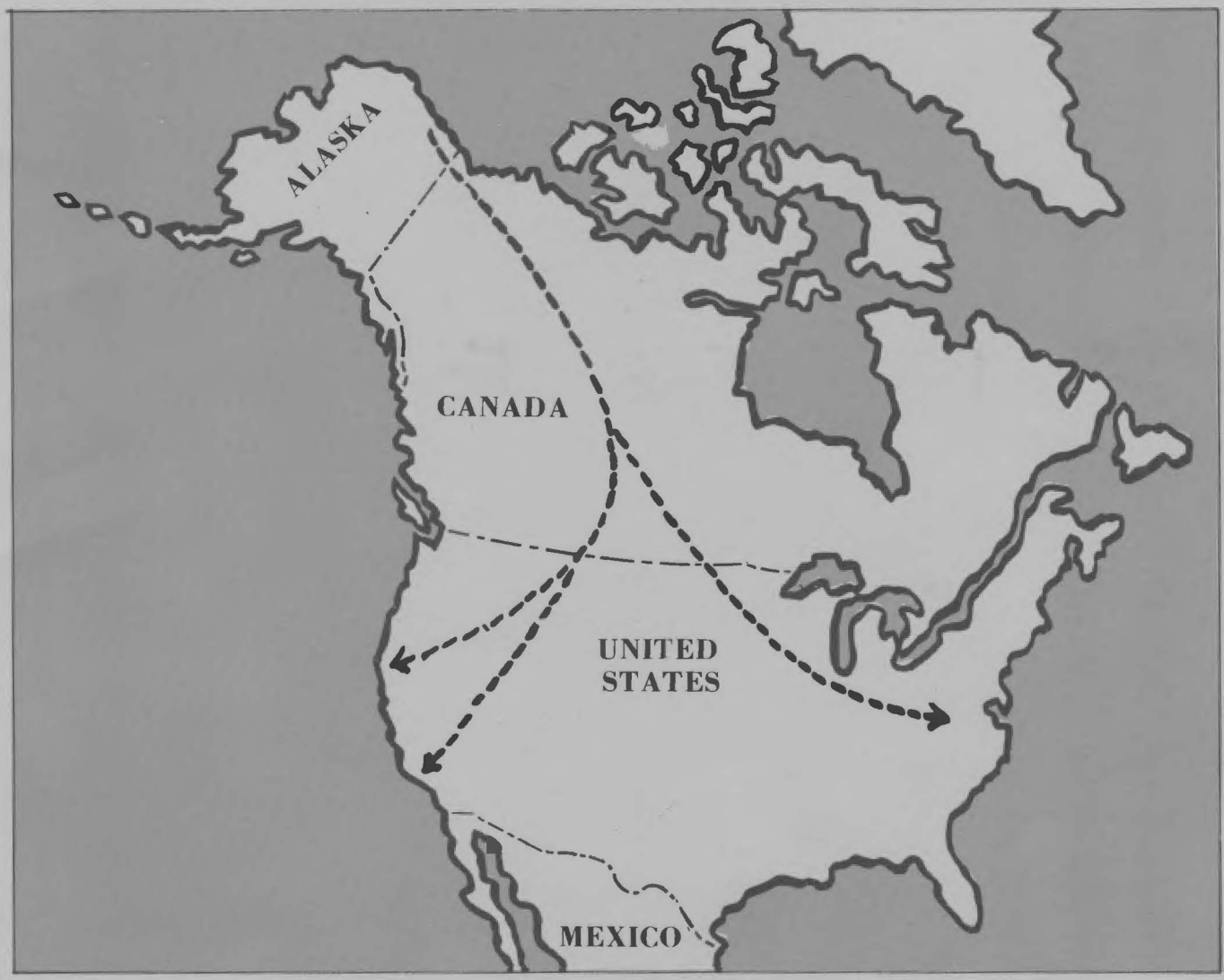
The original documents are located in Box 3, folder "Alaska Natural Gas Transportation System" of the Norman Ross Files, 1974-75 at the Gerald R. Ford Presidential Library.

