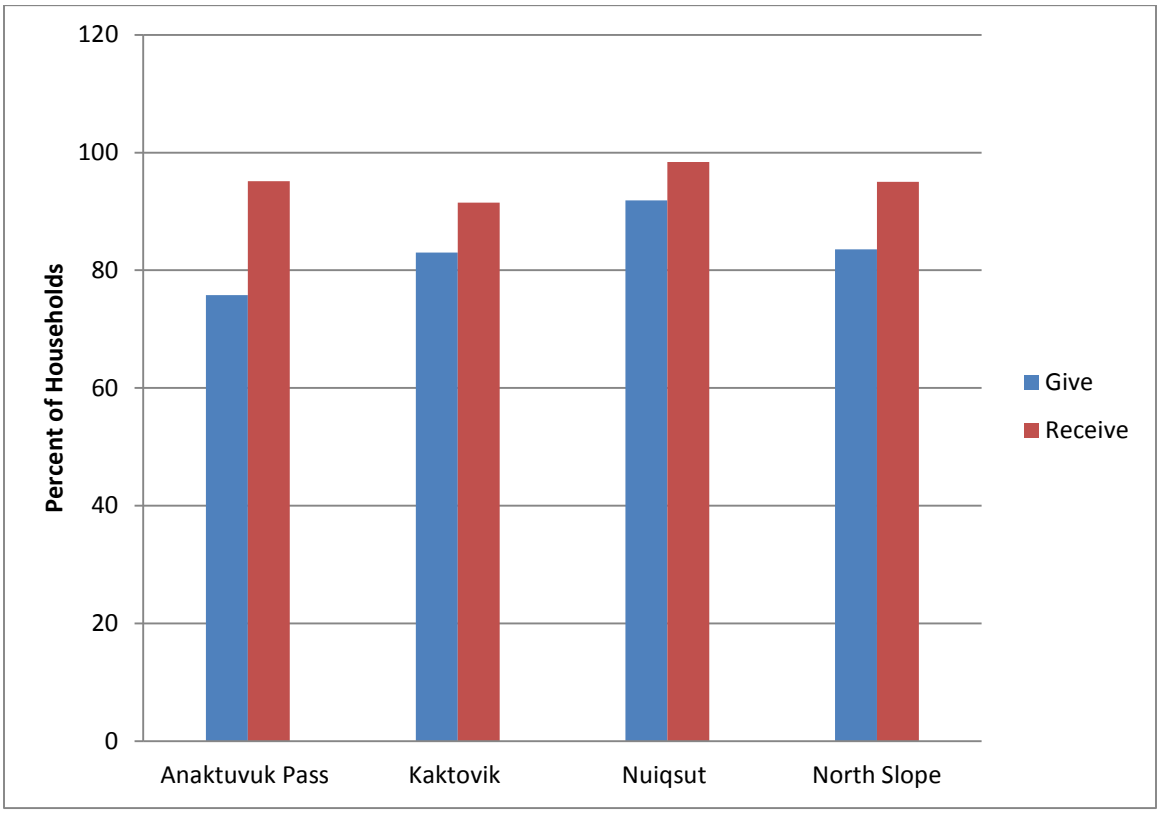
Figure 5.14-3 Percent of Households Sharing Subsistence Resources – North Slope Region



Notes: Most Representative Study Year shown for all study communities.

Sources: Anaktuvuk Pass 2011 (ADF&G, 2014; Holen et al., 2014), Barrow 1989 (SRB&A and ISER, 1993), Kaktovik 1992 (ADF&G, 2014); Nuiqsut 1993 (ADF&G, 2014).

5.14.3 Interior Region

5.14.3.1 Seasonal Round

Seasonal round patterns for North Slope communities discussed in the FEIS are unchanged (USACE, 2012).

5.14.3.2 Subsistence Use Areas

Subsistence use areas for many Interior communities were mapped in 2011 and reported on in 2012 by the ADF&G Subsistence Division for the APP (ADF&G, 2012).

Alatna and Allakaket use areas documented in 2011 are centered on the Koyukuk River area and include the Kanuti and Alatna Rivers. Use areas also extend into the South Fork Koyukuk River area, and are located within 10 miles of the ASAP Project alignment (ADF&G, 2012).

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Subsistence use areas for the community of Beaver documented in 2011 are largely centered on the Yukon River and its tributaries, including the Hodzana River, Beaver Creek, and the Lower and Upper Mouths of Birch Creek. Use is documented along the Yukon River past Stevens Village, as far west as the River's intersection with the Dalton Highway and as far east as the Yukon's confluence with the Chandalar and Christian Rivers. Use areas intersect the project area near the Dalton Highway (ADF&G, 2012).

Bettles use areas documented in 2011 include the Koyukuk, South Fork Koyukuk, Wild, John, Malamute Fork John, and Malamute Fork Alatna Rivers, as well as Mettenpherg Creek, Iniakuk and Wild Lakes, Colorado Creek, and Lookout Mountain. Bettles and Evansville use areas recorded in 2011 are similar, but more focused on the John, Wild, and Koyukuk Rivers. Both communities' use is concentrated to the west of the Dalton Highway; however, both communities report using the Dalton Highway and areas adjacent to it (including the Project area) for accessing subsistence resources (ADF&G, 2012).

Subsistence use areas for the community of Wiseman were documented in 2011. Areas used by Wiseman residents are centered along the Dalton Highway from its intersection with the Jim River at the south, continuing north past Toolik Lake. Bob Johnson Lake, Chandalar Lake, and the South Fork Koyukuk River Flats are also documented as Wiseman use areas (ADF&G, 2012).

Use areas intersect the project area along the Dalton Highway.

5.14.3.2.1 Subsistence Harvest Patterns

Community baseline harvest surveys completed by ADF&G in 2011 and 2012 for the APP project update available comprehensive all-resources harvest data for the interior communities of Alatna, Allakaket, Beaver, Bettles, Evansville, Minto, Manley Hot Springs, and Wiseman (ADF&G, 2012).

With updated information taken into account, fish and land mammals still contribute the majority of edible pounds to the total subsistence harvest for Interior study communities (Figure 5.14-4), and nearly all communities report harvesting vegetation and birds and eggs, as well. For the communities of Alatna, Bettles, Coldfoot, Evansville, and Wiseman, land mammals contributed more to the total edible pounds harvested than fish; however, averaged together, the estimated harvest of fish was the greatest contributor to Interior communities' total harvest. Residents of Anderson and Healy reported marine invertebrate harvest, and no communities report marine mammal harvest. The average of estimated harvest for all resource groups in each community indicates that fish contribute 81 percent of the total harvest for the Interior, while land mammals contribute 16 percent, and vegetation, birds and eggs, and marine invertebrates comprise the remaining 3 percent (ADF&G, 2012).

Although no interior households reported harvesting marine mammals, marine mammal use is a component of the subsistence patterns for the community of Alatna, where 100 percent of households reported receiving whale, and 17 percent of households reported receiving seal. This pattern likely reflects the ancestral ties Alatna residents have to Eskimo groups in the Kobuk, Selawik, and

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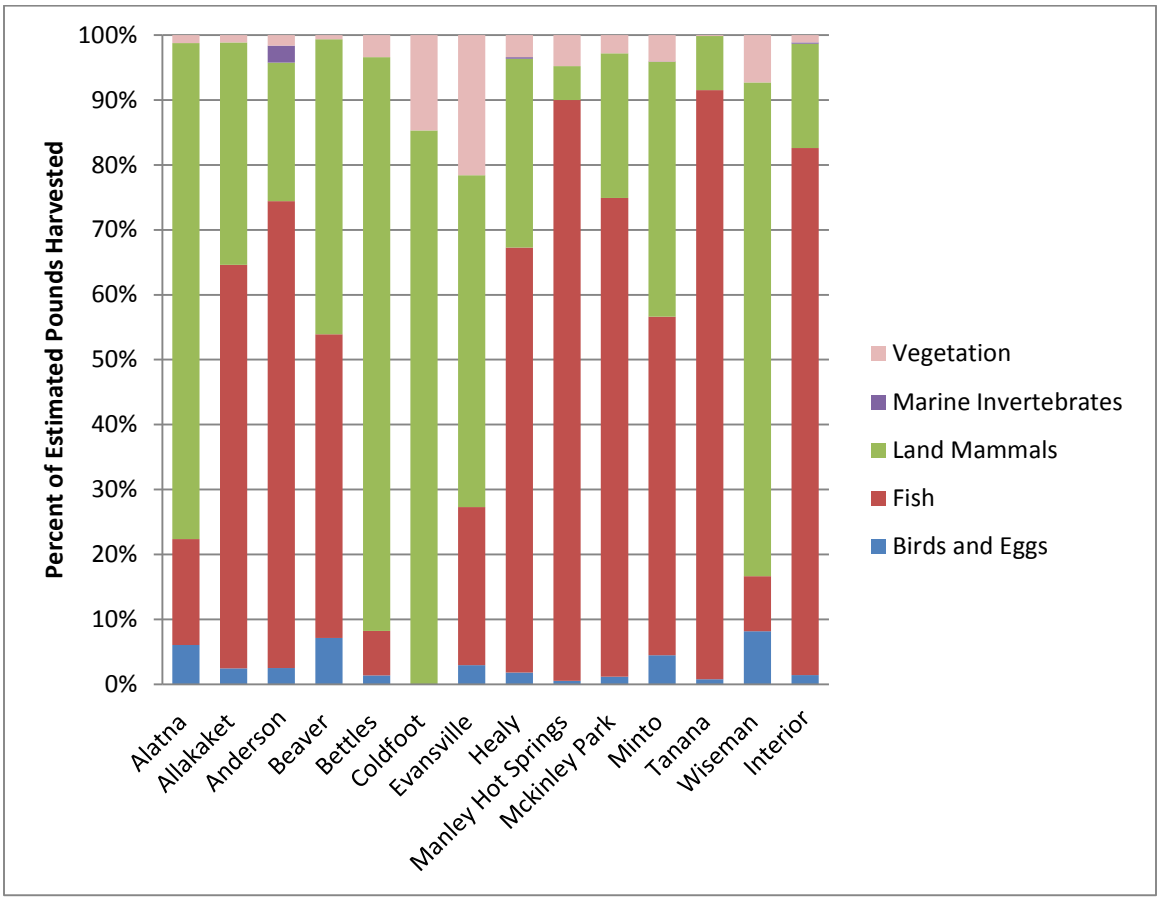
Kotzebue areas. Allakaket and Wiseman also reported using whale and seal, with 52 percent of Allakaket households using (receiving) whale and 20 percent of Wiseman households using (receiving) seal (ADF&G, 2012).

Figure 5.14-4 Percent of Harvest by Resource Category – Interior Region



Notes: Most Representative Study Year shown for all study communities.

(ADF&G, 2014)

Figure 5.14-5 illustrates the top three species harvested by each Interior study community in terms of percent of total harvest. Moose and chum salmon were some of the top three harvested resources for nearly all communities, and caribou and coho were also commonly harvested across communities. The community of Coldfoot illustrates a decidedly different harvest pattern, with caribou, berries, and Hudson Bay tea comprising the top three harvested resources.

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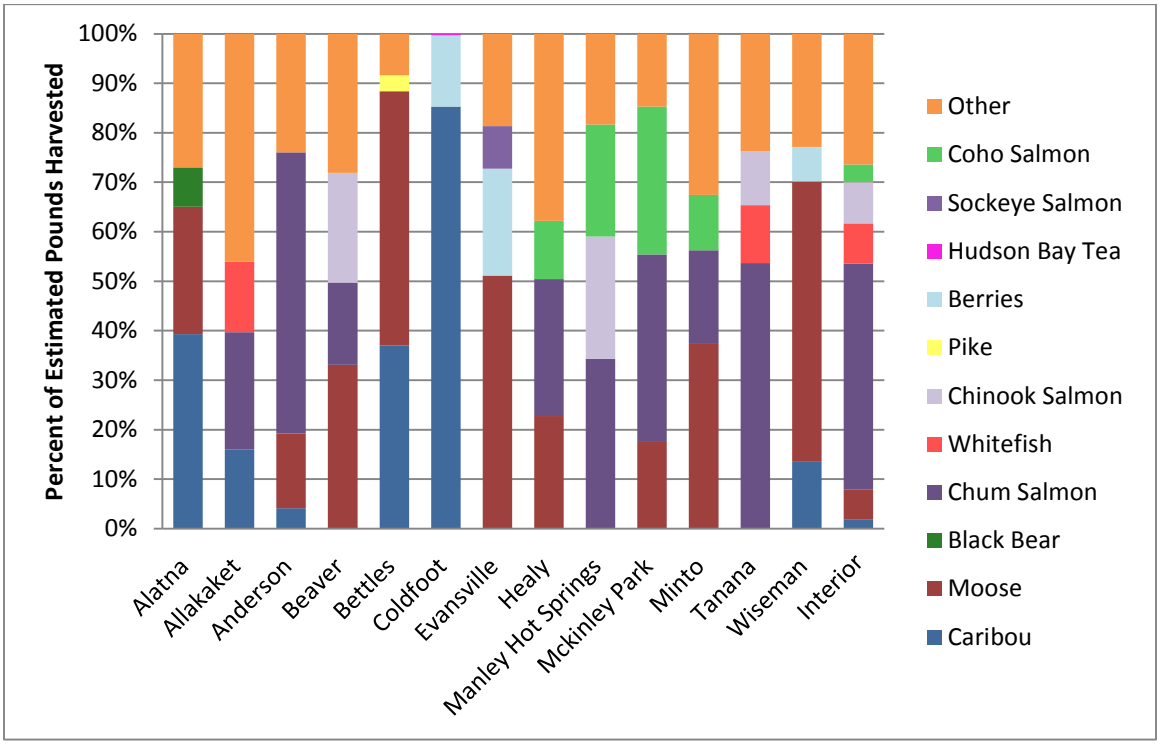
Figure 5.14-5 Percent of Harvest by Top Three Species – Interior Region



Notes: Most Representative Study Year shown for all study communities.

source: ADF&G, 2014

Recent data from 2011 indicates sharing of subsistence resources among households remains common in Interior communities, as illustrated in Figure 5.14-6, which shows the percentage of households in Interior communities giving and receiving subsistence resources. As discussed in the FEIS, the percentages of households participating in sharing of resources is generally higher in communities with primarily Alaskan Native populations versus those with mixed or primarily non-Native populations (Anderson, Healy, and McKinley Park). Bettles, Wiseman, and Coldfoot, all of which are occupied primarily by non-Native residents, demonstrate high rates of sharing of resources, as well. As noted in the FEIS, sharing commonly happens among residents within communities, and also between communities, as discussed earlier for Alatna, Allakaket, and Wiseman households and their use of marine mammal resources (USACE, 2012).

