ALASKA
PipelineProject

Alaska Pipeline Project
Resource Report No. 10 Preliminary Draft

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TransCanada ExxonMobil

Introduction

TransCanada Alaska Company, LLC and Foothills Pipe Lines, Ltd., working cooperatively with ExxonMobil, are collectively progressing the Alaska Pipeline Project[1]. The goal of APP is to treat, transport, and deliver gas from the North Slope of Alaska to markets in North America. This preliminary draft resource report pertains only to that portion of the Project in Alaska. Unless the context otherwise requires, references in the resource reports to APP refer only to the Alaska portion of the project.

The pipelines, Gas Treatment Plant, and associated facilities described in this document are based on the estimated volumes of gas from projected customer commitments. If final volumes are significantly different, the design will be adjusted as needed.

The location information, facility descriptions, resource impact data, construction methods, and mitigation measures presented in this report are preliminary and subject to change. APP is currently conducting engineering studies, environmental resource surveys, agency consultations, and stakeholder outreach efforts to further refine and define the details of the project. In particular, the route through the following areas is being more closely analyzed:

- Alaska's North Slope, including the Prudhoe Bay Unit Area;
- The Atigun Pass through the Brooks Range;
- The Yukon River crossing;
- The City of Fairbanks, including residential and commercial development, and proximity to Eielson Air Force Base;
- The Delta Junction area, including waterbody crossings and residential development;
- Multiple locations between Delta Junction and the Alaska-Yukon border, including fault crossings; and
- The Upper Tanana region near Tetlin.

Yellow highlighting is used throughout this preliminary draft Resource Report to highlight selected information that is pending or subject to change.

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[1] The Alaska Pipeline Project is referred to herein as either APP or the Project.

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[Note: These figures will be provided in the Draft Report.]

APPENDIX

[Note: This appendix will be provided in the Draft Report.]

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List of Acronyms and Abbreviations

§	Section
AMP	Alaska Mainline milepost
ANGPA	Alaska Natural Gas Pipeline Act of 2004
APP	Alaska Pipeline Project
Btu	British thermal units
CCP	Central Compression Plant
CGF	Central Gas Facility
CO_2	carbon dioxide
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EPAct	Energy Policy Act of 2005
FERC	U.S. Federal Energy Regulatory Commission
GTP	Gas Treatment Plant
kW	kilowatt
LNG	liquefied natural gas
PBU	Prudhoe Bay Unit
PMP	Point Thomson Gas Transmission Pipeline milepost
PRB	Plan Review Board
PTGP	Point Thomson Gas Transmission Pipeline
Put-23	Oxbow Pit
TAPS	Trans-Alaska Pipeline System

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10.0 RESOURCE REPORT 10 – ALTERNATIVES

10.1 INTRODUCTION

This resource report describes Alaska Pipeline Project's (APP's) route and facility evaluation process and provides the technical rationale and justification for selection of the proposed project. APP would be constructed pursuant to the Alaska Natural Gas Pipeline Act of 2004 (ANGPA), which states that construction of a natural gas pipeline from the North Slope to major North American markets is in the national interest and would enhance national energy security by providing access to the significant gas reserves in Alaska to meet anticipated future demand for natural gas. APP identified and evaluated alternatives to the proposed APP in accordance with the U.S. Federal Energy Regulatory Commission (FERC) regulations and applicable laws. These alternatives included the no-action alternative, the energy conservation alternative, energy source alternatives, pipeline system alternatives, different configurations of the proposed facilities, major and minor route alternatives, route variations, and aboveground facility site alternatives. The main criteria used in considering alternatives are:

- Whether the alternative can meet the project purpose and need, which is to transport natural gas from the North Slope to major markets in the contiguous United States;
- Whether the alternative is technically and economically feasible and practical (some alternatives may be infeasible or impractical because they cannot be reasonably implemented after considering existing technology and/or cost); and
- Whether the alternative confers a significant environmental advantage over the proposed project without transferring impacts from one area or group of landowners to another.

Each alternative was considered to the point where it was clear whether it could meet the project purpose and need. If it could meet the project purpose and need, it was considered to the point where it was clear whether the alternative was technically and economically feasible and practical considering existing technology and cost. If it met that standard, it was analyzed to determine whether it conferred a significant environmental advantage over the proposed project. Those alternatives that met the project purpose and need and appeared to be technically and economically feasible and practical were reviewed in the greatest environmental detail. Based on APP's evaluation, the proposed project as described in Resource Report 1 offers the strongest combination of environmental sensitivity, engineering feasibility, and operational efficiency.

Filing Requirements Checklist

Table 10.1-1 lists the FERC's filing requirements from Title 18 of the Code of Federal Regulations Section (§) 380.12 that are applicable to Resource Report 10 of APP's environmental report, and where each requirement is addressed in this resource report.