ALASKA NATURAL GAS TRANSPORTATION SYSTEM

Draft Environmental Impact Statement

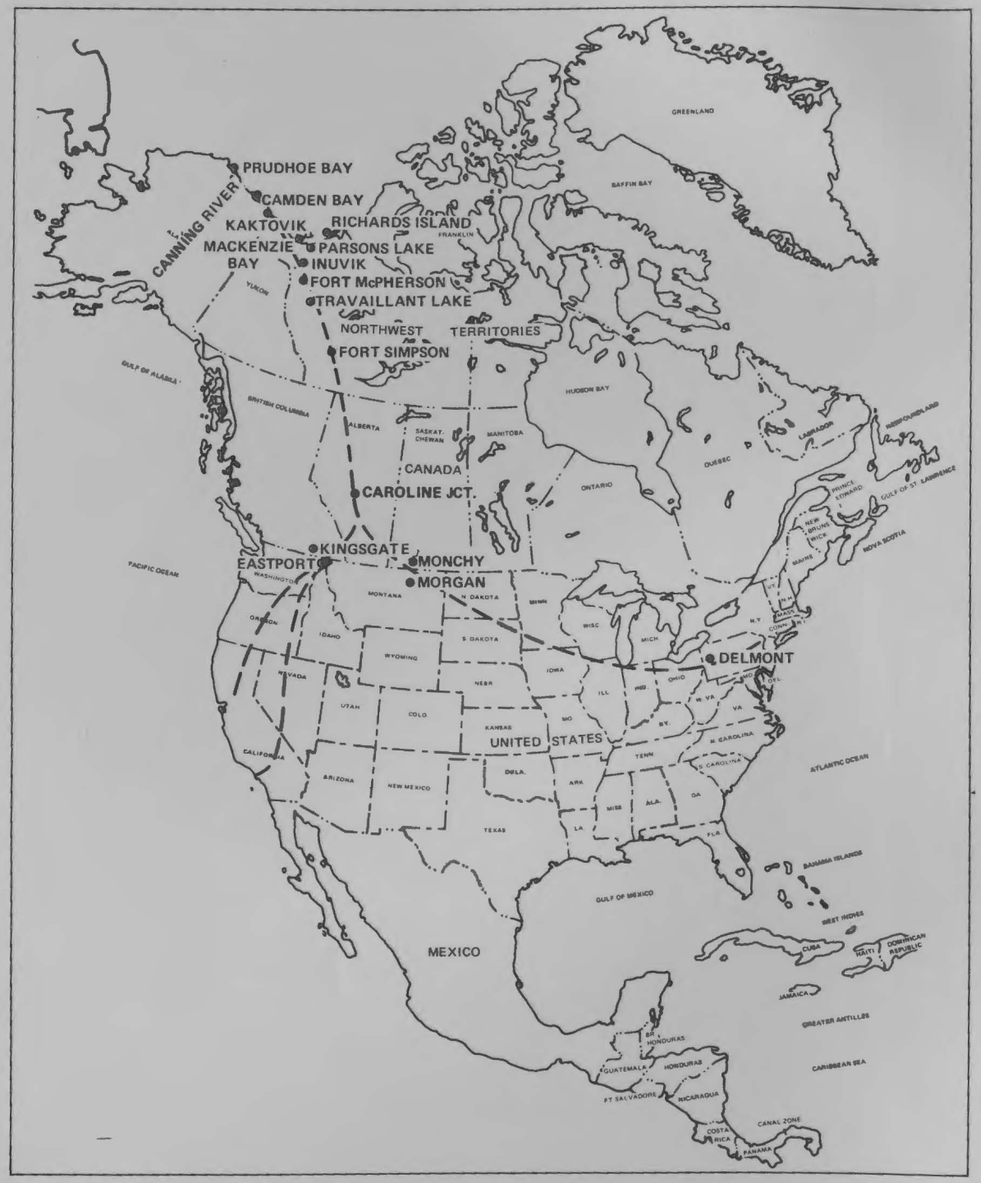
EXECUTIVE HIGHLIGHTS



JUNE 1975

U.S. DEPARTMENT OF THE INTERIOR

WASHINGTON, D.C. 20240



EXECUTIVE HIGHLIGHTS

Alaska Natural Gas Transportation System
Draft Environmental Impact Statement

INTRODUCTION

A major oil find on the North Slope of Alaska was proven in 1968. A 200 square mile area known as the Prudhoe Bay Field contains an estimated 26 trillion cubic feet of natural gas both in solution in the oil and as free gas. Following confirmation of the oil-gas discovery, the Alyeska Pipeline Service Company was formed to construct and operate an oil pipeline. Applications for permits and rights-of-way for the oil line were tied up in litigation until the matter was settled in November 1973, by the passage of amendments to the Mineral Leasing Act of 1920, which included the Trans-Alaska Pipeline Authorization. Congress authorized and directed the Federal Agencies to issue the necessary permits and rights-of-way for the construction of the oil line (TAPS). Actual pipeline construction began in the Winter of 74-75.

It is estimated that 1/3 of the natural gas is in solution with the oil and 2/3 is in a gas cap on top of the oil reservoir. Therefore, gas will be produced when the oil wells are put into operation. Natural gas can be reinjected into the oil field, utilized (or marketed), or wasted by flaring (burning gas in the open atmosphere). Since Alaska State law prohibits flaring of gas, that option is closed. Natural gas will be reinjected as the oil field becomes active until a reservoir analysis can be made. Significant quantities of gas will be available from the Prudhoe Bay Field, about one year after the oil operation starts.

A consortium of 27 companies has proposed construction of a 6,280-mile pipeline for the transportation of this gas from Prudhoe Bay to markets in the 48 conterminous States. The oil producers have entered into negotiating agreements with members of the consortium for the gas. These oil producers would gather, chill, compress, and deliver available gas to the consortium. Gas would be delivered to a metering station at the start of the gas pipeline at a temperature of 25° Fahrenheit and a pressure of 1,600 p.s.i.g. (pounds per square inch gauge).

The gas pipeline, in terms of dollars, is reported to be the largest privately financed project in the world. Based on early 1975 estimates the cost of construction would be $9.6 billion. Terminal points of the proposed pipeline will be Antioch, California; Cajon, California; and Delmont, Pennsylvania.

FEDERAL ACTION

Before construction can begin on a gas pipeline, appropriate agencies of the Federal Government must grant a series of permits, authorizations, and approvals. Among the agencies with major involvement is the Federal

Power Commission which must grant permits for interstate gas sales and for the construction and operation of interstate pipelines. The Department of the Interior is responsible for granting rights-of-way across Federal lands; some 967 miles of the pipeline are on Federal land. Since these are major Federal actions that will have a significant impact on the environment, this environmental impact statement has been prepared.