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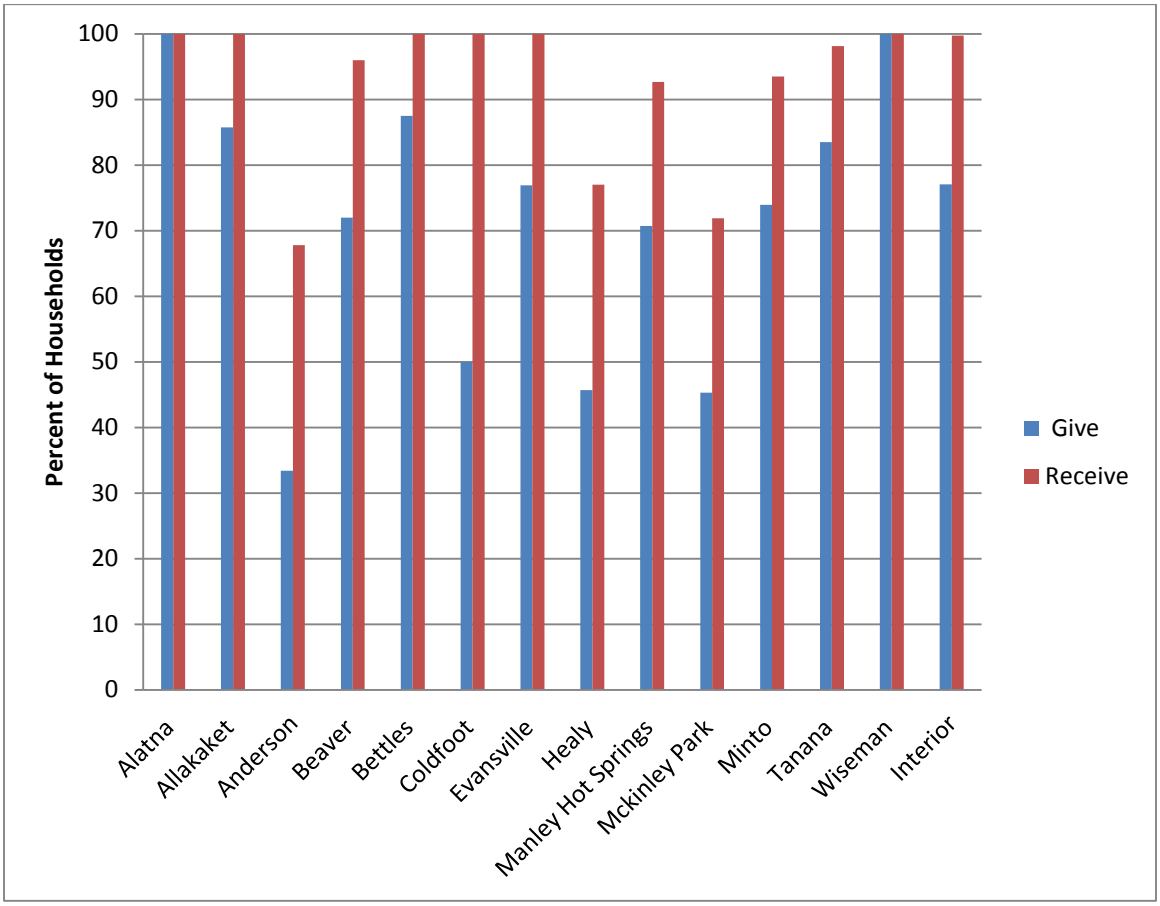
Figure 5.14-6 Percent of Households Sharing Subsistence Resources – Interior Region



Notes: Most Representative Study Year shown for all study communities.

(ADF&G, 2014)

5.14.3.3 Seasonal Round

Seasonal round patterns for Interior communities discussed in the FEIS are unchanged (USACE, 2012).

5.14.4 Southcentral Region

5.14.4.1 Subsistence Use Areas

Subsistence use areas for many Southcentral communities for the study year 2012 were mapped and reported on in 2014 by the ADF&G Subsistence Division for the Susitna Hydroelectric Project (ADF&G, 2014b). The updated information is available for the following communities: Cantwell, Chase, Talkeetna, Trapper Creek, Alexander/Susitna, and Skwentna.

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Cantwell use areas documented in the 2014b ADF&G report are centered along the Parks and Denali Highways. Along the Parks Highway, Cantwell residents indicated subsistence use areas on both the western and eastern sides of the highway, from the intersection with Honolulu Creek, north to Riley Creek. These use areas directly intersect the ASAP pipeline alignment and associated other project elements.

Subsistence use areas documented in the 2014b ADF&G report for the community of Chase are centered on the Susitna River, from Talkeetna north along Lane and Chinuluna (Clear) Creeks. Chase residents also reported use along the Denali Highway from Cantwell as far east as Tangle Lakes. Use areas do not directly intersect the proposed project, but are located within 5 miles.

Talkeetna use areas documented in the 2014b ADF&G report include Talkeetna Lakes, Trapper Creek, the Chulitna and Susitna Rivers from Talkeetna north, the Talkeetna River to its confluence with Disappointment Creek, and Disappointment Creek itself. Cantwell Creek and the Denali Highway, including the Deadman Lake and Talkeetna use areas intersect the proposed project. The alignment corridor and Parks Highway are one of the primary hunting areas and access routes for migratory waterfowl and upland game birds, as well as moose.

Trapper Creek use areas documented in the 2014b ADF&G report are largely focused around the community of Trapper Creek, along Petersville Road and the Parks Highway, and include Moose, Trapper, Kroto, and Montana Creeks; the Talkeetna River; and Amber Lake. Trapper Creek residents reported use areas furthest from Trapper Creek, near Troublesome Creek to the north, for harvesting berries, plants, greens, and mushrooms. Trapper Creek use areas intersect the proposed project.

Subsistence use areas for the communities of Alexander and Susitna documented in the 2014b ADF&G report include the area around and east of Mount Susitna, Alexander Creek, and along the Susitna River, almost to its confluence with the Yentna River. Subsistence use areas for Alexander and Susitna do not intersect the proposed project, but are located within 18 and 10 miles, respectively, of the proposed project.

Skwentna use areas documented in the 2014b ADF&G report focus from Skwentna east along the Yentna River to Lake Creek and Twentymile Slough, west along the Yentna River up into Denali National Park (DNP), and on lakes west of Skwentna (Hewitt Lake, Whiskey Lake, Shell Lake, and One Stone Lake). The lands surrounding the Skwentna, Talachulitna, and Hayes Rivers were also documented as subsistence use areas. Skwentna use areas are located within 10 miles of the proposed project.

5.14.4.2 Subsistence Harvest Patterns

Community baseline harvest surveys completed by ADF&G in 2013 for the Susitna Hydroelectric Project update available comprehensive all-resources harvest data for the Southcentral communities of Cantwell, Chase, Talkeetna, Trapper Creek, Alexander/Susitna, and Skwentna (ADF&G, 2014b).

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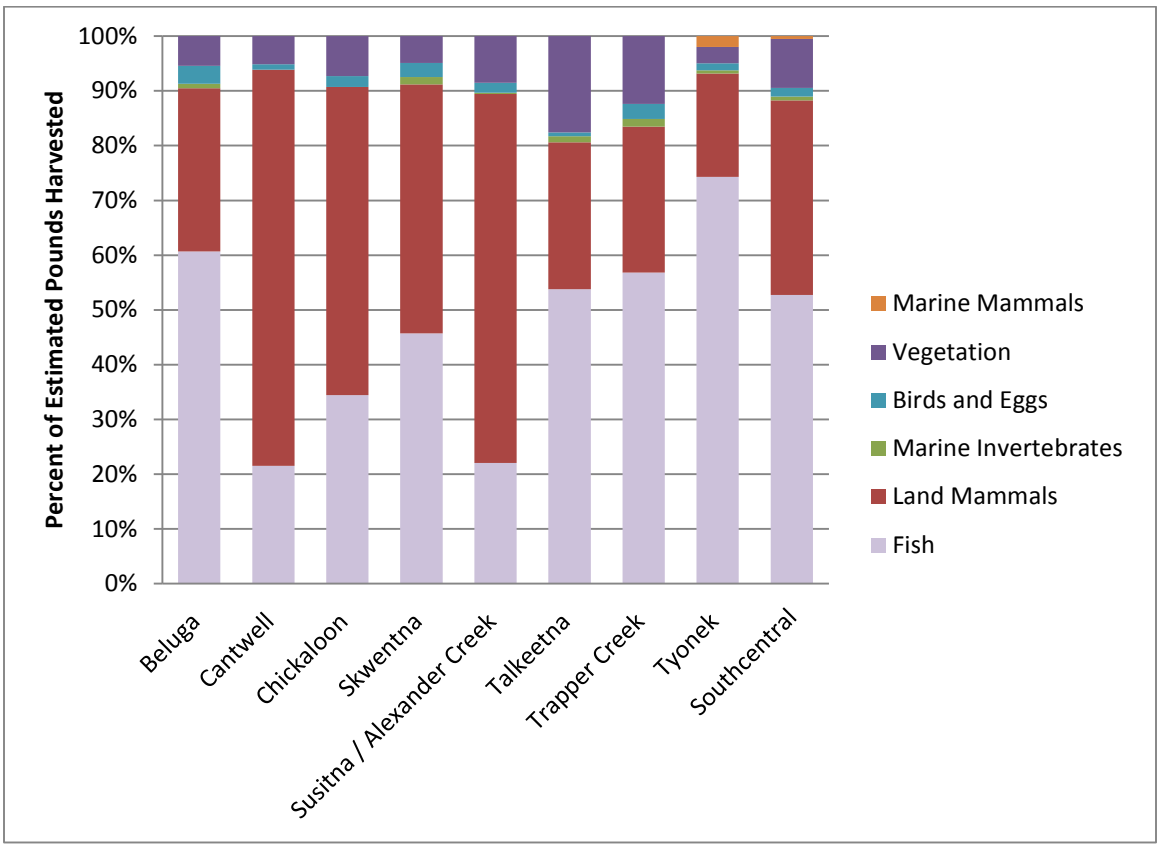
With updated information taken into account, and similar to Interior communities, fish and land mammals contribute the majority of edible pounds to the total subsistence harvest for Southcentral study communities (Figure 5.14-7). All study communities in Southcentral harvested fish, land mammals, vegetation, and birds and eggs. With the exception of Cantwell and Chickaloon, all Southcentral study communities harvested marine invertebrates; only the community of Tyonek harvested marine mammals (beluga whale in 2006). The average estimated harvest for subsistence resource categories indicate that fish contribute 53 percent of the total harvest for Southcentral; while land mammals contribute 35 percent; vegetation follows comprising 9 percent of the harvest; and birds and eggs, marine mammals, and marine invertebrates comprise the remaining 3 percent.

Figure 5.14-7 Percent of Harvest by Resource Category – Southcentral Region



Notes: Most Representative Study Year shown for all study communities.
(ADF&G, 2014)

Figure 5.14-8 illustrates the top three species harvested by each Southcentral study community in terms of percent of total harvest. Moose was one of the top three harvested resources for all communities except Talkeetna; coho and sockeye salmon were also commonly harvested. Caribou was in the top three for the community of Cantwell, and Rainbow Trout appeared only in the top three harvested resources for Chickaloon residents. Berries were one of the top three resources harvested by Talkeetna and Trapper Creek residents, and Chinook salmon was one of the top three resources harvested by Beluga and Tyonek residents.

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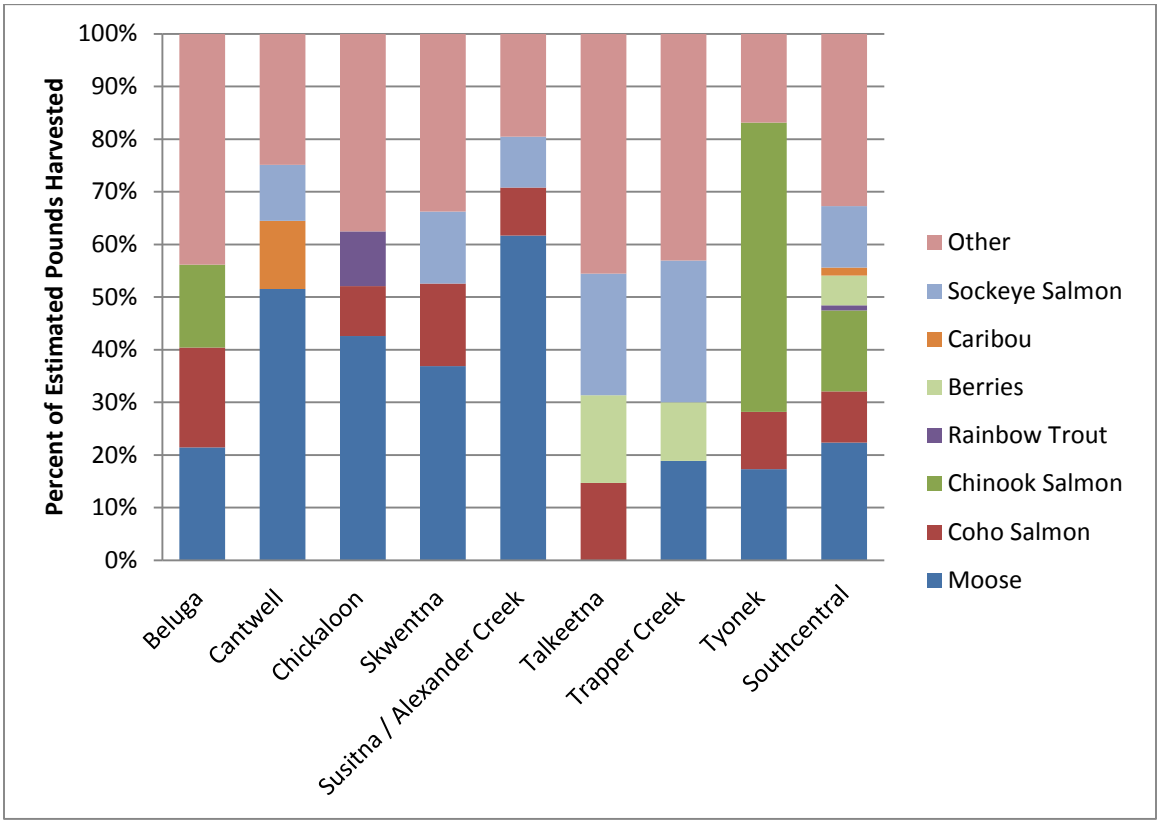
Figure 5.14-8 Percent of Harvest by Top Three Species – Southcentral Region



Notes: Most Representative Study Year shown for all study communities.