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TABLE 10.1-1

Alaska Pipeline Project
Resource Report 10 Filing Requirements Checklist

Filing Requirement		Where Found In Document
1.	Address the "no action" alternative. (§ 380.12[l][1]) Discuss the costs and benefits associated with the alternative.	Section 10.2
2	For large projects, address the effects of energy conservation or energy alternatives to the project. (§ 380.12[l][1])	Section 10.3
3.	Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative. (§ 380.12[l][1]) Discuss the costs and benefits associated with each alternative.	Section 10.4
4.	Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (e.g., wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route. (§ 380.12[l][2][ii]) For onshore projects near to offshore areas, be sure to address alternatives using offshore routings.	Section 10.5
5.	Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site. (§ 380.12[l][2][ii])	Section 10.6

10.2 NO-ACTION ALTERNATIVE

Congress recognized in ANGPA that construction of a natural gas pipeline from the North Slope to major North American markets is in the national interest and would enhance national energy security by providing access to the significant gas reserves in Alaska to meet anticipated future demand for natural gas. Under the "no-action alternative," APP would not be certificated or constructed. If the project is not constructed, the environmental impacts identified in these resource reports would not occur; however, Congress' objective of enhancing national energy security would not be met.

10.3 ALTERNATIVE MEANS TO MEET THE PROJECT PURPOSE AND NEED

10.3.1 CONSERVATION

While energy conservation can play a critical role in the future of the U.S. energy sector, growth projections suggest that the demand for energy, including natural gas, would outstrip cost-effective programs designed to stimulate energy conservation. Although it is likely that continued high energy prices may result in some increase in the rate of conservation, the incremental increase would not have a material effect on the regional demand for new sources of natural gas supply, as evidenced by projections for future energy use (U.S. Energy Information Administration (EIA), 2009b).

Energy Conservation is not in itself an energy source. It cannot substitute for the vast supply of clean, domestic natural gas on Alaska's North Slope that has been the subject of proposed projects to transport that energy to North American markets since the mid-1970's. To address the growing demand for natural gas by industrial, residential and other customers, additional supply such as that provided by the APP is needed, along with complementary efforts in support of energy conservation. However, increased energy conservation is not an alternative to the proposed project.

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10.3.2 ALTERNATIVE ENERGY SOURCES

10.3.2.1 Renewable Energy

Over the past decade, worldwide emphasis on global climate change and high gasoline and oil prices has shaped the role of renewable energy in the United States. At the federal level, Congress passed the Energy Policy Act of 2005 (EPAct), which was the first major energy law enacted in more than a decade. One goal of the EPAct was to increase the role of renewable energy in the U.S. energy portfolio by providing federal tax incentives for renewable energy projects, funding research and development of renewable energy technology, compelling the passage of state permitting requirements for renewable energy, and requiring renewable fuels for automobile fuel mixes. At the state level, a number of states also have adopted renewable portfolio standards or goals as a means of reducing reliance on conventional fossil fuels. However, each of those alternatives faces its own challenges.

Hydropower, or generating electricity from water stored behind dams that is then run through turbines, plays a role in the current energy mix of the United States. Hydropower is expected to remain the largest source of renewable energy generation through 2030 (EIA, 2008a). Environmental concerns regarding the technology and the scarcity of available new sites, however, is limiting hydropower's growth. Hydropower's share of the total electricity generated in the United States is expected to fall from 7.1 percent in 2006, to 5.8 percent in 2030. Most feasible hydroelectric facilities have already been developed (Northwest Power and Conservation Council, 2007). Existing hydropower facilities are unlikely to be expanded, and few new facilities are expected to be constructed and licensed. The practical realities experienced by owners of existing hydropower facilities provides a solid basis to conclude that total hydropower production is not likely to expand appreciably in the near future. As a result, the development of additional hydropower resources is not a reasonable alternative to APP, a project that will have the capacity to provide up to 4.5 bcf of domestic natural gas.

A new speculative source of future electric power is hydrokinetic energy, or electricity generated from ocean currents, swells, waves, or tidal action. These facilities could only be developed offshore or in tidally influenced rivers and no commercial scale facilities currently operate in the United States. The FERC only recently initiated a licensing process for hydrokinetic test projects in the United States. Any one of these multiple factors serves to underscore the speculative nature of this renewable energy source. Based on all that is known today and when compared to the clear and certain benefits that the APP will provide, substantial development of hydrokinetic energy is not reasonably foreseeable and therefore is not an alternative to this project that warrants further consideration.

Geothermal resources are naturally occurring sources of heat, such as hot springs, geysers, or volcanoes that could be tapped to generate energy. The main barriers to the development of geothermal resources are the development cost associated with such projects and the proximity of the geothermal potential relative to its end use. Given the physical limits of geothermal sites that have a potential for future exploitation, the lack of interest from investors in developing new potential resources and the minimal amounts of energy that geothermal resources produce, this type of renewable resource is not a feasible, reasonable, or foreseeable alternative to the proposed project.