ENVIRONMENTAL IMPACT STATEMENT

The environmental impact statement is presented in seven parts as follows:

Part I	Overview (1 Volume)	Part V	North Border (3 Volumes
Part II	Alaska (3 Volumes)	Part VI	Alternatives (2 Volumes)
Part III	Canada (3 Volumes)	Part VII	Consultation and
Part IV	West Coast (4 Volumes)		Coordination (1 Volume)

The first five parts are geographically oriented and are presented in parallel format. The following subject groupings are covered sequentially in each Part:

1. Description of the proposal.
2. Description of the environment.
3. The environmental impact of the proposed action.
4. Mitigating measures included in the proposed action.
5. Any adverse effects which cannot be avoided should the proposal be implemented.
6. The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.
7. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
8. Alternatives to the proposed action.
9. Consultation and coordination with others.

Part VI, Alternatives and Part VII, Consultation and Coordination develop their subjects in a different grouping than the geographic parts.

A reader may elect to pursue his particular interest selectively. For example, a reader interested only in his area, say Montana, could use Part I for the big picture and Part V, North Border for the coverage of his specific area. In the same manner, a reader interested in ways of transporting natural gas could refer to Part VI, Alternatives and satisfy his needs.

Following is ~~a brief~~ description of the coverage of each part:

Part I — Overview - The Overview covers the Arctic Gas System proposal in its entirety. It will be most useful to those readers who want a system view and a broad concept of anticipated environmental impacts of the 6,280 mile pipeline project.

Part II — Alaska - This part covers the 195 mile proposal of the Alaskan Gas Arctic Pipeline Company originating at Prudhoe Bay and terminating at the Alaska-Yukon Border.

Part III — Canada - This portion of the environmental impact statement analyzes the 2,430 mile pipeline proposal of Canadian Arctic Gas Pipeline, Ltd., beginning at the Yukon-Alaska Border and proceeding generally southward to Caroline Junction in Alberta. At this point, the proposed pipeline forks, one leg entering Idaho, near Kingsgate, British Columbia, and the other entering Montana, near Monchy, Saskatchewan.

Part IV — West Coast - This part analyzes two pipeline proposals. One, a 917 mile pipeline, is sponsored by the Pacific Gas Transmission Company and passes through Idaho, Washington, and Oregon to Antioch, Contra Costa County, California. The other, a 1,119 mile pipeline, is proposed by Interstate Transmission Associates (Arctic), and passes through Idaho, Oregon, Nevada, and terminates at Cajon, San Bernardino County, California.

Part V — North Border - This part is an analysis of the 1,619 mile pipeline proposed by the Northern Border Pipeline Company. It covers the area from the United States-Canada Border crossing in Montana, across North and South Dakota, Minnesota, Iowa, Illinois, Indiana, Ohio, a short distance in West Virginia, and terminates near Delmont, Pennsylvania.

Part VI Alternatives - This part covers a "no action" alternative, deregulation, other natural gas sources, alternative energy sources, modes of transportation, route alternatives, pipeline size alternatives, and a special section on a major system alternative of crossing Alaska by pipeline and then converting gas to a liquefied state for transportation to lower 48 States by sea.

Part VII Consultation and Coordination - This part describes and discusses the efforts made by the Department of the Interior to consult with and coordinate its work in the development of this statement. It includes the gathering of basic information for analysis, public meetings, and efforts which have and will be made to assure that environmental impacts are adequately treated.

CONCEPT OF THE PIPELINE PROPOSAL

The basic concept of the Arctic Gas Project is construction of a buried overland natural gas pipeline over a relatively direct route from northern Alaska and northwestern Canada to market areas across both Canada and the U.S. It will be built with large capacity, in order to achieve the economies of scale made possible by transporting natural gas from both the United States and Canadian Arctic to market areas in both nations, which have a growing need for the gas. The gas will be refrigerated in the north to protect the integrity of the pipeline and to lessen disruption of the permafrost. In permafrost areas, construction will be in the winter. Both measures are among the steps which help protect the environment.

The forty-eight inch main line of the Arctic Gas Project will carry approximately 4.5 billion cubic feet of gas per day when full compression horsepower is installed. The line can, of course, be expanded by "looping" and adding compression in order to carry additional volumes of gas as they become available.

Present planning calls for startup capacity and throughput of 3.25 billion cubic feet per day, with expansion to 4.5 billion in about three years, but these levels can be modified to carry the available gas.

Alaskan Arctic Gas Company will own and operate a pipeline from Prudhoe Bay on the Beaufort Sea coast of northern Alaska to the Alaska-Yukon border, approximately 195 miles to the East. In the Prudhoe Bay area, the large quantities of natural gas, as well as oil, which have been proven lie in the middle of an area of even larger additional potential reserves of both oil and gas.

From the Alaska-Yukon border, the pipeline passes into the ownership of Canadian Arctic Gas and runs east and south across the narrow Yukon neck to a point near Travaillant Lake, in the Northwest Territories, where it will connect with the pipeline lateral from the Canadian arctic producing areas in the Mackenzie Delta, which will be transporting Canadian source gas.