(ADF&G, 2014)

Similar to Interior communities, data collected in 2013 indicates sharing of subsistence resources among households remains common in Southcentral communities, as illustrated in Figure 5.14-9. Beluga and Susitna/Alexander had the highest rates of sharing of resources, while Cantwell, Skwentna, and Trapper Creek residents reported the lowest rates of resource sharing. On average, 70 percent of residents living in Southcentral study communities reported giving subsistence resources away, while 88 percent reported receiving subsistence resources.

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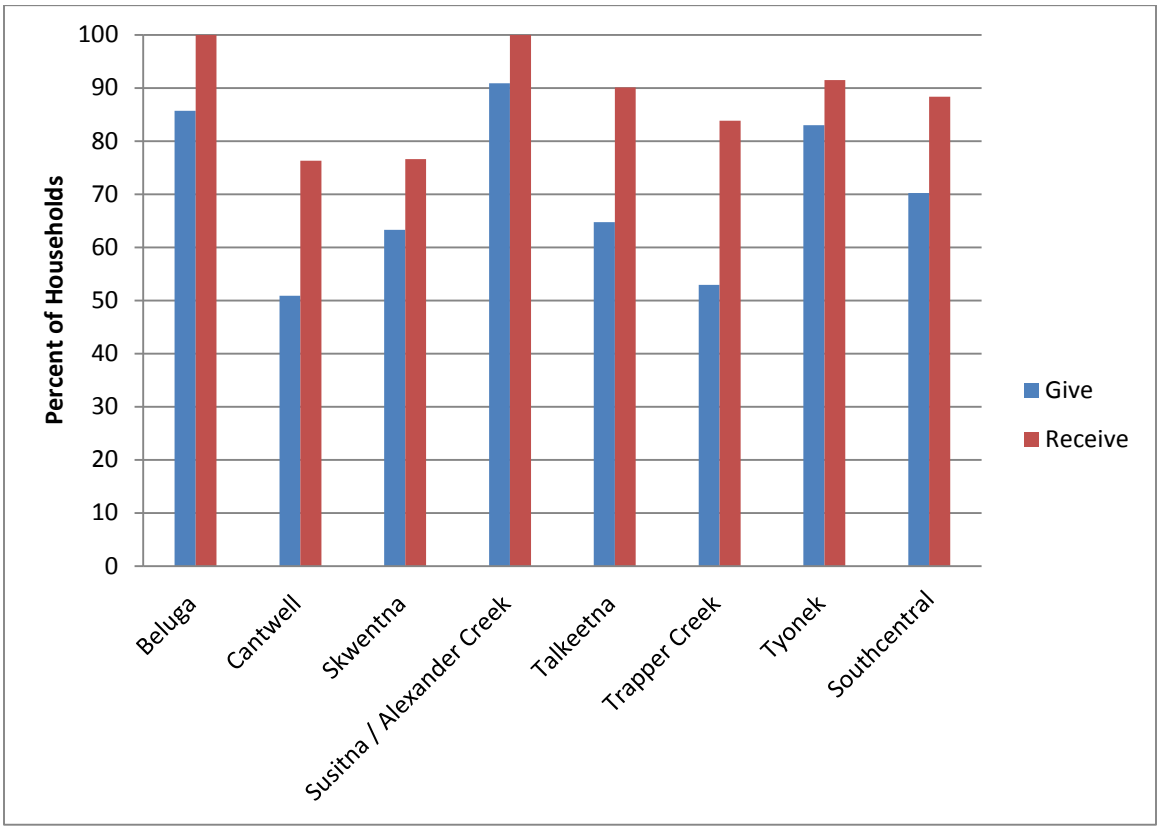
Figure 5.14-9 Percent of Households Sharing Subsistence Resources – Southcentral Region



Notes: Most Representative Study Year shown for all study communities.

(ADF&G, 2014)

5.14.5 Seasonal Round

Seasonal round patterns in Southcentral communities discussed in the FEIS are unchanged (USACE, 2012).

5.14.6 Environmental Consequences

As reported in the FEIS, subsistence use and harvest studies indicate use of the proposed project area both in residents' lifetimes and within the last 1 to 20 years. Impacts to subsistence include direct and indirect effects on subsistence use areas, user access, resource availability, and competition; discussion in the FEIS regarding the nature and magnitude of these impacts to subsistence, including assumptions, remains valid. Though use area data was collected for 15 of the 46 study communities since the publication of the FEIS, the data represents a single year of harvest and use, and does not contain the level of specificity or analysis (number of harvesters using any given area) needed to eliminate use of assumptions made in the FEIS. The assumptions that "a project that

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passes through an area used by multiple harvesters, versus an area used by a few harvesters, will have an impact of greater magnitude because it affects a greater number of harvesters" (FEIS, p. 5.14-64) and that fewer harvesters go to use areas located furthest from the community are maintained and applied throughout this analysis (USACE, 2012).

Although the proposed project does not intersect with use areas documented for Anaktuvuk Pass in 2011, the project will still affect resource availability (for example, disrupt caribou migration) for Anaktuvuk Pass residents (and the remaining North Slope communities). Updated use area information for Coldfoot and Wiseman demonstrates intersection with the proposed project. It remains likely that impacts to user access, competition, and resource availability are greatest within the Interior for Minto, Nenana, Healy, Anderson, Wiseman, Coldfoot, and residents near Denali National Park. In Southcentral, updated baseline information indicates the proposed project directly intersects with use areas for Cantwell, Talkeetna, and Trapper Creek; and it remains likely that these communities (along with Willow, due to proximity) will be impacted the greatest by the Project. The summary table published in the FEIS noting subsistence communities and their proximity to the proposed project remains valid (USACE, 2012).

The revisions to the Project eliminate compressor stations, the Straddle Plant and Off-take Facility, and the Natural Gas Liquid Extraction Plant (NGLEP). They also shorten and straighten the Mainline pipeline; bury the first 7 miles of the pipeline, reroute the Fairbanks Lateral, provide greater design detail for access roads, define borrow sites, and require previously unanticipated modification and dredging at West Dock/Prudhoe Bay (AGDC, 2014b). The effects of these changes on the assessment of impacts reported in the FEIS are described in this section (USACE, 2012).

5.14.6.1 Construction

Construction of the pipeline will occur over a 3.5-year period, rather than a 2.5-year period, as defined in the FEIS (USACE, 2012). However, major pipeline construction is expected to take place over a 2-year period, with three-quarters of the pipeline being constructed over two winter construction seasons. Impacts to subsistence during construction are still expected to be temporary in duration.

Routing the Mainline through an undeveloped area west of the Nenana River could cause habitat disturbance during construction and short-term displacement of subsistence resources from noise and traffic, which will have a greater effect on subsistence users from Nenana, Healy, and Anderson, who harvest in this area.

The proposed pipeline corridor now crosses 265 waterways and drainages, of which 50 are anadromous (Section 5.2, Section 5.6); access roads cross an additional 40 waterways, of which 14 are anadromous. Potential effects analyzed in the FEIS remain valid; however, project changes will result in reduced impacts, as this is a reduction in centerline crossings and anadromous fish streams reported in the FEIS (USACE, 2012).

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The POS, rather than the Port of Anchorage (POA), is now proposed as the primary point of entry for pipe, materials, and large construction equipment, largely eliminating potential project effects on beluga whale populations and to Alaska Native harvesters from Tyonek and the Cook Inlet region.

West Dock Head (DH) 3 is proposed as the port for offloading prefabricated components of the Gas Conditioning Facility (GCF); 23 barges will be brought in during a single sealift. Use of West Dock DH3 will require winter dredging of a navigation channel; the channel was previously permitted and used by BP Exploration (Alaska), Inc. (BPXA). Barges pulled by tugs arriving to offload will be anchored in a staging area in close proximity to West Dock, remaining a safe distance from Cross Island. Smaller tugs will be used to rotationally move barges into the navigational channel leading up to West Dock (DH3).

West Dock DH 3 is within the developed area of Prudhoe Bay and located on the edge of Nuiqsut subsistence use area. Subsistence harvest is minimal in direct proximity to this developed area, and use of the dock is not anticipated to displace subsistence harvesters. AGDC will coordinate with whaling groups and agencies to employ appropriate mitigation measures to avoid and minimize disturbance of noise and vessel traffic to subsistence species and activities. Barge activity near West Dock is not expected to impact subsistence activities; as the nearest southern base camp for Nuiqsut whalers is at Cross Island, 14 miles away to the northeast. There is no spring whaling season for Nuiqsut hunters.

Vessel traffic and noise associated with construction, barging, and dredging activity at West Dock DH3 will occur outside of spring subsistence whaling periods for Barrow and Kaktovik, but may affect bowhead whale and seal populations, which are important resources for the subsistence users in North Slope communities and Alatna, and to a lesser degree, Allakaket and Wiseman. Potential impacts to subsistence whaling and mitigation measures are also addressed in Section 5.7 and Attachment 6 (Biological Assessment) of this document Effects to bowhead will be temporary in nature (lasting minutes to hours) and could consist of undetectable transitory avoidance behavior by very small numbers of whales with no biological consequence. These effects are unlikely to impact subsistence whaling. Effects to seal populations and seal behavior are expected to be similarly undetectable; therefore, no impact to subsistence harvest and use is expected.

Analysis of impacts to subsistence from construction of Operations and Maintenance (O&M) buildings, construction camps, and Pipe Storage Yards (PSYs) reported in the FEIS remains valid (USACE, 2012).The total number of material sites necessary for construction and operation of the proposed Project was reduced from 546 to 89 sites (Section 2).

5.14.6.2 Operations and Maintenance

Analysis in the FEIS of direct and indirect effects resulting from Mainline pipeline O&M remains valid; changes in the analysis are described in this section (USACE, 2012).

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As noted in the FEIS (USACE, 2012), a cleared Right-of-Way (ROW) may attract new harvesters to an area, who use off-road vehicles to travel along the ROW. Because the pipeline route is adjacent to, but no longer within ROWs for transportation and utility corridors, an increase in user access could affect resource availability by increasing competition for subsistence resources. These effects are likely to occur where the pipeline is routed farthest from existing transportation and utility corridors, near Minto Flats and along the western side of the Nenana River. Residents of Minto, Anderson, Nenana, and Healy, who indicated use in these areas, are most likely to be affected. Residents of Coldfoot, where the pipeline is routed approximately 1 to 0.5 miles from the existing Trans-Alaska Pipeline System (TAPS) and Dalton Highway corridors may also be affected by increased access and competition for subsistence resources, though effects will likely be less.

Indirect effects identified for the Minto Flats area are also valid for Nenana, Healy, and Anderson residents with use indicated on the undeveloped western side of the Nenana River.

Impacts to subsistence users and resources along the repositioned Fairbanks Lateral alignment will most likely affect harvesters from the nearby communities of Fox, Ester, College, Fairbanks, Pleasant Valley, Two Rivers, North Pole, Moose Creek, and Eielson Air Force Base.

Analysis of impacts to subsistence from GCF operations and other aboveground facilities reported in the FEIS remains valid (USACE, 2012).

5.14.6.3 Alaska National Interest Lands Conservation Act (810 Subsistence Finding)

Based on the updated information presented in this chapter and in the FEIS (USACE, 2012), and pursuant to Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), the Bureau of Land Management (BLM) has conducted an analysis of subsistence impacts from the proposed ASAP Project that includes findings on the following three issues:

1) The effect of use, occupancy, or disposition on subsistence uses and needs
2) The availability of other lands for the purpose sought to be achieved
3) Other alternatives that will reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 U.S. Code [USC] Section 3120)

The ANILCA 810 Subsistence Finding is provided in Appendix L of the FEIS (USACE, 2012).

5.14.7 References

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5.15 PUBLIC HEALTH

This section describes the known changes to the affected environment for public health since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012) and describes the anticipated changes in impacts to public health based on the revised project description (AGDC, 2015).

5.15.1 Affected Environment

The conceptual design change from Natural Gas Liquids (NGL) to a lean gas scenario eliminated the need for the compressor stations, the Straddle and Offtake Facility, and the Cook Inlet Natural Gas Liquid Extraction Plant (NGLEP). Route modifications shortened pipeline length, and refined design information provides greater detail on many project elements, including access roads, construction worker camps, and workforce requirements. These project revisions result in changes to the previous assessment of the effects of the proposed project on public health.

The construction schedule for the revised proposed project has Gas Conditioning Facility (GCF) construction planned over a 4-year period, commencing with site preparation activities in Year 1; dock improvements in Year 2; channel dredging activities, and receipt and installation of modules in Year 3; and completion of the GCF facilities and commissioning in Year 4.

Pipeline construction is planned for a 2.5-year period. Preconstruction activities, such as land clearing; Right-of-Way (ROW) preparation; and construction of access roads, Pipe Storage Yards (PSYs), and camps will begin in the summer before the first season of pipeline construction. Infrastructure build-out is planned under the current schedule to begin in early 2017, with pipeline construction planned to begin in late 2018. Construction will be completed in separate sections, referred to as “spreads,” defined in the Alaska Stand Alone Pipeline (ASAP) POD (AGDC, 2014).

Site access will include use of existing public roads and railroads to facilitate equipment and material distribution along the proposed project, as was discussed in the FEIS. The FEIS assumed approximately 3,800 rail cars will be required to transport the pipe from Seward to Fairbanks for double-jointing, and approximately 9,000 truckloads will be required to distribute the pipe to PSYs (USACE, 2012). The revised proposed project will require double-jointing and coating to be completed at the pipe mill before shipping to Alaska, and estimates the need for approximately 6,000 rails cars and 17,700 truckloads to transport the pipe from port in Seward to the proposed PSYs. Assuming, as in the FEIS, an average haul distance of 400 miles per trip (out and return), delivering the pipe to laydown yards entails a total of 7.1 million vehicle miles (see Table 5.15-2) (USACE, 2012).

Numerous temporary and permanent access roads will also be required to transport equipment, materials, and workers to the proposed project areas, as well as to access water sources, material sites, and various aboveground facilities. The revised Project consists of a revised number and distance of new or existing roads (Table 2-1).

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Material sites (sand and gravel pits) located along the proposed project alignment will be used to provide gravel for work pads, access roads, pipeline bedding and padding, and the construction of aboveground facilities. Based on refined design information, 89 developed material sites and 2 commercial sites will produce up to 25 million cubic yards (MCY) of material during project construction.

The number of construction camps to house workers during proposed project construction was reduced from 15 to 13. Previously, six of the work camps were anticipated to be within the boundaries of nearby communities, including Coldfoot, Livengood, Nenana, Healy, Cantwell, and Talkeetna Junction, also known as Y. Using the current alignment route, only two of the camps are anticipated to be within the boundaries of nearby communities: Livengood and Cantwell (see Table 5.15-1).

Work camp facilities will be located in previously cleared and disturbed areas, and are accessible by the use of existing roads. The stationary construction camps will primarily be located in previously disturbed areas that were used for construction of the Trans-Alaska Pipeline System (TAPS), Alaska Railroad Corporation (ARRC) facilities, or for public events.