Biomass resources can produce electricity and heat or steam from wood, wood waste, plant and animal waste, or other organic matter. Barriers to further development of biomass resources include its own adverse impacts on the environment, as well as uncertainty in biomass outputs,

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the high costs associated with the transportation of forest products to an energy conversion facility, and lack of private capital investment in the development of additional biomass facilities. Because of the difficulties of developing biomass resources and the small amount of additional energy such resources could produce, biomass resources do not represent a feasible, reasonable, and foreseeable alternative to the proposed project.

Solar power has not yet made a significant contribution to the U.S. energy mix, and solar technologies in general remain too costly for grid-connected application (EIA, 2008b). By 2035, the EIA projects that renewable-generated electricity will account for 17 percent of the total U.S. electricity generation (EIA, 2010). Despite significant expected growth in the development of this energy source, solar power does not appear at this time to have the capacity to produce the amount of energy that is equivalent or close to the projected 4.5 bcf capacity of APP. Thus, while solar power is expected to play an important role in overall domestic energy production, it is appropriate to conclude that it is not a reasonable or feasible alternative to the proposed project.

There is considerable uncertainty about the growth potential of wind power, which depends on a variety of factors, including fossil fuel costs, state renewable energy programs, technology improvements, access to transmission grids, and public concerns about environmental and other impacts. Generation from wind power is expected to increase from 0.6 percent of total electricity generated in the United States in 2006, to 2.4 percent in 2030 (EIA, 2008b). Due to the variable nature of wind, wind turbines only generate about one-third of their maximum output capacity, on average. In addition, there are numerous barriers to development of wind farms, including: lack of transmission capacity; potentially adverse impacts on migratory birds and bats; noise impacts; and concerns about aesthetic impacts. Also, clustering effects at wind farms result in spikes and troughs in production that have no relation to demand, and contribute to transmission congestion. In 2008, the U.S. Department of Energy (DOE) published a report that concludes that there are significant costs, challenges, and impacts associated with wind energy that are not likely to be overcome in the near term (DOE, 2008). Although wind power has the potential to contribute in some measure to the nation's domestic energy needs, this alternative energy source continues to be confronted by challenges that have yet to be resolved. As a result of these challenges and the present state of development, it is appropriate to conclude that wind power is not a reasonable or feasible alternative to the proposed project.

10.3.2.2 Nuclear Energy

Due to economic, environmental, and regulatory factors, the future of nuclear power as an energy alternative is uncertain. There are currently 104 nuclear power plants operating in the United States. These resources generate about 20 percent of the nation's electricity (Nuclear Energy Institute, 2011). There have been only two new nuclear power plants approved since the mid-1980s due to concerns raised after the Three Mile Island incident in Pennsylvania in 1979. Recent concerns with siting nuclear facilities in natural disaster-prone areas are also a challenge to nuclear energy development. Other barriers to the nuclear industry include problems related to the long regulatory review time and costs. In addition, major concerns exist relating to the disposition of spent fuel in light of the proposed abandonment of Yucca Mountain, the only proposed long-term repository for spent commercial nuclear fuel. In light of these concerns, the Watts Bar nuclear power plant in Tennessee that began operation in 1996 and took 23 years to complete at a cost of $6.9 billion is the only nuclear power plant that has been put in service since the Three Mile Island incident. Whatever the long-term future of nuclear energy may be, the challenges described above lead to the conclusion that in the reasonably

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foreseeable short-term captured by the energy potential of the proposed project, nuclear power is not a viable alternative to APP.

10.3.2.3 Fossil Fuels

Petroleum and coal-based energy are commonly found and used throughout the United States. Development of petroleum and coal-based energy would result in a variety of environmental impacts, including impacts associated with extraction, transportation, refinement, and distribution. Further, the end use of petroleum or coal-based energy sources would result in increased environmental impacts associated with emitting pollutants to the air (e.g., smog and acid rain). Natural gas, when compared to other fossil fuels such as coal or fuel oil, is cleaner, especially with respect to the emission of regulated pollutants (e.g., nitrogen oxide and sulfur dioxide) and greenhouse gases (e.g., carbon dioxide (CO_2)) (U.S. Environmental Protection Agency, 2011). Petroleum and coal-based energy do not provide a significant environmental advantage over natural gas and, therefore, are not a reasonable alternative to the proposed project.

10.3.2.4 Summary

Since the discovery of oil in Prudhoe Bay in the 1960s, there has been the recognition that the extraction and transportation of the natural gas associated with that oil is also in the national interest. It was for these reasons that Congress in 1976 and again in 2004 adopted legislative initiatives to encourage a project such as APP. Given that recognition and the limitations on the development of renewable and other alternative sources of energy discussed above, there is a clear need for the development of this project.