From Travaillant Lake, the pipeline carrying both Canadian and U.S. source gas will run in a generally southern direction up the Mackenzie River and into the province of Alberta to a point near Caroline.

At Caroline the line will divide, with the western leg running to Kingsgate on the border between Idaho and British Columbia. The eastern leg will run to Monchy, Saskatchewan on the Montana border. The existing and proposed gas pipelines which will connect with Arctic Gas at the Monchy and Kingsgate points on the U.S.-Canadian border are essential parts of the Project.

The Canadian gas destined for Canadian pipelines and markets will leave the eastern leg of the Arctic Gas system at Empress, Alberta, where the line connects with that of Trans Canada Pipeline, a member company

which is the major supplier to Manitoba, Ontario and Quebec. Other points of connection for supply of Canadian gas to other parts of Canada will also be provided.

To carry Arctic gas to the U.S. Midwest and East, and to the regions south of there which they serve, six U.S. pipeline companies have created Northern Border Pipeline Company. This company will be a carrier of gas and will construct a pipeline from the Montana border point, past the coal fields of Montana and the Dakotas, through Minnesota, Iowa, Illinois, Indiana, Ohio and on to its terminus in western Pennsylvania. Along the way it will have connection points at which gas can be delivered to most of the companies which serve the area east of the Rocky Mountains.

To serve areas of the United States west of the Rocky Mountains two pipelines are included. One line will terminate near San Francisco; this line is essentially an expansion of an already existing system. The other line terminates near Los Angeles and is a new pipeline to interconnect and serve markets in the Pacific Southwestern area near Los Angeles.

SALIENT IMPACTS

A 6,280 mile linear development plunging south across the North American continent to both the Pacific and Atlantic Coastal areas of the lower United States can be expected to have significant and many environmental impacts. It does.

The EIS addresses the following environmental factors:

Climate	Socio-Economic
Topography	Land Use
Geology	History-Archeology
Soils	Paleontology
Water Resources	Recreation-Aesthetics
Vegetation	Air Quality
Wildlife	Noise
Ecology	Other Special Items

The environmental factors listed above impact the pipeline proposal in a definitive manner. Likewise, the environmental factors are impacted by the construction, operation, and maintenance of the pipeline facilities. To illustrate, climate, one of the environmental factors, is on the receiving end of little or no significant modification resulting from the pipeline; localized micrometeorological impacts - yes but no regional climatic changes. On the other hand, the harsh extreme temperatures, strong winds, blowing snow, and winter darkness all interact to make construction activities hazardous in the Arctic environment.

EIS coverage is from both view points, but in this executive highlight emphasis is placed upon the environmental impacts of the pipeline.

Following are concise highlights of some of the more prominent impacts that are identified:

Climate

- Compressor station turbine exhaust emissions of some 7,200 gallons of 600°F water vapor per hour would affect the climate immediately adjacent to each compressor station in the arctic areas of Alaska and the Yukon.

- The pipelines to San Francisco and Los Angeles, carrying gas at about 100°F, would be considerably warmer than the surrounding soil and would influence the duration of snow cover over the lines.

Topography

° Construction of the proposed pipeline system would change the character of the terrain in many local instances, modifying its contours and dimensions.

° Wind erosion of disturbed soils, and gully erosion following construction will change the topography and also cause secondary impacts by transporting the soil to other locations.

° In open tundra and grassland landscapes, the pipeline ditch berm, gravel road and airfield embankments, the the various buildings and towers will create new elevations and a new horizon alien to the natural topography.

Geology

° The proposed pipeline system would have no significant impact on the bedrock along the route.

° The installation of the pipeline and its associated airfields, roads, and communications network would stimulate prospecting and development of additional oil and gas reserves and mineral deposits in the Arctic.

° The proposed pipeline will be buried in permafrost and the construction will disturb the active layer, with resulting secondary impacts on vegetation, soils, and water quality.

Soils

° Disturbance and mixing of the soil profile will alter its structural characteristics, microbiological activity, and the soil-climate relationships. This mixing of subsoil on the surface of the backfilled ditch will prevent the full restoration of the site and cause a permanent loss of soil productivity.

° Crop growth and grazing capacity would also be reduced on the routes, with the impacts depending on the soil type. In all cases the pipeline excavation will be 7 to 10 feet deep. Topsoil horizons vary from a few inches to 2 feet along the various routes.

° An estimated 300 miles of the Northern Border route could be left with relatively sterile subsoils or parent materials on the surface.

° Wind erosion of exposed soils along the ditch would be a major impact where detached fine silt and clay particles are exposed. An estimated 17,000 tons per year could be lost by wind erosion on the Los Angeles route between Spokane and the Oregon border.

° Wind erosion hazard would also be high along the 650 miles of the Northern Border route across the spring wheat region of Montana and North Dakota where losses could be as high as 53 tons of soil per acre per year. Losses exceeding 5 tons per acre per year from wind erosion would cause severe seedling damage and make revegetation of the right-of-way very difficult.

° Water erosion would form gullies and increase sediment yield from the disturbed soil on all routes. Erosion hazard is greater on certain soils.

° The Northern Border route would also cross three irrigation project areas in Montana and North Dakota. The ditch and gas pipeline would interfere with subsurface irrigation drains. Construction equipment and compaction would disturb the soil density and slope and interfere with gravity flow irrigation.