Table 5.15-1 Proposed Work Camp Housing and Nearest Communities

Borough	Location	MP	Nearest Community	Distance from Nearest Community (Miles)	Camp Capacity	Camp Staff
NSB	GCF	0	Prudhoe Bay	9.94	800	-
	Franklin Bluffs	43.6	Deadhorse[a]	38.02	600	44
	Happy Valley	85.7	Deadhorse[a]	79.6	1,000	44
	Galbraith Lake	144.6	Wiseman	86.23	1,000	44
Yukon-Koyukuk REAA	Dietrich	207.3	Wiseman	24.95	1,000	-
	Prospect	279.2	Wiseman	49.59	600	-
Yukon Flats REAA	Five Mile	353.2	Livengood	64.69	1,000	-
	Livengood	401	Livengood	4.04	1,000	-
	Dunbar	453.4	Nenana	15.63	600	44
Denali Borough	Healy	523.3	McKinley Park	11.02	1,000	44
	Cantwell	563	Cantwell	0	600	44
MSB	Swan Lake	640.9	Talkeetna	19.3	1,000	-
	Rustic Wilderness	697	Big Lake	26	1,000	-

Note: The nearest communities were located and distances calculated using the USDOT roads data. These are the nearest communities on a by-road-mail basis, which may differ from what was included in the FEIS (USACE, 2012).

MP - Mile Post

MSB - Matanuska-Susitna Borough

NSB - North Slope Borough

REAA - Regional Educational Attendance Area

USDOT - U.S. Department of Transportation

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In the FEIS, it was estimated that the proposed project will require 6,400 construction employees at any given time, with the majority (5,500) required for the construction of the Mainline (USACE, 2012). Operations and Maintenance (O&M) employee needs have been updated and are described in Table 2-1 and in Section 2.8.8, above. As revised, the proposed project anticipates pipeline construction labor will peak at nearly 6,000 workers on the pipeline. Additionally, 130+ workers will be needed to construct the GCF in Alaska. There will be a need for a number staff to fill management positions, as well as provide craft labor (Table 2-1).

The communities potentially affected by the proposed project remain unchanged since the FEIS was issued (USACE, 2012). Information on community profiles and their baseline health status has not been updated because it is unlikely that changes have occurred that will affect the assessment of public health impacts.

5.15.2 Environmental Consequences

5.15.2.1 Construction

The construction period is estimated at 3.5 years. In considering the possible impact of the construction workforce, it is useful to note that the estimates provided herein are average. As shown in the FEIS, the estimated size of the workforce varies with season and year (USACE, 2012).

5.15.2.2 Water and Sanitation

The impacts to water and sanitation are based on a peak pipeline construction workforce of 6,000 using 13 construction camps.

The revised proposed project estimates surface water use at approximately 467 million gallons for hydrotest, work pad, and access road activities, and an additional 246 million gallons for domestic water use during construction.

Additionally, the revised project proposes a 1,000-person camp located near the pipeline terminus, called the Rustic Wilderness camp. This will eliminate the need for workers to reside in local lodging in Wasilla. The current project peak workforce for the Fairbanks Lateral is 500 employees; these workers will be housed in local lodging, provided it meets Health, Safety, Security, and Environmental (HSSE) requirements for personnel.

5.15.2.3 Scoring

The health impact score for water and sanitation is not affected by changes to the construction schedule, the change in workforce, or changes in camp size and location.

5.15.2.4 Accidents and Injuries

The evaluation of accidents and injuries to construction workers in the FEIS (USACE, 2012) remains valid with the revised Project.

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As noted in the FEIS, workers who transport pipe sections by rail and truck could sustain injuries. With the project revisions, the number of rail cars has increased from 3,800 to approximately 6,000. The fatal and nonfatal injury rates for rail transport reported in the FEIS expected to be small for the duration of project construction (USACE, 2012). These rates may increase with the increase in rail cars.

Table 5.15-2 Fatal and Nonfatal Injuries Associated with Truck Haulage of Pipeline

Item	Description	Value	Source
Truckloads	Truckloads required to distribute pipe to laydown yards	17,700	Estimate from AGDC
Haul Distance	Average haul distance (miles)	400	Assumption
Vehicle Miles	Estimated vehicle miles	7,080,000	Calculation based on information provided herein
Fatality Rates	Fatality rate/100 million vehicle miles	0.106	Average for Alaska for Calendar Year 05 through Calendar Year 11
	Fatality rate/100 million vehicle miles	2.4	Year 2006 for all of U.S.
Nonfatal Injury Rates	Injury rate/100 million vehicle miles	2.256	Not given; estimated from ratio of national rates
	Injury rate/100 million vehicle miles	51.1	Year 2006 for all of U.S.
Fatal Injuries	Based on Alaska data	0.008	
	Based on all U.S. data	0.170	
Nonfatal Injuries	Based on Alaska data	0.160	
	Based on all U.S.A data	3.62	
U.S. – United States			

Based on the information in Table 5.15-2, there is a high probability that no fatalities or nonfatal injuries associated with trucking will occur, which is the same conclusion reported in the FEIS. The fatal and nonfatal injuries associated with transporting construction workers to and from work camps will likely be comparable to the estimates presented in the FEIS (0.003 and 0.15, respectively) since the peak number of workers did not change substantially (USACE, 2012).

With regard to a possible increase in accidents and injuries to non-workers resulting from higher use of roads, the revised proposed project will require the use of 298 new access roads totaling 174.4 miles and 23 ice access roads totaling 22.9 miles. Compared with the road mileage assessed in the FEIS (USACE, 2012), the incremental change in road mileage will not substantially change the accident or injury rate for non-workers.

5.15.2.5 Scoring

The health impact score for accidents and injuries is not affected by changes to the number of construction workers, changes in amounts of materials being shipped by rail and truck, or changes in travel distances for workers and materials.

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5.15.2.6 Other Public Health Factors

The proposed project revisions will not alter the public health impact assessment presented in the FEIS (USACE, 2012) with respect to:

- Health Infrastructure and Delivery
- Exposure to Hazardous Materials
- Food, Nutrition, and Subsistence
- Infectious Diseases
- Non-communicable and Chronic Disease
- Social Determinants of Health
- Changes in Economy or Employment

5.15.2.7 Operations

The current estimated workforce needs for long-term operations of the Project are 240 workers (employees and contractors). This includes:

- Staff at 3 Operations & Maintenance Response Bases (MRBs)
  - GCF MRB (10 Full-time Equivalent (FTE) management positions)
  - Fairbanks MRB (9 FTE management positions)
  - Big Lake MRB (5 FTE management positions)

- ASAP Headquarters
  - Anchorage Offices (88 FTE management positions)

- Additional Employees or Contracted Support (remainder)
  - Management and staffing positions described in greater detail in Section 2, above.

The 240 workers will mostly be housed in Prudhoe Bay, Fairbanks, the Matanuska Valley, and Anchorage, and will not affect water and sanitary infrastructure.

The length of the pipeline has shortened to 763 miles (730 mile Mainline, 30 mile Fairbanks Lateral), which results in a lower number of potential fatalities and injuries.

The conceptual design revisions to the project eliminated compressor stations, which reduces the emission of combustion-related pollutants, such as Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Particulate Matter (PM), Volatile Organic Compound (VOCs), and Sulfur Dioxide (SO_2). The design revisions also eliminated NGL (isobutene, pentanes, hexanes, hydrogen sulfide, butane, and ethane). Combined, these design modifications lower the potential exposure to hazardous materials. Current air quality data and modeling are under review by the Alaska Department of Environmental Conservation and the U.S. Environmental Protection Agency.

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Impacts to food, nutrition, and subsistence will not be affected by the 240 O&M personnel. The possible operational impacts of the proposed project on public health concerns related to infectious disease and social determinants of health also are proportionate to the number of workers. In addition, the proposed project route was refined and no longer follows the existing transportation or utility corridors in their exact locations. Accordingly, the project does not anticipate increased access and additional negative impacts to subsistence resources based on these alignment shifts.

With regard to determining the probable frequency of gas leaks on the Mainline based on Pipeline and Hazardous Materials Safety Administration (PHMSA) national statistics and injuries, the current length of the Mainline pipeline and incident data from USACE 2012 has shortened to approximately 733 miles, which results in a fewer potential gas leaks. Using the updated length of the pipeline, the estimated number of significant incidents per year over the 30-year period would be (45.2/297,000) x 733 = 0.112. This estimate might overstate the potential for leaks because many are related to corrosion (at least in the initial years) or disturbance by digging activities, and these are expected to be less of an issue for a new pipeline located in a remote area.

5.15.3 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

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5.16 AIR QUALITY

This section describes the known changes to the affected environment for air quality since release of the Final Environmental Impact Statement (FEIS) (USACE, 2012) and describes the anticipated changes in impacts to air quality based on the revised project description (AGDC, 2015). Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project, such as changes to the natural gas composition and associated design changes (see AGDC, 2015), result in changes to the previous assessment of the effects of the proposed project on air quality. Air quality data and modeling were submitted to the Alaska Department of Environmental Conservation (ADEC) and the U.S. Environmental Protection Agency (USEPA) for review on November 18, 2015.

5.16.1 Affected Environment

The baseline data provided in the FEIS for climate and ambient air pollutant concentrations remain valid (USACE, 2012).

5.16.1.1 Regulatory Setting

Some differences between the proposed project evaluated in the FEIS (USACE, 2012) and the current design in the POD (AGDC, 2014) result in changes to applicability of air quality rules and regulations under the ADEC and USEPA.

The proposed design evaluated in the FEIS (USACE, 2012) included fossil-fuel combustion sources, which were a potential concern for the Regional Haze Rule and Alaska Regional Haze State Implementation Plan study area in Denali National Park (DNP). These combustion sources are no longer part of the proposed project; therefore, no regional haze impacts are anticipated.

The proposed project requires a Best Available Control Technology (BACT) analysis for the Gas Conditioning Facility (GCF) because it will be a major source of criteria pollutants and will have a potential to emit greater than 75,000 short tons per year (stpy) of Carbon Dioxide Equivalents (CO_2e). The previous project design would have required a BACT analysis for the GCF, each compressor station, and the Straddle and Offtake Facility.

With the conceptual design change of the project from Natural Gas Liquids (NGL) to lean natural gas, steam-generating units are no longer needed. Therefore, New Source Performance Standards (NSPS) 40 Code of Federal Regulations (CFR) 60, Subpart Dc; and 40 CFR 60, Subpart Db will not apply. The revised proposed project will not have inspection requirements under 40 CFR 60, Subpart KKK - § 60.633 (e). A complete list of applicable NSPS requirements will be included in the regulatory review section of the Prevention of Significant Deterioration (PSD) permit application for the GCF.

The GCF facility is not a major source of Hazardous Air Pollutant (HAP) emissions based on the conceptual design changes. Therefore, 40 CFR 63, Subpart HHH, National Emissions Standards for Hazardous Air Pollutants (NESHAPs) from Natural Gas Transmission and Storage Facilities,

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no longer applies to the proposed project. A complete list of applicable NESHAPs requirements will be included in the regulatory review section of the PSD permit application for the GCF.

The emission factors used to calculate air quality impacts for the FEIS (USACE, 2012) from the California Air Resources Board (CARB) were replaced for the current project analysis to follow the more recent USEPA's Motor Vehicle Emission Simulator (MOVES) model (USEPA, 2010b). Similarly, the current project analysis relied on the USEPA's NONROAD model (USEPA, 2008a) to estimate emissions for heavy equipment for the revised proposed project, rather than the Santa Barbara County Air Pollution Control District values used in the FEIS.

5.16.2 Environmental Consequences

5.16.2.1 Construction

Table 5.16-1 provides a list of the types of equipment that will be used to construct the Mainline pipeline and Fairbanks Lateral. The proposed number of units for each type of equipment used during construction has not been determined; however, air quality impacts from pipeline construction are expected to be the same as those described in the FEIS (USACE, 2012) because the pipeline routes are very similar and the overall activity and use of the equipment is expected to be the same. To support estimation of emissions from the current project, the total number of hours of operation was estimated by Michael Baker Jr., Inc. (MBJ) (an engineering firm) for each type of equipment. It is assumed that the same equipment units will be used for each spread.

Table 5.16-1 Pipeline Construction Equipment per Spread

Equipment Type	
Backhoes	6-7 CY Loader
Ironwolf 1040 on 966 Carrier	8-9 CY Loader
Rough Terrain Crane	Bobcat Skidsteer Loader
Cone and Screen	Wheel Loader
Jaw Crusher	Medium Wheel Loader
Portable Impact Crusher	Chainsaw
Horizontal Shaft Crusher	Manlift
Radial Stacker	Pumper
Superior Conveyor	Drill
Overland Conveyor	Roller Vibratory Screen
Crawler Dozer	Trench Roller
Track Dozer	Large Screen
Bulldozer	Truck Scales with Generator
Small Excavator	Tucker Terra Sno-Cat Snow Machine
Medium Excavator	Flatbed Truck
Large Excavator	Mechanic Truck (Large)
Telehandler Forklift	Powder Truck

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Equipment Type	
Large Telehandler Forklift	Heavy Semi Tractor
30-kW Generator	Volvo Haul Truck
100-kW Generator	Caterpillar Water Truck (Off-road)
750-kW Generator	Terex Water Truck
1,000-kW Generator	Water Truck (Off-road)
Grader	Envirovac - skid-mounted

Notes:

Please refer to deliverable # 008-49-911-001 for details on the equipment that will be used during pipeline construction.

The number of units of equipment is not available at this time. Only total hours of operation information was provided by MBJ.

CY – cubic yard

kW - kilowatt

With the revisions to the proposed project, open burning is no longer planned. Air quality impacts associated with this activity were eliminated.

The design refinements have reduced the length of pipeline construction; therefore, minor reductions in air quality impacts are expected relative to what was presented in the FEIS. The proposed project has more defined access roads than what was assessed in the FEIS. The emissions from access road construction will be controlled using proper dust control techniques, as described in the FEIS (USACE, 2012).

With construction of fewer aboveground facilities under the revised proposed project, construction emissions will be lower than what was presented in the FEIS (USACE, 2012).

Construction emissions for the GCF under the design changes will be somewhat greater than the emissions described in the FEIS (USACE, 2012). Fugitive dust emissions will be less at the GCF site because construction will be modular, resulting in less ground disturbance and lowering fugitive emissions of Particulate Matter of 10 microns (µ) in diameter or smaller (PM_{10}) and Particulate Matter of 2.5 µ in diameter or smaller ($PM_{2.5}$). However, dredging and roadway improvements necessary for the moving of the modules will result in more particulate impacts. Soil surfaces are anticipated to be wet during construction, controlling most particulate emissions; therefore, the anticipated increase in emissions is not anticipated to result in a significant change in impacts.