10.4 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed project that would make use of other existing, modified, or proposed natural gas transmission systems to meet the stated purpose and need of the project. A system alternative may also be a substantially different configuration of the proposed pipeline system (such as wholly different endpoints and transportation technologies). A system alternative would make it unnecessary to construct all or part of the proposed project, although some modifications or additions to one or more existing pipeline systems may be required to increase capacity or accommodate receipt/delivery points, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts; however, the impact could be less than, similar to, or greater than that associated with construction of the proposed project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the proposed facilities could be avoided or reduced while still allowing the stated purpose and need of the project to be met. In order to be a viable system alternative to the proposed project, potential system alternatives must meet the project purpose and need, be technically and economically viable, and provide a significant environmental advantage over the proposed project.

To assist in fulfilling ANGPA's intent, the proposed Alaska Mainline segment of APP would connect to the Canadian Section of the Project at the Alaska-Yukon border. The location of the international border interconnect is fixed by the fact that the Project already has a certificated route in Canada. The location of this interconnect has resulted in the present routing decisions for the southern end of the Alaska portion of the APP.

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10.4.1 USE OF ALTERNATIVE NEW PIPELINE SYSTEMS

10.4.1.1 Denali Pipeline System

There are a number of proposed pipeline systems in Alaska, including natural gas and liquids pipelines. One of these proposed systems, the Denali Pipeline Project could be capable of carrying natural gas from the North Slope to the Yukon border. The Denali Pipeline Project is a joint venture between ConocoPhillips and BP and is described in Denali Pipeline Project's filings with FERC (Docket #PF08-26-000). It is unlikely that both APP and the Denali Pipeline Project will be constructed.

10.4.2 USE OF EXISTING PIPELINE SYSTEMS, WITH OR WITHOUT SYSTEM UPGRADING

10.4.2.1 Trans-Alaska Pipeline System Alternative

The Trans Alaska Pipeline System (TAPS) is an 800-mile-long, 48-inch-diameter crude oil pipeline that currently transports crude oil from the North Slope to a tanker terminal in Valdez, for shipment to refineries and markets on the West Coast of the United States.

Although TAPS presently has capacity to accommodate additional crude oil throughput, use of TAPS as an alternative to APP would present the following issues:

- Crude oil and natural gas cannot be transported long distances within the same pipeline using existing technology.
- The TAPS pipeline would need to be converted from a crude oil pipeline to a natural gas pipeline, a detailed technical analysis would be required to determine the feasibility of converting and certificating TAPS for gas transmission service in compliance with pipeline safety regulations.
- While there is some uncertainty as to what pressure the pipeline could be permitted for, a new pipeline of the same diameter, wall thickness and steel grade as TAPS would only be capable of transporting a fraction of the proposed APP capacity.
- Conversion of TAPS from a crude oil pipeline to a natural gas pipeline would displace the crude oil currently being transported through TAPS.

Based on the foregoing reasons, APP has eliminated the use of TAPS as an alternative.

10.4.3 DIFFERENT CONFIGURATION OF PROPOSED FACILITIES

10.4.3.1 Valdez Configuration

In its open season filing, APP offered shippers an alternative pipeline system that would transport natural gas from the North Slope to a proposed liquefied natural gas (LNG) facility in Valdez, Alaska. The approximately 811-mile-long Valdez LNG alternative would consist of a 48-inch-diameter natural gas pipeline, a gas treatment plant (GTP), two compressor stations, two meter stations, three heater stations, launchers, receivers, mainline block valves, and other ancillary and auxiliary facilities. The Valdez LNG alternative would follow the proposed project route (and TAPS) to Delta Junction. At Delta Junction, the alternative would branch off the proposed project route (which follows the Alaska Highway southeast for the remainder of its

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route) and continue to follow TAPS south to the Port of Valdez. The alternative would have a maximum allowable operating pressure of 2,500 pounds per square inch gauge, and would deliver about 3.0 billion cubic feet per day to a LNG facility. The LNG facility would liquefy the gas and load it onto seagoing vessels for transportation to market. The LNG facility would be constructed, owned, and operated by a third-party.

The Valdez LNG alternative configuration is an option that was included in APP's initial open season in 2010 and involves ongoing discussions with potential shippers. APP is in the process of negotiating the terms and conditions of precedent agreements with shippers. Commercial discussions are confidential, including details surrounding route selection. While the determination of a route would be finalized only by the signing of precedent agreements with shippers, in order to progress the project, APP's current work efforts are focused on the proposed project as described in Resource Report 1.

10.4.3.2 Northern Configuration

An alternative configuration of the proposed project would be to route the proposed pipeline north from Prudhoe Bay into the Beaufort Sea, then east and south into Inuvik, Canada. A northern route such as this would bypass most of Alaska. In Section 103(d) of ANGPA, Congress prohibited the issuance of any approval required under federal law for the construction of any pipeline to transport natural gas from land within the Prudhoe Bay oil and gas lease area for any pipeline that follows a route that traverses land beneath navigable waters beneath, or the adjacent shoreline of, the Beaufort Sea and enters Canada at any point north of 68 degrees north latitude. Any such alternative was, therefore, dropped from consideration.