° From North Dakota east to Pennsylvania the proposed gas pipeline would transect thousands of miles of farm drainage systems. Pipeline ditching would cut these drains, introduce sediments, and possibly pollute the receiving streams. Without functioning drainage systems, farming would be very difficult.

Water Resources

° Construction and operation of the proposed natural gas pipeline system would present potential water resource impacts at each stream crossing from erosion and sedimentation, and from introduction of industrial chemicals and pollutants.

° Hydrostatic testing of the completed pipe will require huge volumes of water, and the indiscriminate use of surface waters for test fluids may reduce local flows and quality. Test-water discharges may be colored and have high iron oxide or other metal content which would lower quality of receiving waters and may form a reservoir of metals toxic to aquatic organisms.

° Disposal of water from purification columns at Prudhoe Bay, if a wet adsorption process is used to remove carbon dioxide and hydrogen sulfide from the gas, must be provided.

° Water supply is a significant problem in the Arctic where most surface water will be frozen during the construction season. Indiscriminate withdrawal of water from springs and lakes will have severe adverse effects on overwintering fish and invertebrates.

° Release of large volumes of test water into dry stream channels on the western routes would cause streambed scour, erosion, and increased sediment yields.

° Erosion from construction sites would cause a temporary reduction in downstream water quality, as would the use of large volumes of domestic water and discharge of sewage at each construction camp. The Los Angeles route passes close to a municipal water well in California, that could contaminate the supplies of two towns.

° Fuel and lubricant spills from construction machinery, compressor stations, camps, etc., would pollute surface water and ground water supplies. Huge volumes of fuels will be stored and used at each camp and some spills are inevitable.

Vegetation

° Vegetation and terrain surface integrity will be totally destroyed along the pipeline ditch, at camp and landing sites, towers, permanent roads, and other permanent facilities.

° Vegetation will be partially destroyed and changed by winter roads; alteration of drainage; forest, grass and tundra fires; fuel and methanol spillage; sulfur dioxide emissions; and off-road vehicle use for pipeline emergency repairs.

° Invasion by weedy plant species is expected to occur in the denuded areas, particularly on land managed for wildland or forest.

° The incidence of fire will probably increase during the construction and operation of the pipeline, but so should the ability to detect and control fire.

° Where the pipeline crosses forests or woodlands, there will be a permanent change in vegetation, because in no case will forest or woodland be allowed to grow directly over the line. Cropland production loss will be considerable while construction is underway, but will be back to near normal within a few years.

Wildlife

° Areas of critical mammalian habitat that would be affected, for examples, caribou calving grounds in Alaska and Indiana bat caves. Areas will be affected by clearing vegetation for rights-of-way and project-related facilities, by pollutant spills, and by continued suppression of trees and brush during the operation phase.

° If project disturbance forces the animal from a critical portion of its range or changes its habits, populations could be reduced. Disturbance factors include noise from construction, maintenance and operation machinery; aircraft used in line inspection; and increased numbers of people in the area.

° Disturbance will be the main factor affecting birds. Project caused disturbance will drive birds from their nesting and resting areas and in the case of waterfowl will affect the molting and fall staging periods so that population numbers will drop.

° Habitat destruction from water quality degradation, vegetative change or destruction, changing drainage patterns, and drainage of water courses will all adversely affect bird populations.

° Increased sedimentation from upstream erosion and stream crossing activities will be the major cause of fish losses.

° Pollutants in and on the water, blasting near fish spawning areas when eggs are present, and increased or decreased water temperatures because of vegetative changes or pipeline operation will also adversely affect fish populations.

Ecology

° Disturbance of the organic cover protecting soils from erosion, and the mixing of topsoils with subsurface materials will adversely affect the functioning of all terrestrial ecosystems and result in reduced productivity.

° The prairie pothole region contains a very special ecosystem which provides the cover and nutrition required by many waterfowl and shorebirds at critical periods in their life history. Pipeline system intrusion on this ecosystem, already decimated by agricultural drainage, will affect migratory bird populations covered by international treaties with Canada and Mexico.

° Turbidity and sedimentation created at stream crossings will result in a reduction in primary productivity of the affected streams which should last only one season unless erosion of the disturbed areas continue to contribute silt to the stream.

° Pipeline construction will cause locally significant losses in net annual productivity, but in relation to the size of most ecosystems affected, the losses will be minor.

Socio-economic

° During the construction phase, tax benefits to State and local governments along the pipeline corridor will come primarily from sales and motor fuel taxes. Personal and corporate income taxes will also generate revenues to the States. Additional revenues to local government will be generated by State and local sales and income taxes where they apply.

° Property taxes on the pipeline, compressor stations and improvements will be the primary tax benefits to the governments through whose jurisdiction the pipeline passes. New housing and business expansions resulting from the needs of new permanent employees would add to the local property tax base.

° Alaska would have an additional benefit from the sale of its royalty interest (12.5%) of the natural gas produced there.

° Adverse impacts would come about because of short-term surges of demand for housing; demand for Federal, State, and community services; cultural upheaval; and increased competition for recreation, education, transportation, and entertainment.

° Impacts will be felt more intensely in small communities and counties with small populations.