While the sizes of construction camps will be larger than those evaluated in the FEIS (USACE, 2012), air quality impacts from the construction camps are expected to be similar. This will also be true for the Pipe Storage Yards (PSYs). Estimates of the projected maximum 12-month emissions in short tons per year (stpy) for each of the proposed construction camps included in the revised project are presented in Table 5.16-2.

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5.16.2.2 Operations

Table 5.16-3 shows the proposed equipment for the GCF for the revised proposed project. While the overall design of the GCF has changed, the flare usage, which is expected to have the most impact on air quality, will be similar to the amount anticipated in the FEIS (USACE, 2012).

Emissions from operation of the GCF were estimated and are provided in Table 5.16-3. These emissions provide the estimated maximum potential to emit for the facility. The estimated emissions from the 2012 FEIS are also presented in Table 5.16-4 for comparison.

With the revisions to the proposed project, operations at the GCF will result in lower NOx emissions than those presented in the FEIS. The Project will no longer be a major source of HAP emissions from the GCF. The proposed project will, however, result in higher annual Greenhouse Gas (GHG) emissions compared with the operations evaluated in the FEIS (USACE, 2012). Emissions for other pollutants will be similar, and air impacts are anticipated to be the same.

A comparison of operations emissions between the two projects for all aboveground, permanent sources is presented in Table 15.6-5. As shown in this table, air quality emissions from the proposed project evaluated in the FEIS (USACE, 2012) are much higher than emissions for the proposed project under the POD (AGDC, 2014) for all pollutants but GHGs.

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Table 5.16-2 Potential Camp Operations Maximum 12-month Emissions

Camp Name	VOC Emissions (STPY)	NO_x Emissions (STPY)	CO Emissions (STPY)	SO_2 Emissions (STPY)	PM_{10} Emissions (STPY)	$PM_{2.5}$ Emissions (STPY)	CO_{2E} Emissions (STPY)	HAP Emissions (STPY)
Cantwell	36.2	35	4.4	0.63	3.7	3.6	54,402	2.1
Dietrich	50.5	49	6.1	0.88	5.1	5.1	75,860	2.9
Dunbar	39.7	39	4.8	0.69	4.0	4.0	59,655	2.3
Five Mile	57.8	57	7.0	1.01	5.9	5.8	86,900	3.3
Franklin Bluffs	57.7	56	6.9	1.01	5.9	5.8	86,722	3.3
Galbraith Lake	86.4	85	10.4	1.51	8.8	8.7	129,905	5.0
Happy Valley	67.0	65	8.1	1.17	6.8	6.7	100,612	3.9
Healy	56.1	55	6.7	0.98	5.7	5.6	84,229	3.2
Livengood	86.7	85	10.4	1.51	8.8	8.7	130,350	5.0
Prospect	84.7	83	10.2	1.48	8.6	8.5	127,234	4.9
Prudhoe Bay	43.6	43	5.2	0.76	4.4	4.4	65,442	2.5
Rustic Wilderness	52.4	51	6.3	0.91	5.3	5.3	78,709	3.0
Swan Lake	45.2	44	5.4	0.79	4.6	4.5	67,935	2.6

Notes:

a. Please refer to deliverable # 008-49-911-002 for details on emissions calculations and assumptions.
b. Only emissions from onsite stationary sources are summarized in this table.
c.
d. The emissions information presented for the construction camps is current as of information available on August 1, 2014.

CO – Carbon Monoxide
NO_X – Oxides of Nitrogen
SO_2 – Sulfur Dioxide
VOC – Volatile Organic Compound

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Table 5.16-3 Gas Conditioning Facility Emission Unit Inventory

Item	Number of Units	Purpose	Rated Capacity	Fuel	Change from the FEIS project design (USACE, 2012)
Power Generation Turbines	3	To generate power for the GCF.	29 MW	Treated and Untreated Gas	New Equipment[c]
Feed-gas Compressor Turbines	2	To drive CO_2 compressor.	22 MW	Treated and Untreated Gas	New Equipment[c]
CO_2 Compressor Turbines	2	To drive Feed-gas Compressor.	11.93 MW	Treated and Untreated Gas	New Equipment[c]
Emergency Power Generators	4	Emergency.	2.5 MW	ULSD	Same as 2012 project
Heaters	4 (3 Operating + 1 Spare)	To heat Propylene Glycol from 150 to 240°F.	129.60 MMBTU/hr (LHV)	Treated and Untreated Gas	New Equipment[c]
Flares	2	To burn HC at 100 psig.	35,625 MMBTU/hr (LHV)	Treated and Untreated Gas	Same as 2012 project
	2	To burn HC at 10 psig.	990 MMBTU/hr (LHV)	Treated and Untreated Gas	Same as 2012 project
Fire Pump Generators	4	To extinguish fires inside a module during an emergency event.	0.4 MW	ULSD	New Equipment[c]
Other Emergency Generators	2	Generators for infrastructure, camps, and shops. Emergency use only after construction.	1.5 MW	ULSD	Same as 2012 project
Burn Pit	1	Burn excess HC liquid from the Flare Knock-out Drum during an emergency flaring event.	TBD	-	New Equipment[c]

Notes:
[a]The equipment list for the GCF is current as of information available on August 15, 2014.
[b]Please refer to deliverable # 008-14-910-010 for details on the GCF inventory.
[c]Although there is new equipment for the current design of the GCF, overall air quality impacts are expected to be the same between the project proposed in the FEIS (USACE, 2012) and the current project.
°F - Fahrenheit
CO_2 - Carbon Dioxide
HC - Hydrocarbon
LHV - Lower Heating Value
MMBTU/hr - million British thermal units per hour
MW - megawatt
psig - pound per square inch gauge
TBD - To Be Determined
ULSD - Ultra-low-sulfur Diesel

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Table 5.16-4 Gas Conditioning Facility Operations Emissions

Emission Source	NO_X Emissions (STPY)	CO Emissions (STPY)	PM_{10} Emissions (STPY)	$PM_{2.5}$ Emissions (STPY)	SO_2 Emissions (STPY)	VOC Emissions (STPY)	HAP Emissions (STPY)	$CO2_E$ Emissions (STPY)
GCF in FEIS (USACE, 2012)	4,442	913	49	49	4	170	68	519,695
GCF in current design	781	548	52.6	52.6	5.14	168	10	959,041

Notes:

a. The emissions information presented for the GCF is current as of information available on August 15, 2014.

b. Please refer to deliverable # 008-14-910-010 for details on the GCF inventory, calculations and assumptions.

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Table 5.16-5 Impact of Revisions to Aboveground Facility Operations Emissions

Emission Source	NO_x Emissions (STPY)	CO Emissions (STPY)	PM_{10} Emissions (STPY)	$PM_{2.5}$ Emissions (STPY)	SO_2 Emissions (STPY)	VOC Emissions (STPY)	HAP Emissions (STPY)	$CO2_E$ Emissions (STPY)
GCF in FEIS (USACE, 2012)	4,442	913	49	49	4	170	68	519,695
Two Compressor Stations in FEIS (USACE, 2012)	638	538	38	38	1.6	78	4	164,322
Straddle and Offtake Facility	367	147	10	10	0.6	19	3	85,639
Total 2012 Operations	**5,447**	**1,598**	**97**	**97**	**6.2**	**267**	**75**	**769,656**
Current Project Operations	**781**	**548**	**52.6**	**52.6**	**5.14**	**168**	**10**	**959,041**

Notes:

a. The emissions information presented for the GCF is current as of information available on August 15, 2014.

b. Please refer to deliverable # 008-14-910-010 for details on the GCF inventory, calculations and assumptions.

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While the location and staffing requirements for the Operations and Maintenance (O&M) facilities were revised since the FEIS was issued (USACE, 2012), the overall air quality impacts from the O&M facilities will remain essentially the same.

Additional information is available for analysis of the current project that was not available during analysis of the project presented in the FEIS. For the sources not quantified in the FEIS, a qualitative comparison of the current project and the project presented in the FEIS is summarized in Table 5.16-6 (USACE, 2012).

Table 5.16-6 Summary Qualitative Comparison of Projects

Emissions Category	Comparison to the 2012 project	Discussion
Fuel Transport to the Camp	Approximately same air quality impacts as 2012	Fuel requirements are determined based on the overall camp and heavy equipment usage for pipeline construction. While the fuel usage may differ slightly between the two projects, these differences are expected to have minimal impact on air quality.
Pipe Transport to the ROW	Slightly lower air quality impacts than 2012 (less than 1.5% reduction)	The length of the Mainline pipeline is reduced from 737 to 733 miles in the current project. Therefore, less pipe is needed for the project.
Material and Supply Transport to and from the Camps	Approximately same air quality impacts as 2012	Because the number of workers needed is about the same for the 2012 project and the current project, overall requirements for the camps are not expected to differ.
Gravel for Access Roads	Higher air quality impacts than 2012	Based on additional features identified for the project, the gravel requirements for the current project are expected to be higher than in 2012. As detailed engineering for the project is developed, the gravel requirements will be refined.
Marshalling Yards	Approximately same air quality impacts as 2012	The locations of the marshalling yards are different than presented in the FEIS (USACE, 2012). However, the overall pipe requirements for the project will not change significantly. Therefore, air emissions from operation of the marshalling yards is expected to be approximately the same as in 2012.
Construction of Construction Camps and PSYs	Approximately same air quality impacts as 2012	The location of the camps and PSYs are different between the two projects. The workers requirements are also expected to be different between the two projects on a camp-by-camp basis. However, for the entire project, the overall requirements are not expected to be very different between the two projects.
North Slope Construction Activities/ West Dock Upgrade	Slightly higher air quality impacts than 2012	A higher level of construction activity is expected on the North Slope compared to the 2012 project design. Specifically, the current project is expected in result in roadway improvements, increased dredging, construction of a new channel, and use of larger barges. However, air quality emissions associated with these activities are relatively low. Therefore, air quality impacts will not increase greatly.

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5.16.3 References

Alaska Department of Environmental Conservation (ADEC). 2011. "Amendments to: State Air Quality Control Plan, Volume II: Analysis of Problems, Control Actions, Section III. K: Areawide Pollutant Control Program for Regional Haze." *Regional Haze SIP*. Division of Air Quality. February 11. http://dec.alaska.gov/air/anpms/rh/rhsip.htm. Accessed August 2014 on multiple days.

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U.S. Environmental Protection Agency (USEPA). 2014a. Title 40: Protection of Environment, Chapter I: Environmental Protection Agency (Continued), Subchapter C: Air Programs (Continued), Part 60: Standards of Performance for New Stationary Sources. 40 CFR Part 60. October 16. http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr60_main_02.tpl. Accessed August 2014 on multiple days.

U.S. Environmental Protection Agency (USEPA). 2014b. Title 40: Protection of Environment, Chapter I: Environmental Protection Agency (Continued), Subchapter C: Air Programs (Continued), Part 63: National Emission Standards for Hazardous Air Pollutants for Source Categories. 40 CFR Part 63. October 16. http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr63_main_02.tpl. Accessed August 2014 on multiple days.

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5.17 NOISE

The Final Environmental Impact Statement (FEIS) assessed the estimated project-related noise levels and ground vibration velocity levels on specified human receptors within 5 miles of proposed project facilities. The U.S. Environmental Protection Agency's (USEPA's) 1974 publication *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA, 1974) is referenced in the FEIS as the primary information source identifying outdoor and indoor noise levels to protect public health and welfare. The method for evaluating the proposed project's noise and vibration levels on human health and welfare has not changed since the FEIS was published (USACE, 2012).

5.17.1 Affected Environment

Revisions to the Alaska Stand Alone Pipeline (ASAP) Project design since the FEIS (USACE, 2012) have resulted in the following changes in the separation distances of noise sources to community population centers:

- Revision of the alignment of the Mainline pipeline increases the separation distance to the Fairbanks, Healy, Talkeetna, and Nenana community population centers.
- Changes to the alignment of the Mainline pipeline circumvent the Cantwell area population center.
- The following Project noise sources were eliminated:
  - Compressor stations along the pipeline route
  - Straddle and Offtake Facility
  - Cook Inlet Natural Gas Liquids Extraction Plant (NGLEP)
  - The Yukon River crossing will use Horizontal Directional Drilling (HDD)

5.17.2 Environmental Consequences

5.17.2.1 Construction

With the exception of the city of Nenana and the city of Cantwell, the FEIS (USACE, 2012) assessment estimated noise and vibration levels for human receptors within 5 miles of construction of the Mainline and aboveground facilities to be insignificant, so will not constitute an impact. This assessment remains valid with the proposed project revisions.

The FEIS (USACE, 2012) estimated moderate noise impacts to the city of Nenana from construction of the Mainline with a separation distance of approximately 0.2 mile. The revised project design places the Mainline on the western side of the Nenana River.

Changes to the alignment of the Mainline pipeline circumvent the Cantwell area population center; instead of going right through the center of Cantwell, the new route stays as far east and south as possible while crossing the Jack River on the Old Anchorage-Fairbanks Highway alignment. With

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a remaining separation distance of approximately 0.4 mile, the noise impact from Mainline construction may be comparable to the moderate impact assessed for the city of Nenana in the FEIS (USACE, 2012).

5.17.2.2 Operations

The changes to conceptual design and other design refinements will not be substantial during the operations phase. The majority of impacts are temporary (construction).

5.17.3 References

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline.* October. http://asapgas.agdc.us/documents.html.

U.S. Environmental Protection Agency (USEPA). 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*.

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5.18 NAVIGATION RESOURCES

This section describes navigation resources and navigable waterways that could be affected by construction and operation of the proposed project, and the anticipated changes in impacts to navigation resources and navigable waterways based on the revised project description (AGDC 2015, 2014). Navigable waters are those that provide a channel for commerce and transportation of people and goods. Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project result in changes to the previous assessment of the effects of the proposed project on navigation resources. Sections 5.2, Water Resources, and 5.6, Fish, identify and assess additional potential impacts to navigable rivers and streams within the proposed project area.

5.18.1 Affected Environment

The primary project revisions affecting navigation resources are the construction and offload activities at the West Dock Causeway in the northern project area. Prior to offload activities, winter channel dredging and modifications to the existing infrastructure are required. These activities are described in the POD (AGDC, 2014) and the JAfP (AGDC, 2015).

In addition, Horizontal Directional Drilling (HDD) is now the preferred option for crossing the Yukon River. Option 2 is to use the existing bridge, and Option 3 is to build a new suspension bridge near the location identified for the HDD crossing.

5.18.1.1 Regulatory Setting

Federal, state, and local agencies regulate project activities that have a potential to impact navigable waterways. Federal agencies have made navigability determinations regarding waterways throughout the proposed project area. Navigability determinations are implemented through state and federal laws and regulations.