10.4.3.3 PTGP Aboveground Pipeline Configuration

[Note: Further information will be provided in the Draft Report.]

10.4.3.4 Alaska Mainline Aboveground Pipeline Configuration

[Note: Further information will be provided in the Draft Report.]

10.5 ROUTE ALTERNATIVES

Route alternatives can be divided into three categories: major route alternatives, minor route alternatives, and route variations. Major and minor route alternatives refer to deviations from the proposed pipeline alignment. Major route alternatives are designed to address large issues or obstacles. The end points of major route alternatives are generally the same as the corresponding segments of the proposed pipeline; however, they could have substantially different alignments. Minor route alternatives are smaller in scale and designed to address similar issues. On an even smaller scale, route variations are designed to avoid or reduce impacts on specific, localized resources including wetlands, residences, archaeological sites, and terrain constraints.

To route the proposed Point Thomson Gas Transmission Pipeline (PTGP), APP planners and engineers initially took a "straight line approach" from the Point Thomson Unit to the proposed GTP, while keeping the pipeline away from the North Slope shoreline. Planners and engineers then shifted the pipeline south of and parallel to the existing Badami pipeline. It also was adjusted to avoid waterbody crossings where practical. This PTGP routing was finalized in fall 2009 and was used as the basis for engineering and cost estimating in support of the project's open season. Subsequent routing revisions were made primarily to cross and stay to the south

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of the proposed Point Thomson Project liquids pipeline, to improve major river crossing locations, to avoid pingos (mounds of earth-covered ice found in arctic and subarctic regions), and to route further from established drilling and processing facilities. No major or minor route alternatives have been evaluated for the PTGP. Four minor route variations are evaluated below.

To route the proposed Alaska Mainline, APP planners and engineers considered that the proposed Alaska Mainline segment of APP would connect to the Canadian Section of the Project at the Alaska-Yukon border. The location of the international border interconnect is fixed by the fact that the Project already has a certificated route in Canada. The location of this interconnect has resulted in the present routing decisions for the southern end of the Alaska portion of the APP.

In routing the pipeline, APP planners and engineers initially established a 2-mile-wide corridor that generally followed existing rights-of-way (the TAPS pipeline and the Alaska Highway) from Prudhoe Bay to the Alaska-Yukon border. Installation of new pipelines along existing rights-of-way (such as other pipelines and roads) is often environmentally preferable to constructing in a new, greenfield right-of-way because impacts can normally be reduced by using a previously disturbed right-of-way and existing infrastructure, rather than creating a new right-of-way through previously undisturbed areas. However, collocating facilities within a shared right-of-way can be operationally challenging and may not be preferred from a facility management standpoint.

After establishing a corridor that followed existing rights-of-way, project planners and engineers identified a specific route within the corridor using preliminary data from existing literature and field reconnaissance. This early route was finalized in early 2009 and was used as the basis for engineering and cost estimating in support of the project's open season. Since 2009, project planners and engineers have gathered additional information and further refined the route. A variety of factors were considered in refining the route, including pipeline length, land requirements, landowners affected, accessibility, constructability, and environmental impacts. The proposed project represents APP's preferred route, whereas the alternatives presented here represent segments of the original route that were rejected in favor of the changes. Six minor route alternatives and 14 route variations have been evaluated for the Alaska Mainline.

10.5.1 MAJOR ROUTE ALTERNATIVES

There are no major route alternatives for the proposed project.

10.5.2 MINOR ROUTE ALTERNATIVES

10.5.2.1 Prudhoe Bay Coastal Plain Route Alternative

The Prudhoe Bay Coastal Plain Route Alternative follows a "straight-line" approach between its beginning and end points, approximately five and thirty miles south of the GTP, whereas the proposed route follows a more irregular route along TAPS and the Dalton Highway. [See Figure 10.5.2-1, to be provided in the Draft Report.] Both routes traverse relatively flat terrain characteristic of the North Slope, with many shallow lakes, polygonal ice wedge formations, and tundra. Table 10.5.2-1 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

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TABLE 10.5.2-1

Alaska Pipeline Project
Comparison of the Prudhoe Bay Coastal Plain Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.2.2 Brooks Range Foothills (North Side) Route Alternative

The Brooks Range Foothills (North Side) Route Alternative generally follows a "straight-line" approach between the beginning and end points, in the general vicinity of TAPS Pump Station 3, whereas the proposed route follows a more irregular route along TAPS and the Dalton Highway. [See Figure 10.5.2-2, to be provided in the Draft Report.] The alternative extends generally west of, and parallel to, TAPS and the Dalton Highway. The alternative traverses mostly flat terrain associated with a tributary of the Sagavanirktok River as well as some rolling terrain characteristic of the Brooks Range Foothills towards its end. Table 10.5.2-2 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