Land Use

° The pipeline right-of-way will impact the agricultural use during the construction period. Those lands required for use of compressor and pumping stations, new roads, and other permanent facilities needed for the operation phase of the project will be lost to agricultural use for long periods of time.

° In those parts of the country where irrigation is used in conjunction with agriculture, a new set of impacts are found such as the problem of interference with irrigation and drainage ditches.

° The pipeline will traverse large areas of forested lands, both commercial and non-commercial. In the commercial forested areas there will be a long-term loss of timber production.

° Residential, commercial, and industrial land uses would be precluded from the pipeline right-of-way and from sites of related facilities.

° Existence of a transportation system would stimulate an increase in further exploration and possible development of potential oil and gas basins in northern Alaska and Canada as well as the coal field in Montana and other parts of the United States. The impacts from this aspect can be major and of national significance.

° Impacts on the existing land use plans would vary from major, as with the Arctic National Wildlife Range, to slight.

° The proposed project would impact a wide variety of existing transportation and communication facilities. Major highways, secondary roads, railroads, navigable rivers, canals, power transmission lines and other pipelines would all be crossed or closely paralleled in places along the prime route.

Archeology-Paleontology-History

° The nature of the proposed construction is such that any cultural resource sites in the path of the pipeline, access roads, compressor stations or other facilities could be damaged or destroyed.

° In most cases the damage would be a direct consequence of site disruption and excavation by man and machine without knowledge of the paleontological or archaeological values, but in other cases the impact will come as a consequence of increased access and vandalism to unprotected historic sites.

° There are now enough sites of known historical and archaeological value along the various proposed pipeline routes to practically guarantee that additional sites will be encountered.

° Very little is known about the pre-history occupation of the Arctic Coastal Plain by man, but the coast and several of the rivers appear to have been trade routes where archaeological sites might be found. If the pipeline is constructed as proposed during the cold and dark arctic winter, discovery, protection and recovery of sites will be very difficult.

° Sites discovered and properly investigated prior to construction would add to the knowledge of our heritage. Some sites might be located during construction that could have enough interest and significance to warrant permanent protection and become points of interest and public attraction.

Recreation and Aesthetics

° The Arctic Slope of Alaska and the Yukon Territory is largely wilderness at this time and the proposed pipeline with its associated transportation and communications facilities would introduce not only machinery and noise, but also more people to the area.

° Pipeline system buildings, radio towers, airfields and other facilities will continue to alter the aesthetic quality of the Arctic Slope during the life of the pipeline.

° Vapor plumes from the compressor stations will stand out on the level arctic terrain and be visible for miles.

° The cleared and disturbed pipeline right-of-way will be a discordant element in the tundra and boreal forest vegetation for many years and will show up as a long, straight line with a color and texture different from the surrounding landscape.

° The loss of old trees, straight-line cuts through mature forests, and pipelines ascending steep bluffs and cliffs will all constitute aesthetic impacts of long duration.

° Pipeline construction access roads will provide public vehicular access in previously inaccessible areas.

Air Quality

° The only continuous long-term impacts on air quality would be from the operation of the many compressor stations along the gas pipeline system.

° Sulfur dioxide emissions, while low enough to preclude adverse effects on human health, would be present in sufficient concentrations to kill lichens which are very sensitive to sulfur oxides. Loss of lichens would have adverse impacts on caribou dependent on those plants in Alaska and Canada.

° Concentrations of construction equipment at some sites would cause nitrogen dioxide concentrations that exceed National Ambient Air Standards under certain meteorological conditions.

° Dust from constrcution activities would also create short-term adverse impacts on air quality and visibility.

Noise

° Ambient noise levels along much of the proposed 6,280 mile pipeline system are now very low and any pipe hauling, pipeline construction, or operating noises will be noticeable. Federal regulations are inadequate to reduce the noise from diesel trucks hauling pipe to construction sites.

° Where the pipeline passes near towns and farms, construction equipment noise will be loud enough to be highly annoying to thousands of people.

° Compressor station operating noises will be long-term. Compressors will be audible for 6,000 to 7,000 feet and the degree to which the noise annoys people will depend on location with respect to human habitation.

° Periodic venting of high pressure gas from the pipeline and compressor stations would cause temporary but severe increases in sound level. These maintenance check or emergency blowdowns would occur about once a year and last for 45 minutes on the pipeline and 5 minutes at a compressor. They would be audible for 15 miles.

° The operational noise from compressor stations with built-in silencers will be 66 to 71 db(A) at the compressor station boundary, and will range between 56 to 61 db(A) at approximately 800 feet from the boundary.

° Operating noises would have greater impacts on wildlife behavior than on human health over the northern portions of the pipeline system.

Other Special Items

° There are fire and health hazards involved in the gas processing operation which will occur at Prudhoe Bay.

° Natural gas is easily flammable, becomes explosive when confined, and when purified is odorless and can act as an asphyxiant.

° The propane used as a refrigerant is also flammable and, being denser than air, poses an even greater threat of fire than natural gas.

° Damage by outside forces, a construction defect, or a material failure could all cause a failure in the pipeline system resulting in a loss of gas and requiring emergency repair.

° Repair activities in some locations, and at some seasons, may cause damage to the environment more severe than that resulting from the initial construction. This is particularly true in the areas of continuous permafrost in Alaska and Canada, but because of the large investment involved and the large number of people dependent upon delivery of the gas, it is not reasonable to assume that major repairs will be postponed until ideal conditions prevail.