5.18.1.1.1 Federal Regulations

There were no substantive changes to the federal regulations applicable to the new project description since the Final Environmental Impact Statement (FEIS) was published (USACE, 2012). The federal agencies responsible for navigable resources remain the same as those describe in the FEIS, including the U.S. Coast Guard (USCG), the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (USEPA), and the Bureau of Land Management (BLM).

The revised proposed project includes a modification to the West Dock Causeway and dredging at Dock Head (DH) 3 to facilitate movement of modules for construction of the Gas Conditioning Facility (GCF), which was not assessed in the FEIS (USACE, 2012). This project element is subject to federal regulations.

As noted in the FEIS (USACE, 2012), the Federal Government through the USEPA and USACE assert jurisdiction over “traditional navigable waters” or “(a) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including

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all waters which are subject to the ebb and flow of the tide." (33 Code of Federal Regulations [CFR] § 328.3(a)(1); 40 CFR § 230.3(s)(1)). Federal jurisdiction over navigable waters also extends to Waters of the United States (WOUS) under the Clean Water Act (CWA). The definition of WOUS is open to judicial interpretation but appears to include wetlands with a "significant nexus to navigable waters."

The Federal Energy Regulatory Commission (FERC) also has authority to regulate commerce over navigable waters and non-navigable tributaries under the Federal Power Act, 1941 (16 U.S. Code [USC] 791).

5.18.1.1.2 State Regulations

The Alaska Department of Natural Resources (ADNR) is named in the FEIS (USACE, 2012) as the state agency responsible for navigation resources, and this remains unchanged with the new project description. There were no substantive changes to the state regulations applicable to the new project description since the FEIS was published.

Under the Equal Footing Doctrine, United States (U.S.) states hold title to tide and submerged lands beneath navigable waters. Congress confirmed the states' ownership to the beds of navigable waters in the Submerged Lands Act of 1953. The BLM issues formal navigability determinations to support land transfers under the Alaska Statehood Act, the Alaska Native Claims Settlement Act, and the Native Allotment Act.

Under the Public Trust Doctrine, principles embraced in the Alaska Constitution "free access to the navigable or public waters of the state…" are guaranteed to the public.

5.18.1.1.3 Local Agencies

There were no substantive changes to the local regulations applicable to the project revisions since the FEIS was issued (USACE, 2012).

5.18.1.2 Navigational Resources Crossed by the Project

The navigation resources included within the proposed project area will extend from Prudhoe Bay in the North Slope Borough (NSB), south to the Matanuska-Susitna Borough (MSB) near Cook Inlet. The Fairbanks Lateral will diverge from the proposed Mainline at approximate Mile Post (MP) 440 (MP FL 0.0) and extend through Yukon-Koyukuk and Fairbanks North Star Boroughs (FNSB). Major drainages that will be crossed include the Yukon, Tanana, and Susitna Rivers. The proposed Project does not cross the Sagavanirktok (Sag) River but parallels it for some distance. There are areas adjacent to or directly in the Sag River that may be used as material sites. Some investigation areas lie near the banks of the Sag River, while some are centered in areas directly adjacent to the banks, but overlapping the river. Gravel taken from the Sag River will occur only following consultation with the Alaska Department of Fish and Game (ADF&G). Gravel collected from riparian areas is generally believed to recharge quickly through natural stream flow and sediment load deposition; therefore, will not substantially impact surface water flow or navigability.

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Material site configurations will be revised in the Geographic Information System (GIS) as field investigations and gravel material needs are clarified.

Table 5.18-1 updates data presented in the FEIS (USACE, 2012) based on the JAfP (AGDC, 2015). The table lists the navigable streams and crossing mode, length, and location. A fourth Nenana River crossing was added (via the existing bridge or a new bridge), and the crossing method for the Susitna River was changed from HDD to use of the existing bridge. Estimated seasons for construction of crossings also were refined.

Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) requires approval prior to the accomplishment of any work in, over, or under navigable WOUS, or which affects the course, location, condition, or capacity of such waters (USACE, 1995). The streams listed in Table 5.18-1 are included in the USACE's 1995 list of navigable waters.

Table 5.18-1 U.S. Army Corps of Engineers Navigable Waterways within the Proposed Project Right-of-Way

Navigable Water Name	Anadro-mous	Type of Crossing	Crossing Mode	Length of Crossing (ft)	Longitude	Latitude	Milepost
Yukon River	Y	Stream	Trenchless Design	2134	-149.742	65.880	356.0
Chatanika River	Y	Stream	Isolated Open Cut	116	-148.682	64.979	437.6
Tanana River	Y	Stream	Trenchless Design	2288	-149.118	64.569	471.9
Nenana River	Y	Stream	Isolated Open Cut	50	-149.301	64.351	488.2
Nenana River	N	Stream	Isolated Open Cut	277	-149.149	64.527	475.0
Nenana River	N	Bridge	Aerial Span	275	-148.933	63.803	530.9
Nenana River	N	Bridge	Aerial Span	398	-148.804	63.456	558.6
East Fork Tolovana River	Y	Stream	Isolated Open Cut	43	-148.633	65.461	401.3
Susitna River	Y	Bridge	Aerial Span	906	-150.175	62.176	673.5
Willow Creek	Y	Stream	Trenchless Design	132	-150.123	61.777	705.5
Little Susitna River	Y	Stream	Isolated Open Cut	106	-150.141	61.471	729.1

Typically, the USCG and the ADNR provide a determination of stream navigability when the design of crossings is complete for review prior to permit approvals. As required by the General Bridge Act of 1946, the Alaska Gasline Development Corporation (AGDC) will submit final designs for stream crossings and crossing locations to the USCG for review prior to the start of construction. Based on this information, the USCG will make a final determination regarding its jurisdiction for particular crossings.

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Table 5.18-2 summarizes the potential intertidal and subtidal impacts only for the sealift operation at West Dock. A summary of stream crossing locations and their attributes, for which impacts were calculated, can be found in the Joint Application for Permit (AGDC, 2015).

Table 5.18-2 Summary of Marine Impacts

West Dock Sea Lift Impacts - Northern Ecoregion: Material Discharged by Habitat Type						
Habitat Type	**Feature ID**	**Permanent or Temporary**	**Quantity (cubic yards)**	**Area Impacted (sf)**	**Area Impacted (acres)**	**Linear Feet of Impact**
Intertidal	Barge Bridge Rake	Temporary	0[a]	5,227	0.12	72
Intertidal	West Dock New Fill (Causeway)	Permanent	500	33,773	0.78	6,516
Total Intertidal			**500**	**39,000**	**0.90**	**6,588**
Subtidal	Barge Bridge and Mooring Dolphins	Permanent	7,000	62,291	1.43	650
Subtidal	9-foot deep channel to West Dock – Dock Head 3	Permanent	0[b]	2,700,720	59.64	5,400
Subtidal	West Dock New Fill (Causeway)	Permanent	30,000	456,093	10.47	6,516
Subtidal	Dredge disposal	Permanent	247,000	4,356,000	100.0	4,350
Total Subtidal			**284,000**	**7,135,128**	**171.54**	**16,916**
Grand Total			**284,500**	**7,174,128**	**172.44**	**23,504**

Notes:

a. The intertidal area below the rake of the barge but above subtidal fill contains no fill, but is temporarily impacted.

b. Marine impacts attributed to the excavation channel equate to 247,000 cubic yards. The 247,000 cubic yards of excavated material are being placed in the dredge disposal area.

The proposed project area includes the temporary use (2 years) of Alaska port sites for construction and the transport of materials and equipment. The primary ports include West Dock at Prudhoe Bay for the delivery of GCF modules and the Port of Seward (POS) in Resurrection Bay in the Southcentral Region (Southcentral) for delivery of pipeline and other materials. The Port of Anchorage (POA) in Cook Inlet is likely to be used as a secondary port to the POS to bring in materials.

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5.18.2 Environmental Consequences

5.18.2.1 Construction

The revised project plan includes activities near Prudhoe Bay that were not included in the FEIS (USACE, 2012). Such activities include dredging, construction, and upgrades at West Dock to accommodate a 23-barge sealift, GCF module offload, and supporting activities. The entire activity will consist of winter dredging in the navigation channel and docking stations, modifications to dock infrastructure, and ballasting two temporary barges to support transportation on the causeway (AGDC, 2015; 2014).

The proposed dredging will occur in an area already permitted for similar dredging by BP Exploration (Alaska), Inc. (BPXA) by similar means and methods. Because a similar level of activity is currently permitted for the area, no additional impacts as a result of dredging are anticipated.

The project revisions do not change the findings in the FEIS (USACE, 2012) regarding potential impacts from increased navigation resource use for supply shipments and increased pollution in Alaskan waters from wastewater discharge. Vessel activity on navigable waterways will be required to comply with federal and state regulations and standards for discharging wastewater.

No adverse impacts from non-native invasive species on navigable waterways in Alaska are anticipated. Barges entering the project area as part of the sealift will be cleaned according to federal and state protocols in order to mitigate against the potential spread of non-native species.

Once construction is complete, no impacts to navigability of streams are expected from stream crossings by the proposed project. Changes to the stream crossing modes and methods from what was described in the FEIS could affect navigability of waters subject to the jurisdiction of Section 10 of the Rivers and Harbors Act of 1899 (USACE, 2012). With the Project revisions, the HDD crossing method is preferred for the Yukon River. Successful HDD crossing will not affect navigation during construction. Activities will occur on land, on either side of the Yukon River. Impacts to navigation could occur if there is unintended release of drilling fluids (a frac-out) where instream work may be necessary for containment.

5.18.2.2 Operations

There will be no additional impacts to navigation resources associated with Operations and Maintenance (O&M) as part of the revised project description.

5.18.3 References

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5.19 RELIABILITY AND SAFETY

The Final Environmental Impact Statement (FEIS) describes the reliability and safety of the Alaska Stand Alone Pipeline (ASAP) Project in the context of U.S. Department of Transportation (USDOT) safety regulations and pipeline performance standards (USACE, 2012). These standards are published in 49 Code of Federal Regulations (CFR) 190 to 199. 49 CFR 192 specifically addresses natural gas pipeline safety issues, and includes regulations to ensure adequate protection for the public, and to prevent natural gas facility incidents and failures. The Pipeline Safety Improvement Act of 2002 provides an additional layer of regulatory requirements for pipelines in High Consequence Areas (HCAs), which are defined as locations where a gas pipeline accident could do considerable harm to people and their property, so requires an integrity management program to minimize the potential for an accident for those identified HCAs.

Recent revisions to the ASAP Project affecting reliability and safety are the change in gas composition, and realignment of the Mainline pipeline and the Fairbanks Lateral (see AGDC, 2015; 2014).

With the change in gas composition from Natural Gas Liquids (NGL) to lean natural gas, the Maximum Allowable Operating Pressure (MAOP) for pipeline transport decreased from 2,500 to 1,480 pounds per square inch gauge (psig). As a result, the pipeline Wall Thickness (WT) requirements have changed. For the four location classes identified in 49 CFR 192, the design WTs for the Mainline are as follows:

- In Class 1 areas, the minimum WT is 0.527 inches for 1,480 psig (versus 0.595 for 2,500 psig).
- In Class 2 areas, the minimum WT is 0.632 inches for 1,480 psig (versus 0.714 for 2,500 psig).
- In Class 3 areas, the minimum WT is 0.758 inches for 1,480 psig (versus 0.857 for 2,500 psig).
- No Class 4 areas will be encountered along the proposed project route, as was the case in the FEIS (USACE, 2012).

The Alaska Gasline Development Corporation (AGDC) identified HCAs along the proposed project route. As noted in the FEIS (USACE, 2012), the AGDC will continue to monitor for potential class location changes and HCAs throughout the life of the proposed project to maintain compliance with the pipeline classification and pipeline integrity management regulations in 49 CFR 192.

Because the project no longer uses NGL, there will be no potential for accidental release of highly volatile liquids. As discussed in the FEIS (USACE, 2012), Mainline Block Valves (MLBVs) will be installed along the proposed Mainline pipeline and on the Fairbanks Lateral, spaced in accord with 49 CFR 192 no greater than 20 miles apart, to allow the Operator to shut down or isolate portions of the pipeline in the event of a rupture.

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None of the recent revisions to the ASAP Project affect AGDC's design approach or commitment to comply with federal and state pipeline safety regulations in the design, construction, and operation of the pipeline; and in particular, those specified in 49 CFR Parts 191, 192, and 199. The recent revisions to the ASAP Project do not affect national public safety concerns or terrorism and security issues. AGDC is working with the Pipeline and Hazardous Materials Safety Administration (PHMSA) to define design, construction and operational procedures on the portion of the pipeline that may require a strain-based design approach to supplement the requirements of 49 CFR 192 for potential arctic route geohazards.

5.19.1 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

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5.20 CUMULATIVE EFFECTS

The Final Environmental Impact Statement (FEIS) (USACE, 2012) assessed the environmental, social, and economic effects of the proposed project and Connected Actions in the context of past, present, and reasonably foreseeable future actions. The combined effects of the proposed action and these other actions on the natural and human environments are cumulative effects.

5.23.1 Affected Environment

Recent revisions to the Alaska Stand Alone Pipeline (ASAP) Project and new information on project area resources have resulted in changes to the potential project impacts on the natural and human environment. In addition, plans for some of the reasonably foreseeable future actions described in the FEIS have changed (USACE, 2012). These changes result in changes to the cumulative effects analysis. This section describes the cumulative effects of the ASAP Project based on the revised project description, new information on the affected environment, and updated information on the reasonably foreseeable future actions in the study area.

5.20.1.1 Key Assumptions of the Cumulative Effects Analysis

- There will be purchasers for the estimated quantities of lean natural gas for the Fairbanks and Cook Inlet areas served by Fairbanks Natural Gas LLC (FNG), Golden Valley Electric Association (GVEA), ENSTAR Natural Gas Company (ENSTAR), Matanuska Electric Association (MEA), Chugach Electric Association Inc. (CEA), Homer Electric Association (HEA), Municipal Light and Power (ML&P), and Seward Electrical Association (SES). The Flint Hills Refinery, noted in the FEIS as a potential purchaser of gas (USACE, 2012), was decommissioned in 2014.

- Natural Gas Liquids (NGL) are no longer part of the project. The cumulative effects analysis was updated to reflect the change in gas composition from enriched to lean gas. This eliminates the reasonable likelihood of development of infrastructure to support the transportation, processing, and distribution of NGL.

- Existing North Slope natural gas reserves are adequate to support proposed project operations; however, the amount of borrow materials needed might require new extraction sources. Overall North Slope oil and gas operations will be limited to transportation activities for purposes of this cumulative effects analysis.