TABLE 10.5.2-2

Alaska Pipeline Project
Comparison of the Brooks Range Foothills (North Side) Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD

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TABLE 10.5.2-2

Alaska Pipeline Project
Comparison of the Brooks Range Foothills (North Side) Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.2.3 Atigun Pass Route Alternative

The Atigun Pass Route Alternative was considered due to its proximity to the highway on both sides of the continental divide where it was located on the high (mountain) side of the highway in or adjacent to the highway ditch. [See Figure 10.5.2-3, to be provided in the Draft Report.] The proposed route and the Atigun Pass Route Alternative each traverse mountainous terrain with significant cross and longitudinal slopes within the Atigun River Valley, although the route alternative follows a slightly straighter alignment at certain points along the route, whereas the proposed route follows a more irregular route along TAPS and the Dalton Highway. Table 10.5.2-3 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

TABLE 10.5.2-3

Alaska Pipeline Project
Comparison of the Atigun Pass Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD

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TABLE 10.5.2-3

Alaska Pipeline Project
Comparison of the Atigun Pass Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.2.4 Yukon River Route Alternative

The Yukon River Route Alternative was considered as another option across the Yukon River. [See Figure 10.5.2-4, to be provided in the Draft Report.] The route alternative deviates significantly from the proposed route, which generally follows TAPS and the Dalton Highway, and follows the Dalton Highway until it reaches the Yukon River. At the Yukon River, the route alternative follows the river east at which point it turns southeast to cross the Yukon River. After crossing the river, the route alternative follows a generally straight course southeast to realign with the proposed route. The route alternative traverses relatively flat terrain north of, and hilly terrain south of, the Yukon River. Table 10.5.2-4 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

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Alaska Pipeline Project
Comparison of the Yukon River Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

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[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.2.5 Fairbanks Bypass Route Alternative

The Fairbanks Bypass Route Alternative was considered because the terrain along the route alternative is relatively flat, the route doesn't deviate as far to the east before turning to the south, and it shifts back to parallel TAPS as soon as practical at the south end when entering the Eielson Air Force Base. [See Figure 10.5.2-5, to be provided in the Draft Report.] The route alternative follows a slightly more irregular route between the beginning and end points than does the proposed route. Both routes traverse various waterbodies and relatively flat terrain, with the proposed route encountering slightly more rolling terrain than the route alternative. Table 10.5.2-5 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

TABLE 10.5.2-5

Alaska Pipeline Project
Comparison of the Fairbanks Bypass Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.2.6 Delta Junction Route Alternative

The Delta Junction Route Alternative was considered mainly because it took a straight line approach through farm land and property onthe east side of Delta Junction. [See Figure 10.5.6-1, to be provided in the Draft Report.] The route alternative generally parallels the proposed route on its northeast side. Both routes traverse a number of creeks and relatively flat terrain. Table 10.5.2-6 compares the pertinent environmental features of this alternative and the corresponding segment of the proposed route.

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TABLE 10.5.2-6

Alaska Pipeline Project
Comparison of the Delta Junction Route Alternative to the Alaska Mainline Proposed Route

Factor	Unit	Route Alternative	Proposed Route
Length of route	miles	TBD	TBD
Construction right-of-way area	acres	TBD	TBD
Permanent right-of-way area	acres	TBD	TBD
Parallel to existing rights-of-way[a]	miles	TBD	TBD
TAPS / other utility crossings	no. / no.	TBD / TBD	TBD / TBD
Highway and road crossings	no.	TBD	TBD
Potential blasting required[b]	miles	TBD	TBD
Active geological fault crossings	no.	TBD	TBD
Waterbody crossings	no.	TBD	TBD
Wetlands / high value wetlands crossed	miles / miles	TBD / TBD	TBD / TBD
Recreation or designated uses[c]	miles	TBD	TBD
Residences[d]	no.	TBD	TBD
Federal land affected	miles	TBD	TBD
State land affected	miles	TBD	TBD
Private land affected	no. / miles	TBD / TBD	TBD / TBD

[a] Within 500 feet of the proposed centerline
[b] For shallow bedrock or permafrost
[c] Such as trails, ballfields, campgrounds, landfills, quarries, etc.
[d] Within 50 feet of the proposed construction work area

[Note: Detailed analysis and comparison will be provided in the Draft Report.]