NEUTRALIZING IMPACTS

° Many environmental impacts stemming from the proposed pipeline are capable of being eliminated or mitigated in some manner to accomplish neutralization. Some neutralization measures are overwhelmingly logical from any view point and thus will be adopted, but others are trade-off items that may or may not be elected for adoption. This latter type, when important environmentally, must be mandated by some device such as conditions to permits or stipulations and restrictions to rights-of-way. There are many varieties and combinations that can be adopted. Pre-construction planning is one of the key steps that can be taken. This involves site location and alignment of the pipeline, as well as anticipatory design. Construction procedures carefully laid out and then followed contribute significantly to lessening or limiting environmental impacts.

° Some of the above steps are already contemplated and committed by the applicant. Other additional steps will be taken in planning by the applicant. These may well be mandated by the Department of the Interior in its grants of rights-of-way, as well as other Federal Agencies also conditioning their actions.

Final Pipeline Alignment

° Minor alignment changes, not to be confused with alternative routes, are changes in the proposed alignment to circumvent unstable areas, recreation areas, potholes and wetlands, woody areas, rivers and stream crossings in order to avoid interference with fish spawning areas, and to minimize the number of river, highway, and railroad crossings. Applicants have proposed judicious route selection as a positive mitigation measure but this has not yet been accomplished. As stated by the Applicants, mitigation will be accomplished during the final design phase through final route selection to avoid the conditions indicated above.

Pipeline Design

° The proposed pipeline system passes through the arctic, subarctic, and temperate zones in the United States and Canada. It crosses many geographic features, including major river crossings, seismic zones of varying magnitude measuring from 2 to 8.3 on the Richter scale, continuous permafrost, discontinuous permafrost, steep slopes, and floodplains.

° Design normally is done in phases that can be defined as conceptual design, preliminary design and final design. The applications submitted for analysis were considered to be in the conceptual design phase.

° The Applicants have basically addressed environmental concerns, environmental effects and mitigating measures related to a pipeline system. All of the problems of construction and operation created by the geologic occurrences are within the realm of engineering feasibility. The major part of the system does not go beyond the current state of the art in engineering, except in the Arctic and subarctic reaches through Alaska and Canada where the proposed burial of a chilled pipeline has never been done. The chilled pipeline concept, while achieving the purpose of maintaining permafrost conditions, creates problems such as frost heave and interference with stream flow, thereby disturbing the river regime and interfering with surface and subsurface water flow by developing an ice bulb around the pipeline. Design criteria for the arctic and subarctic conditions are not considered adequate; therefore further efforts are needed to prevent pipeline failure in order to mitigate adverse environmental impacts.

° Some of the design concepts not considered to be adequately addressed by the applicants are identified as follows:

Pipeline Safety Factors	Emergency Plans
Fracture Toughness	Seismic Monitoring
Seasonal Maintenance	Unrealistic Schedules
Frost Heave	Controlled Gas Chillers
Mass Wasting	Automatic Control Features
River Crossing Integrity	Cathodic Protection
Leak Detection	Properties of Gas
Effects of Leaking Gas	Operating Plans
Subsurface Soil Information	Gas Pressure/Temperature

Construction Procedures

° The Applicants plan to use conventional equipment and construction procedures to build the pipeline system in the temperate zone. Construction procedures have been modified to accommodate arctic and subarctic conditions by scheduling construction activities during the wintertime from snow/ice roads. Equipment and materials will be moved to stockpile areas during the summer months by rail, barge, highway and aircraft then delivered to jobsite during winter. Approximately 2,000 miles of this pipeline system occurs in the arctic and subarctic zones.

° Conventional construction procedures in the temperate zone such as survey, grading, stringing, bending, ditching, welding, coating and wrapping, lowering in and backfilling are well established and known, and generally are in areas where a road network can be utilized to transport equipment and material on a year around schedule. Arctic and subarctic areas where roads do not exist create special logistic problems which the Applicant proposes to accommodate with the proposed snow/ice roads. The snow/ice roads have to be constructed each winter and are usable from 3 to 5 months dependent on climatic conditions and maintenance. Ditching in frozen areas requires special techniques.

° Temperate zone construction procedures and schedules can be mitigated to protect the environment through standard procedures, such as rescheduling work to mitigate interference with animals or birds. Applicants have proposed to do this as necessary.

° Arctic and subarctic construction must be completed as scheduled in order to use the proposed snow/ice roads for access. Consequently, mitigation measures as proposed preclude interference with the environment and will reduce impacts. In this case mitigation is not fully effective and therefore impacts cannot be avoided. All environmental mitigation measures will be secondary to construction schedules.

ALTERNATIVES CONSIDERED

° The proposed action and its objectives have various alternatives; some are available to the Secretary of the Interior, some to the applicants, and some would involve such complex policy matters that their implementation would require Government-wide actions.

° The Secretary of the Interior has three obvious alternatives: grant the right-of-way permits sought, deny them, or defer the decision. The latter course would ultimately lead to one of the other two.

° Denial of permits would mean that the gas could not be transported by the proposed pipelines to market areas in southern Oregon, California, and a 29-state area of the north central and northeastern United States. If permits are denied, projected natural gas supplies would fall short of anticipated demand in the areas that would be supplied by the Arctic Gas System. This would lead to: 1. Use of other gas supplies; 2. Substitution for the energy by utilizing alternative energy sources; 3. Consideration of other routes or systems to transport the Alaskan gas to markets in the conterminous United States; and 4. Curtailment of gas supplies.