- While past federal, state, and local authorizations to construct and operate the Trans-Alaska Pipeline System (TAPS) and its recent 30-year Right-of-Way (ROW) renewal are effective in avoiding and minimizing adverse impacts from that project (BLM, 2002), TAPS contributes to a cumulative effect as a past and ongoing action that affected some of the same natural and human resources potentially affected by the ASAP Project.

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- The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA), the State Pipeline Coordinator's Office (SPCO) and the Operator of the proposed project will use a risk-based compliance monitoring program that emphasizes public safety and health, protection of the environment, and pipeline integrity consistent with 49 Code of Federal Regulations (CFR) 192.

- The federal application for the Alaska Pipeline Project (APP) under the Alaska Gas Inducement Act was withdrawn.

- Applicants for the Alaska Liquefied Natural Gas (AK LNG) Project submitted a request to the Federal Energy Regulatory Commission (FERC) to commence the pre-filing procedures in accordance with FERC regulations under 18 CFR 157.21, which includes the environmental review process. The proposed AK LNG Project includes a new Gas Treatment Plant on the North Slope, connected by an 800-mile pipeline to a new liquefaction facility in Nikiski. The new facility in Nikiski is likely to be located adjacent to or in close proximity to the existing LNG plant. Because this project is in the early planning stages, it is not considered a reasonably foreseeable future action in this cumulative impact assessment.

- The proposed project now bypasses Clear Air Force Base on the western side of the Nenana River, eliminating the proximity to the military base and placing a large natural barrier between the pipeline and the base.

- Revisions to the alignment of the Mainline pipeline have, in many locations, moved it outside of the existing ROWs of the Dalton and Parks Highways and TAPS, although the route generally continues to parallel these existing corridors.

- Most of the proposed improvements at West Dock will be left in place at the conclusion of the construction period to minimize disturbance to the surrounding environment; however, the barge bridge on the West Dock Causeway will be removed, and breasting dolphin beams will be cut below the sediment surface and removed.

All other key assumptions used for the cumulative effects analysis presented in the FEIS remain valid (USACE, 2012).

5.20.1.2 Issues Relevant to the Cumulative Effects Analysis

The revisions to the proposed project reduce or eliminate some support facilities (for example, fewer compressor stations, no Straddle and Offtake Facility, no Natural Gas Liquid Extraction Plant [NGLEP]), shorten and straighten the Mainline pipeline, reroute the Fairbanks Lateral, provide greater design detail for access roads, increase the amount of borrow material, and require previously unanticipated modification and dredging at West Dock and Prudhoe Bay. With these project changes, the relevant issues considered in the cumulative impact analysis remain largely the same as those presented in the FEIS (USACE, 2012).

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No new cumulative effect issues were identified during the scoping process for the Supplemental Environmental Impact Statement (SEIS). Participants at public open house meetings for the SEIS expressed an interest in availability and gaining access to natural gas for their communities. With the change from enriched to lean natural gas, access to natural gas supplies for communities near the proposed pipeline will be easier because no extraction process will be needed; however, the communities will need to develop the distribution system infrastructure from the Mainline to individual users and businesses.

5.20.1.3 Geographic and Temporal Scope

The geographic and temporal scope of the cumulative impact assessment has not changed considerably from the FEIS (USACE, 2012).

Considering that the majority of the proposed pipeline will exist within the Dalton and Parks Highway corridors, the existing corridors and the communities in the Railbelt that will use lean gas delivered by the proposed project constitute the primary area of analysis for the cumulative effects of the pipeline and associated facilities. The temporal range for this cumulative effects analysis is from the present (2016) to 2076, which is 30 years beyond the projected initial 30-year federal ROW for the proposed project. Past projects are considered back to the time of first oil development on the North Slope (1960s), and the increase of transportation and facilities in the Railbelt at about the same time.

5.20.1.4 Cumulative Effects Analysis

This cumulative effects analysis considers the effects of the No Action Alternative and the proposed project (including mitigation measures that protect wildlife and habitat, address spill prevention and response, and wastewater management) and Connected Actions with the past, ongoing, and potential future effects of reasonably foreseeable future actions.

Soils and Geology

The overall footprint of the proposed project was updated from the FEIS to account for changes to project facilities (for example, shortened Mainline pipeline and Fairbanks Lateral lengths, elimination of compressor stations, elimination of the Straddle and Offtake Facility and NGLEP) and more detailed design information on access roads. These changes result in more soil disturbance than what was reported in the FEIS for the proposed project.

While the magnitude of the proposed project's contribution to a cumulative impact has increased, the assessment of cumulative soils and geology impacts presented in the FEIS remains valid (USACE, 2012). Other past, ongoing, and reasonably foreseeable projects affecting soils and geology will continue to implement standard mitigation measures during construction to prevent soil erosion. Consequently, the potential for substantial cumulative erosion effects caused by one or more of these projects in combination with effects from the proposed project is low because of consistent erosion control. The cumulative effect on the geologic environment will be minor because the disturbance areas of these actions are located proximal to each other or in the same general

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corridor. Horizontal Directional Drilling (HDD) (AGDC's preferred option) of the Yukon River crossing will involve the same cumulative effects described for the proposed project suspension bridge.

Borrow Material

The potential cumulative effect on the availability of borrow material identified in the FEIS remains. The amount of gravel, riprap, and bedding material required for the revised proposed project is anticipated to be approximately 25 million cubic yards (MCY) (see Section 2; AGDC, 2015), which is greater than the amount reported in the FEIS, although not all features were defined (USACE, 2012). The Alaska Gasline Development Corporation (AGDC) has identified the total available borrow material from existing sources to be at least 194.1 MCY. The cumulative impact of using 25 MCY of borrow materials will be a long-term loss for other potential projects in the vicinity that also require borrow material. However, many of these material sites may not be opened, nor would any material be produced if not for the ASAP Project. The amount of available materials from existing sites will be depleted more quickly as a result of this project revision. Yet, ASAP will open new material sites from which the Alaska Department of Transportation and Public Facilities could benefit.

Water Resources

The revisions to the proposed project have reduced the amount of water needed for construction by nearly half (AGDC, 2015; 2014). No cumulative impact to water use was identified in the FEIS (USACE, 2012): this assessment remains valid.

Similarly, the proposed project's potential contribution to a cumulative impact on surface drainages, groundwater sources, and water quality was reduced through project changes (for example, fewer waterbody crossings, and shortened pipelines); therefore, the cumulative effect will be smaller. The assessment presented in the FEIS (USACE, 2012) remains valid: no long-term adverse cumulative impacts to waterbodies, surface drainage, near surface groundwater, or water quality are expected from the Project.

Vegetation

The defiend Project Footprint presented in this document has yielded a definitive impact to vegetation, as discussed in the above sections. Much of the Project will be located in or near areas that are currently cleared or maintained, which reduces the cumulative effect of these actions on vegetation. With the revised pipeline alignments, the proposed project will be outside of existing transportation and pipeline ROWs (Dalton Highway, TAPS, and the Alaska Railroad [ARR]) for much of the route, which will contribute to cumulative vegetation removal and maintenance over a larger area. With APP no longer a reasonably foreseeable future action, the overall cumulative affects evaluation in the FEIS (USACE, 2012) remains valid.

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Wetlands and Floodplains

The revised Project, as now fully defined, has reduced impacts to wetlands wherever practicable. The overall cumulative effect reported in the FEIS (USACE, 2012); however, will remain valid considering the withdrawal of the APP project. The extent of wetland losses associated with most other reasonably foreseeable future actions remains unknown, and the basic footprints for existing developments, such as TAPS, ARR, and highways, are not expected to change. Effects to jurisdictional wetlands associated with permitted projects, including the proposed project, are subject to a U.S. Army Corps of Engineers (USACE) Section 404 permit, which will require compensatory mitigation intended to ensure no net loss of wetland habitat.

With the reduction in the number of stream crossings under the revised proposed project, its contribution to a cumulative impact to floodplains will also be reduced. No new cumulative effects to floodplains are anticipated.

Wildlife

The proposed project's contribution to a cumulative effect on wildlife will be largely the same as what was reported in the FEIS (USACE, 2012). Realignment of the pipeline outside of existing ROWs will increase the cleared or maintained area in the corridor, which could increase the cumulative effect of these actions on wildlife habitat.

In the context of the future expansion of the electrical intertie system and its associated forest removal, and the creation of the reservoir associated with the Watana Hydroelectric Project, the ASAP Project will have a relatively small contribution to the cumulative effect on wildlife in the Region of Interest (ROI).

Fish Resources

With the reduction in the number of stream crossings under the revised proposed project, its contribution to a cumulative impact to fish resources in those streams will also be reduced. Modifications to the West Dock Causeway and dredging at Dock Head (DH) 3 will increase the short-term effects of the project in the marine waters at those locations. The short-term effects of construction will not contribute to a greater cumulative effect to fish from what was reported in the FEIS (USACE, 2012).

Marine Mammals

Impacts to marine mammals from the revised proposed project may present a greater contribution to the cumulative effect with other actions at West Dock and DH3 during construction; however, the overall cumulative effect reported in the FEIS remains valid (USACE, 2012). The ASAP Project and will not present a long-term contribution to a cumulative effect on marine mammals.

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Threatened and Endangered and Other Federally or State Designated Species

The revisions to the Project may present a greater contribution to the cumulative effect of the Project on listed species in the vicinity of West Dock and DH3 during construction; however, the activities will be short-term, and the effect will be temporary. Through consultation with National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS), measures to mitigate impacts to designated marine and terrestrial species in the area will be developed to reduce the potential for cumulative impacts to those species.

Other revisions to the Poject do not increase the cumulative effects on designated species from what was described in the FEIS (USACE, 2012). As stated in the FEIS:

> *"Based on the measures incorporated for the location, design, and construction of TAPS and subsequently included in the initial authorizations to construct ANGTS and TAGS, and vessel traffic along the North Slope to and from West Dock, the proposed project is not expected to create long-term negative cumulative impacts to federally or state designated species."*

Land Use and Ownership

The revisions to the Project do not change the overall cumulative effects assessment of land use and ownership in the FEIS (USACE, 2012). Since the proposed project remains within or adjacent to an existing transportation system, its contribution to a cumulative effect on land use and ownership is expected to be minimal.

Recreation

The revisions to the Project do not change the overall cumulative effects assessment of recreation and tourism in the FEIS (USACE, 2012). Construction of the proposed project could be scheduled to reduce combined negative effects of other construction activities on tourism during the peak of the summer season, although there are no major highway work projects currently scheduled for the sections where the proposed project will be near the Dalton, Elliott, or Parks Highways. Updated information on the long-term direct and indirect effects of the proposed project on recreation associated with increased access to remote areas used for recreational activities (for example, hunting, fishing, hiking, camping, skiing, and snow machining) does not change the assessment that cumulative effects to primitive and aesthetic resources from a largely unaltered landscape will be negative.

Visual Resources

The revisions to the Project result in fewer facilities visible to the public. The project no longer contains compressor stations, a Straddle and Offtake Facility, or an NGLEP, and the first 7 miles of pipeline will be buried. Aboveground infrastructure (for example, pig launcher and receiver facilities, and Mainline Block Valves [MLBVs]) will generally be further away from highways and

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less visible. This will reduce the contribution of the proposed project to a cumulative visual impact. The revisions to the pipeline alignment expand the general corridor of cumulative impacts resulting from ASAP, TAPS, highways, and the ARR on visual resources; however, for the most part, ASAP infrastructure in the corridor will be buried.

Socioeconomics

In general, the potential socioeconomic effects resulting from the Project have not changed as a result of the design revisions. While more communities may have opportunities for access to gas from the Mainline, these connections are not reasonably foreseeable; therefore, they are not included in this updated assessment. Potential opportunities for community connections are discussed in Section 5.12 of this Environmental Evaluation Document (EED). Modifications to the West Dock navigation channel, DH3, and causeway will facilitate opportunities for access to North Slope development zones and resources.

A long-term reliable source of natural gas to fuel electrical generation provided by the proposed project will have a positive cumulative socioeconomic effect by contributing to reliable and cost-effective electrical power. This also will be true for minority and low-income areas (that is, environmental justice communities) within the proposed project area.

Cultural and Historic Resources

Revisions to the Project do not change the cumulative effects on cultural and historic resources identified in the FEIS (USACE, 2012). As stated in the FEIS:

> *"…the incremental effect of the proposed project to cultural resources in the ROI will be expected to be small since the responsible state and federal agencies working with the applicant will require adjustment in the location of the activity that could adversely affect a historical or historic resource or other appropriate measure to minimize or eliminate potential negative effects."*

Subsistence Resources

Revisions to the Project do not change the cumulative effects on subsistence resources identified in the FEIS (USACE, 2012). Short-term construction impacts will not likely contribute to a cumulative effect on subsistence because they are not likely to be scheduled concurrent with other major construction projects. The proposed project's contribution to a long-term cumulative effect will be from increased competition for the same resources by non-local users as a result of increased access afforded by the proposed project. This impact will be small in the context of other past, ongoing, and reasonably foreseeable future actions.

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Public Health

The FEIS finding that the Project will not materially contribute to the negative cumulative impacts of other state, federal, and industrial developments on public health remains valid with the project revisions (USACE, 2012). Benefits to public health in the Fairbanks area as a result of improved air quality resulting from the proposed project (that is, a reduction in the reliance on wood, fuel oil, and other energy sources that have greater adverse effect on air quality than natural gas) may offset negative effects of ongoing or other reasonably foreseeable future actions.

Air Quality

The revisions to the Project result in reduced emissions with the change from transporting enriched to lean gas, resulting in a decrease in the proposed project's contribution to a cumulative effect on air quality. Although operational emissions of the proposed project will be lower than what was presented in the FEIS, the proposed Project will generate Greenhouse Gas (GHG) emissions and incrementally contribute to climate change (USACE, 2012). When proposed project emissions are viewed in combination with global emissions levels that are contributing to the existing cumulative impact on global climate change, however, the incremental contribution of GHG emissions will be cumulatively minor.

Noise and Sensitive Receptors

Noise impacts from the Project are primarily attributable to construction activities and, as stated in the FEIS, will be transitory, short-term, and localized. As stated in the FEIS, noise from construction activities for the proposed project will not have a cumulative effect with other large projects, upgrading the electrical intertie system, or the Watana Hydroelectric Project, since these reasonably foreseeable projects will be constructed in different years (USACE, 2012). There will be cumulative effects of noise from project construction when concurrent with and located within a 1-mile radius of maintenance activity at TAPS, nearby highways, or the ARR. Operational noise from the proposed project is not expected to contribute to a cumulative noise impact.

Navigation Resources

As stated in the FEIS, the Project will not cause a negative cumulative effect to vessel travel (USACE, 2012).

Safety and Reliability

The cumulative effects to reliability and safety presented in the FEIS will be reduced because the Project has changed the product to be shipped via pipeline from enriched to lean gas (USACE, 2012).