10.5.3 ROUTE VARIATIONS

Route variations differ from route alternatives in that they are typically shorter in length and do not deviate as far from the proposed route as route alternatives, and they are identified to resolve or reduce construction impacts on localized specific resources such as cultural resource sites, wetlands, recreational lands, residences, and terrain conditions. Because route variations are identified in response to specific local concerns or engineering constraints, they may not always clearly display an environmental advantage other than reducing or avoiding impacts on specific features. Table 10.5.3-1 summarizes the route variations for the APP and the maps provided in Appendix 10A depict route variations that were identified by project planners and engineers as they refined the proposed route. [Note: Appendix 10A to be provided in the Draft Report.] The currently proposed route, therefore, represents APP's preliminary preferred route. The variations summarized in Table 10.5.3-1 represent segments of the original route that were rejected in favor of the changes.

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TABLE 10.5.3-1

Alaska Pipeline Project
Comparison of the Proposed Route to Route Variations

Route Variation Name	Mileposts	Length Greater than (Less than) Variation (miles)	Distance From Variation (feet)	Reason for Consideration
POINT THOMSON GAS TRANSMISSION PIPELINE				
North Slope Borough				
Foggy Island Bay	TBD	TBD	TBD	Fewer waterbody crossings; avoids two pingos
Sagavanirktok River	TBD	TBD	TBD	Increases offset from two deep lakes
Prudhoe Bay	TBD	TBD	TBD	Avoids closely-spaced drill pads and other utilities
Putuligayuk River	TBD	TBD	TBD	Improves alignment across river; avoids construction through mouth of tributary
ALASKA MAINLINE				
Yukon-Koyukuk Census Area				
Nutirwik Creek	TBD	TBD	TBD	Closer to TAPS; improves access; less rugged terrain
Dietrich Camp	TBD	TBD	TBD	Closer to TAPS; improves access; less rugged terrain
Sukakpak Mountain	TBD	TBD	TBD	Avoids old river oxbow; less rugged terrain; avoids two Dalton Highway crossings
Grayling Lake	TBD	TBD	TBD	Improves road crossing alignments; avoids parking lot
Fort Hamlin Hills	TBD	TBD	TBD	Less rugged terrain; improves TAPS crossing; improves waterbody crossing
Slate Creek	TBD	TBD	TBD	Improves access and TAPS crossing; greater collocation with existing rights-of-way
Fairbanks Northstar Borough				
Tungsten Hill Fairbanks	TBD	TBD	TBD	Improves alignment across highway, commercial area, and rugged terrain; further away from federal facility
Tanana-Tetlin Census Area				
Berry Creek	TBD	TBD	TBD	Improve constructability near creek in steep topography; avoids potential archaeological sites near Berry Creek
Midway Lake	TBD	TBD	TBD	Greater collocation with highway right-of-way
West of Bitters Creek	TBD	TBD	TBD	Greater collocation with highway right-of-way
West of Beaver Creek	TBD	TBD	TBD	Greater collocation with highway right-of-way
Beaver Creek	TBD	TBD	TBD	Less rugged terrain
Northway Junction	TBD	TBD	TBD	Greater collocation with highway right-of-way
Scottie Creek	TBD	TBD	TBD	Improves creek crossing; increases offset from tributary; increases collocation with existing rights-of-way

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10.6 ABOVEGROUND FACILITY SITES

10.6.1 GAS TREATMENT PLANT

In siting the proposed GTP, APP first conducted a geographical analysis. These geographical areas were the Prudhoe Bay Unit (PBU), west of the PBU, south of PBU, and east of PBU. [See Figure 10.6.1-1, to be provided in the Draft Report.] Specifically, the geographical areas include:

- PBU: in the vicinity of the developed area of the PBU, including Deadhorse;
- West of PBU: beginning outside the developed area of the PBU and extending westward, the western boundary of this area is not specifically defined;
- South of PBU: beginning south of Deadhorse and extending southward, the southern boundary of this area is not specifically defined; and
- East of PBU: beginning outside the developed area of the PBU and extending eastward, the eastern boundary is defined by the Arctic National Wildlife Refuge.

Geographical siting criteria that APP reviewed consisted of several specific environmental, technical, economic, and operational criteria required to accommodate a GTP and its related facilities. Table 10.6.1-1 summarizes these criteria and identifies whether the geographical areas fulfilled APP's initial criteria.

TABLE 10.6.1-1

Alaska Pipeline Project
Alternative Gas Treatment Plant Site Geographical Areas Comparison

Preferred Criteria for a Gas Treatment Plant site	PBU	East of PBU	South of PBU	West of PBU
Near feed gas source and at needed pressure	Yes	No	No	No
Near injection points	Yes	No	No	No
Proper safety distance from existing operating facilities and public/private infrastructure	Yes	Yes	Yes	Yes
Infrastructure improvements cause minimal environmental impact	Yes	No	No	No
Existing infrastructure used	Yes	No	No	No
Existing resources/services for both construction and operations used	Yes	No	No	No

In comparison to the proposed geographical area (i.e., PBU), none of the three alternatives was able to fulfill the required siting criteria. Therefore, these alternative geographical areas were not evaluated further.