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5.20.2 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline.* October. http://asapgas.agdc.us/documents.html.

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5.21 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

The Final Environmental Impact Statement (FEIS) (USACE, 2012) presents the short-term use versus long-term productivity of the environment of the Alaska Stand Alone Pipeline (ASAP) Project in the context of Section 102 of the National Environmental Policy Act (NEPA) (42 United States Code [USC] § 4332).

Recent revisions to the ASAP Project affecting the analysis of short-term use versus long-term productivity include the following project elements: the change in gas composition and resulting facility and pad requirements, changes to the Mainline pipeline and Fairbanks Lateral alignments, changes in access road alignment and length, changes in the requirements for fill material, and temporary use of West Dock facilities (see AGDC, 2015; 2014).

As does Section 5.21 of the FEIS (USACE, 2012), this section considers the revised ASAP Project in the context of short-term use versus long-term productivity with respect to land use, water resources, biological resources, and air quality.

Short-term use versus long-term productivity of **land use** under the revised ASAP Project compares to the FEIS (USACE, 2012) in the following ways:

- While the alignment of the Mainline pipeline, Fairbanks Lateral, and access roads have shifted, the minimum operational right-of-way (ROW) width has increased to 53 ft throughout the length of the mainline and to 30ft for the Fairbanks Lateral. Material site locations were refined to some degree, and footprint details of access roads were delineated. Long-term productivity associated with land use in the project corridors will not be appreciably different from that evaluated in the FEIS. Note: The added details of project features that have increased the Project Footprint (that is, related to Mainline Block Valves (MLBVs), camp locations, false ROWs, material sites, and access roads) were anticipated but not included in the FEIS; they are a function of advancement of the Project Design and not new elements of the Project.

- Proposed modifications to West Dock facilities and module offloading activities will temporarily limit or preclude use of portions of West Dock by other users for one winter construction period and one summer module offloading period. The long-term availability of West Dock facilities will not be diminished for other industrial land uses.

The short-term use versus long-term productivity with respect to **water resources** compares to the FEIS (USACE, 2012) in the following ways:

- Overall, surface water use during construction and for pipeline hydrotesting has changed from 1.09 billion gallons to 467 million gallons. Permit stipulations will ensure that short-term water extraction from any one source will not result in long-term changes in water quality or quantity or preclude water use for other human or biological activities.

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- The reduction in the number of centerline pipeline stream crossings from 515 to 272 (265 on the Mainline, 7 on the Fairbanks Lateral) by trenching and the definition of 40 access road crossings through the installation of culverts and bridges will reduce the short-term use of streams and the long-term effects on stream banks, stream beds, and water quality.

- The advancement of the project design results in an overall increase in wetlands fill associated with access roads, facility pads, construction camps, and other facilities over what was reported in the FEIS. The total area of permanent wetland impacts from the proposed project changed (see section 5.4 Wetlands; see Attachment 8) as a result of project revisions and advancement of project design. The resulting overall long-term loss of the functions of those wetlands will be proportional; however, the types of wetlands and wetland functions permanently impacted may be different from what was evaluated in the FEIS because alignments have shifted (USACE, 2012).

- Winter dredging and spoil material disposal at West Dock are elements new to the proposed project since the FEIS (USACE, 2012). One-time dredging activity will have minimal short-term impacts to water quality because the work will be done in the winter when the water is frozen. Disposal of dredged material will likely result in short-term water quality impacts to the nearshore or seafloor where disposal occurs, as noted in the JAfP (AGDC, 2015). The exact method and location of disposal have been defined (Attachment 3). No long-term impacts are anticipated.

Short-term use versus long-term productivity with respect to **biological resources** compares to the FEIS in the following ways (USACE, 2012):

- While the overall footprint of the proposed project has changed and the alignment of the Mainline and Fairbanks Lateral have changed, long-term productivity effects to biological resources (for example, vegetation, wildlife, and fish) at landscape and population levels will not be different from those evaluated in the FEIS.

- The reduction in the number of pipeline centerline stream crossings from 515 to 272 by trenching and the definition of 40 access road crossings using culverts and bridges will reduce the proposed project's overall short-term use of resident and anadromous fish habitat and lessen the long-term effects on the health and productivity of the streams for fish habitat.

- The addition of West Dock as a module offloading site and the associated permanent and temporary changes to West Dock facilities may result in short-term effects on marine fish, mammals, birds, and benthic organisms, but long-term productivity will not likely be affected.

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Short-term use versus long-term productivity of the environment with respect to **air quality** compares to the FEIS (USACE, 2012) in the following ways:

- While the Mainline pipeline and Fairbanks Lateral are shorter and the proposed project has changed in several ways, air quality effects associated with construction will not likely change from what was evaluated in the FEIS.

- Projected emissions from operation of the GCF will be equivalent to those estimated in the FEIS; therefore, long-term air quality will be similar.

- The currently Project will have fewer long-term effects on air quality because the lean gas scenario does not require the compressor stations, Straddle and Offtake Facility, and Cook Inlet Natural Gas Liquid Extraction Plant (NGLEP) that were analyzed in the FEIS.

- Depending on the number of homes, businesses, and industrial facilities in and around Fairbanks that convert from current heat sources, such as oil and wood, to natural gas, the proposed project could result in long-term air quality improvements in the Fairbanks area, which is currently classified as a non-attainment area by the U.S. Environmental Protection Agency (USEPA) and Alaska Department of Environmental Conservation (ADEC).

- Air quality in other communities or regions along the pipeline corridor also may be improved if natural gas distribution systems are established and homes, businesses, industries, and power generation facilities choose to convert to natural gas for heating and electrical power generation.

5.21.1 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

U.S. Army Corps of Engineers (USACE). 2012. *Final Environmental Impact Statement. Alaska Stand Alone Pipeline*. October. http://asapgas.agdc.us/documents.html.

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5.22 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Final Environmental Impact Statement (FEIS) (USACE, 2012) presents the irreversible and irretrievable commitment of resources by the Alaska Stand Alone Pipeline (ASAP) Project in the context of Section 102 of the National Environmental Policy Act (NEPA) (42 United States Code [USC] § 4332) and Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] § 1502.16).

Recent revisions to the ASAP Project affecting the analysis of irreversible and irretrievable commitment of resources include the following project elements: the change in gas composition and resulting facility and pad requirements, changes to the Mainline pipeline and Fairbanks Lateral alignments, changes in access roads and fill requirements related to further development of project design, and previously unanticipated modifications and dredging at West Dock and Prudhoe Bay (AGDC, 2014a, b). Specific project changes affecting the magnitude or type of resources that will be irreversibly and irretrievably committed to the project are:

- Gas Conditioning Facility (GCF) location moved and design updated (new shape and size)
- Mainline pipeline route straightened and shortened by 4 mi.
- Fairbanks Lateral route changed from Alaska Railroad Corporation (ARRC) corridor in Goldstream Valley to Murphy Dome and Old Murphy Dome Roads; shortened by 4 mi.
- Two compressor stations along the pipeline route eliminated
- Straddle Plant and Offtake Facility eliminated
- Natural Gas Liquids Extraction Plant (NGLEP) eliminated
- First 7 miles of pipeline buried (no longer aboveground on Vertical Support Members [VSMs])
- New and updated design information for access roads, material sites, pigging facilities, and Mainline Block Valves (MLBVs).

As with Section 5.22 of the FEIS (USACE, 2012), this analysis of the irreversible and irretrievable commitment of resources for the revised ASAP Project examined construction materials and labor, physical setting, water resources, biological resources, cultural resources, land use and ownership, and energy resources. The following statements update the findings of the FEIS:

- The total volume of material that will be irreversibly removed from the ground has become more defined (preliminary features defined and quantified amounted to 13.1 million cubic yards [MCY]; current estimate is 25 MCY).

- The area of permanent fill in wetlands has changed (Section 5.4 Wetlands).

- Gravel pads and access roads supporting long-term operations will be left in place; however, at land-owners' request, Alaska Gasline Development Corporation (AGDC) will restore such construction sites not required for long-term operations to preconstruction conditions.

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- The footprint of the revised proposed project will increase the area of permanent physical changes to landforms. Permanent physical changes to landforms (that is, from natural features to engineered project elements) will affect the natural visual quality of the landscape, resulting in an irreversible and irretrievable commitment of visual resources. This will be most noticeable where proposed project features were moved outside of the existing development corridors.

- The amount of water needed for construction has decreased from 974 million gallons to 467 million gallons.

- The reduction in large aboveground facilities reduces the irreversible impact to wildlife use patterns from what was reported in the FEIS.

- The larger footprint of the revised proposed project will increase the area of irretrievable impact to timber resources. The maintained area for the minimum pipeline right-of-way (ROW) has increased to 53 ft, nominally, which increases the irreversible commitment of timber resources.

- Modifications at West Dock will require an irreversible commitment of resources for construction; however, the physical setting could be restored to preconstruction conditions. Some site restoration will occur with the proposed project: the causeway bridge will be removed, and the breasting dolphin beams will be cut below the sediment surface and removed. The proposed project does not include maintenance of the dredged navigational channel. It may return to preconstruction conditions through natural processes.

- There is a change in the number of cultural resource sites affected

- The land use and ownership potentially affected by the proposed project has changed as a result of changes to and greater detail in project design. Most of the land potentially affected is under federal or state ownership, as was discussed in the FEIS. The total area of irreversibly and irretrievably committed land to the proposed project changed (see Table 2-1).

None of the listed changes affect the overall evaluation of the irretrievable and irreversible commitment of resources presented in the FEIS. AGDC will continue to pursue mitigation measures to reduce these impacts, as stated in the FEIS (USACE, 2012).

5.22.1 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3.

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5.23 MITIGATION

The Final Environmental Impact Statement (FEIS) completed an analysis and assessment of effectiveness for mitigation measures proposed by the Alaska Gasline Development Corporation (AGDC) in 2011 for the construction and operation of the Alaska Stand Alone Pipeline (ASAP) Project. The FEIS also included a comprehensive listing of the National Environmental Policy Act (NEPA) mitigation requirements; State of Alaska (SOA) Right-of-Way (ROW) Lease mitigation requirements; and numerous federal, state, and local permits required for the proposed project that collectively govern the mitigation requirements with which AGDC is committed to comply. The FEIS correctly acknowledged that in addition to the mitigation measures and plans proposed by AGDC, the full extent of mitigation required for the ASAP Project is ongoing and will ultimately be known at the conclusion of the federal, state, and local governments' permitting process (USACE, 2012). A well-defined Mitigation Statement was provided to the USACE by AGDC in its Joint Application for Permit (JAfP) for the ASAP Project (AGDC, 2015). This statement discusses mitigation process and methodology and expected actions for the ASAP Project.

5.23.1 Affected Environment

Following publication of the FEIS, two changes were made to the ASAP Project design to avoid and minimize impacts to Waters of the United States (WOUS), wetlands, and intertidal and subtidal habitats. The proposed project is now a lower-pressure, lean natural gas pipeline, eliminating the need to construct and operate compressor stations, a Straddle and Offtake Facility, and the Cook Inlet Natural Gas Liquids Extraction Plant (NGLEP). The project now also includes a dredging and dredge disposal plan for accessing the West Dock Causeway that was not previously included in the FEIS project description (USACE, 2012).

With the exception of the two project changes noted, mitigation of the affected environment analyzed in the FEIS has not changed (USACE, 2012), but has been better defined (AGDC, 2015).

5.23.1.1 Regulatory Setting

The regulatory environment remains the same as described in the FEIS (USACE, 2012).

5.23.2 Environmental Consequences

The JAfP (AGDC, 2015) includes an updated and comprehensive description of AGDC's proposed avoidance, minimization, and compensation plans (Section 23) for the changes and revisions that now comprise the ASAP Project. The mitigation details in the JAfP will not be reiterated here. However, the following is a summary of the mitigation consequences for the two major project changes.

Lower pressure, lean natural gas: Eliminates the construction and operating impacts previously assessed in the FEIS for compressor stations, the Straddle and Offtake Facility, and Cook Inlet NGLEP (USACE, 2012).

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West Dock Dredge and Dredge Disposal: The sealift operation to transport Gas Conditioning Facility (GCF) modules to Prudhoe Bay evaluated eight alternative options. All of the North Slope docks considered for the sealift required modifications, dredging, or both to meet the needs of the module offload and land transportation process.

West Dock Head (DH) 3 was chosen as the best option for offloading the prefabricated modules because of the availability of existing infrastructure, existing staging area, prior use for modular sealift, proximity to the GCF, and reduced dredge requirements. This location presents the fewest limitations and risk associated with the modular offload.

Winter dredging is proposed, which eliminates potential conflicts with migratory animals (birds and marine mammals), subsistence activities, and migratory fish routes. However, winter activities will require monitoring for detection and avoidance of polar bear and ice seal dens.

Composition and contamination of the dredge spoils, timing, site selection, technical feasibility, environmental acceptability, cost/benefit, and legal constraints were examined to determine the least environmentally damaging practicable alternative for dredge disposal. Based on available information, the preferred winter dredge disposal option is the nearshore on the southeastern side of Prudhoe Bay.

5.23.3 References

Alaska Gasline Development Corporation (AGDC). 2015. *Alaska Stand Alone Gas Pipeline/ASAP – Joint Application for Permit Revised*. Dec 29, 2015.

Alaska Gasline Development Corporation (AGDC). 2014. *Alaska Stand Alone Gas Pipeline/ASAP – Plan of Development*. Revision 3. June. http://asapgas.agdc.us/pdfs/documents/pod2014/POD%20Rev%203_Final_07-22-2014_COMBINED.pdf. Accessed October 9, 2014.

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ATTACHMENTS

Attachment 1. Alaska Stand Alone Pipeline Map Book

Attachment 2. State of Alaska Right-of-Way Lease for the Alaska Stand Alone Pipeline – Exhibit A (Stipulations)

Attachment 3. West Dock Dredge and Disposal Plan

Attachment 4. Letter from Alaska Gasline Development Corporation President to Fairbanks Northstar Borough Mayor

Attachment 5. Essential Fish Habitat Assessment

Attachment 6. Biological Assessment

Attachment 7. Wetlands and Waters of the United States Delineation Report for Rev 6.1 Route

Attachment 8. Aquatic Site Assessment

Attachment 9. ADF&G Research Report: 2015 Stream Surveys SF2015-228

Attachment 10. Access Road Habitat Assessment and Fish Study: 2015 Fish Resource Permit SF2015-212 Research Report

Attachment 11. Pipeline Stream Crossing Construction Mode Determination

Attachment 12. Senate Bill 70 - Gas Pipeline Right-of-Way, Parks, and State Recreation Areas

Attachment 13. Interactive Map Viewer User Guide

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