Subsequently, APP identified the proposed GTP site and three alternative sites in or near the preferred geographical area, including the following.

1. Proposed site: Located west of the existing Central Gas Facility (CGF);
2. Alternative Site 1: Located north of the Oxbow Pit (Put-23);
3. Alternative Site 2: Located southwest of the Deadhorse Airport; and

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4. Alternative Site 3: Located north of the CGF/Central Compression Plant (CCP).

It should be noted that for evaluation purposes, Alternative Sites 1, 2, and 3 all had identical pad footprints and a similar logistical execution plan consisting of using West Dock 2 to offload the modules and transport them to the site using primarily existing roads. Infrastructure differences between these alternatives were primarily on the length of road upgrades, pipeline crossings, and new line lengths. Alternative Site 3, however, had a newly built dock extending out into Prudhoe Bay, and modules would not travel over existing roads.

10.6.1.1 Alternative Site 1

Alternative Site 1 is located north of the Oxbow Pit (Put-23). [See Figure 10.6.1-2, to be provided in the Draft Report.]

Table 10.6.1-2 provides a comparison of environmental considerations of the proposed site and Alternative Site 1.

TABLE 10.6.1-2

Alaska Pipeline Project
Comparison of Alternative Site 1 to the Proposed Gas Treatment Plant Site

Criteria	Alternative Site 1	Proposed Site
Land Availability	TBD	TBD
Zoning	TBD	TBD
New vs. Existing Facility	TBD	TBD
Wetland Impacts	TBD	TBD
Designated Land Uses and Constraints	TBD	TBD
Polar Bear Habitat	TBD	TBD
Nesting Eider Habitat	TBD	TBD
Caribou Migration Corridors	TBD	TBD
Bowhead Whale	TBD	TBD
Yellow-Billed Loon Habitat	TBD	TBD
Raptor and Migratory Bird Nests	TBD	TBD
Cultural or Paleontological Resources	TBD	TBD
Air Quality	TBD	TBD
Noise Sensitive Areas	TBD	TBD
Previously Disturbed Lands	TBD	TBD
Potential for Spill to Open Water (Prudhoe Bay)	TBD	TBD

10.6.1.2 Alternative Site 2

Alternative Site 2 is located southwest of the Deadhorse Airport. [See Figure 10.6.1-2, to be provided in the Draft Report.]

Table 10.6.1-3 provides a comparison of environmental considerations of the proposed site and Alternative Site 2.

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TABLE 10.6.1-3

Alaska Pipeline Project
Comparison of Alternative Site 2 to the Proposed Gas Treatment Plant Site

Criteria	Alternative Site 2	Proposed Site
Land Availability	TBD	TBD
Zoning	TBD	TBD
New vs. Existing Facility	TBD	TBD
Wetland Impacts	TBD	TBD
Designated Land Uses and Constraints	TBD	TBD
Polar Bear Habitat	TBD	TBD
Nesting Eider Habitat	TBD	TBD
Caribou Migration Corridors	TBD	TBD
Bowhead Whale	TBD	TBD
Yellow-Billed Loon Habitat	TBD	TBD
Raptor and Migratory Bird Nests	TBD	TBD
Cultural or Paleontological Resources	TBD	TBD
Air Quality	TBD	TBD
Noise Sensitive Areas	TBD	TBD
Previously Disturbed Lands	TBD	TBD
Potential for Spill to Open Water (Prudhoe Bay)	TBD	TBD

10.6.1.3 Alternative Site 3

Alternative Site 3 is located north of the CGF/CCP area near the Prudhoe Bay shoreline. [See Figure 10.6.1-2, to be provided in the Draft Report.]

Table 10.6.1-4 provides a comparison of environmental considerations of the proposed site and Alternative Site 3.

TABLE 10.6.1-4

Alaska Pipeline Project
Comparison of Alternative Site 3 to the Proposed Gas Treatment Plant Site

Criteria	Alternative Site 3	Proposed Site
Land Availability	TBD	TBD
Zoning	TBD	TBD
New vs. Existing Facility	TBD	TBD
Wetland Impacts	TBD	TBD
Designated Land Uses and Constraints	TBD	TBD
Polar Bear Habitat	TBD	TBD
Nesting Eider Habitat	TBD	TBD
Caribou Migration Corridors	TBD	TBD
Bowhead Whale	TBD	TBD
Yellow-Billed Loon Habitat	TBD	TBD
Raptor and Migratory Bird Nests	TBD	TBD
Cultural or Paleontological Resources	TBD	TBD
Air Quality	TBD	TBD
Noise Sensitive Areas	TBD	TBD
Previously Disturbed Lands	TBD	TBD
Potential for Spill to Open Water (Prudhoe Bay)	TBD	TBD

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10.6.2 COMPRESSOR STATIONS

[Note: Compressor station site alternatives are currently being evaluated. Further information will be provided in the Draft Report.]

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