Alternative Energy Sources

° Alternative sources of natural gas include both domestic and imported supplies.

° In the past, natural gas consumed in the United States has been produced by conventional onshore and offshore oil and gas wells in the United States or supplies by overland pipeline imports from Mexico and Canada. The future United States gas supply will include liquefied natural gas (LNG) from regions that have large gas reserves but limited internal markets and substitute natural gas.

° For several years these sources have not been able to meet the rapidly growing demand.

° Deregulation of new natural gas at the wellhead is one measure that could change the natural gas supply-demand imbalance.

° Energy from sources other than natural gas can be considered as an alternative to transporting Alaskan gas. Interfuel substitution and energy conservation are also possible ways to alleviate the projected shortfall in gas supplies.

° The total potential United States energy supply exceeds probable demand through the year 1990 and beyond subject to the important qualification that the hydrocarbon portion of the domestic energy resource base is heavily weighted by coal. Uranium supply could be limited under present nuclear reactor technology, but may be extended almost indefinitely if breeder reactor technology is successful. Other key domestic energy resources, particularly natural gas and petroleum, are not as abundant and are not physically distributed within the regions that are the major consumers of these resources.

° Virtually all of the major energy resources currently in use are substitutable in a variety of uses in the energy markets. The factors affecting the use of a particular energy source are economics, availability, technology, environmental considerations, other social influences including preference, and administered restrictions or constraints. Considerable interfuel substitution is anticipated in projections of energy components to 1990 to make up for the anticipated shortfall in natural gas supply relative to requirements during that period.

° A possible alternative to the delivery of Alaskan gas is the conservation of equivalent amounts of energy in the United States through administered, regulated, or voluntary programs.

° Conservation of scarce energy supplies can also be accomplished through interfuel substitution of more abundant or low cost energy resources such as coal.

° Alternative sources of energy covered in the EIS are:

Coal	Hydroelectric Power
Petroleum	Geothermal
Oil Shale	Nuclear
Synthetic Gas and Oil	

° Several energy sources offer a variety of potential advantages over the longer term. These include tar sands, biological energy, solar energy, tidal power, and wind power. While each of these could contribute to some degree to the Nation's total energy supply in the future, they have not been developed to a point of economic feasibility to be realistic alternatives to Arctic Gas within the timeframe of the project.

° Technology is currently under development for several methods of increasing the efficiency of converting energy to work. These conversion techniques include fuel cells, magnetohydrodynamics, thermoelectric, and thermionic. As in the case of the long-term energy sources, research on these techniques is proceeding slowly, and they have not been developed to a point of feasibility at the present time that would make them realistic alternatives to the Arctic Gas System.

Alternative Transportation Modes

° Alternative modes of transportation for the Arctic Gas include densephase and methanol pipelines, railway, monorail, ice-breaking tankers, submarines, airplanes, helifloats, and dirigibles. The gas could also be converted to electricity and transmitted via high voltage lines or transported by a combination of transportation modes. The system considered the most likely alternative would be a combination pipeline LNG tanker system.

Alternative Routes

° Routes covered in the EIS include:

4 in combination Alaska-Canada
2 in Alaska only
0 in Canada only
4 in combination Canada-North Border
4 in North Border only
4 in West Coast only

Alternative Pipe Size

° An alternative system variation by pipe size is a smaller diameter pipe at the source (42-inch contrasted to 48-inch in the applicant's current proposal). Corresponding reduced sizes are covered in the Alaska, North Border, and West Coast segments considering Prudhoe Bay gas only.

COORDINATION EFFORTS

° The proposals presently pending before the Department of the Interior and Federal Power Commission were developed exclusively by the Applicant companies and without the direct involvement of the Federal Government. The information submitted by the Applicants to the Interior Department does indicate, however, that during the development of their applications and environmental reports, the Applicants did consult with some Federal agencies and bureaus which would have to issue permits and licenses were the proposals to be approved.

° Both the Federal Power Commission and the Department of the Interior determined that granting of the necessary permits and certificates would constitute a "major Federal action significantly affecting the quality of the human environment" and therefore would require an environmental impact statement. Both agencies determined, from the start, that a sound and comprehensive environmental analysis on the various proposals, when completed, would be useful and beneficial to the other Federal agencies and bureaus which would have to issue additional permits.

° It was believed, therefore, that the applications pending before the Federal Power Commission and the Department of the Interior could be adequately discussed in one environmental impact statement. A Memorandum of Understanding was executed by the Federal Power Commission and the Department of the Interior to prepare jointly a single environmental impact statement on the proposals for natural gas transmission facilities.

° In order to implement the terms of the Memorandum of Understanding, the Interagency Task Force established four subject-oriented work groups and four multidisciplinary support teams to gather and analyze information in the field and in defined geographic areas.

° In developing the environmental impact statement, the field teams drew upon the following sources of information: the applications submitted by the companies; supplemental information filed by the companies in response to questions by the Task Force; field data provided by various agencies; work contracted to firms with special, technical expertise; and the original research, analysis and writing completed by the field team members.

° A consolidated outline served as the primary mechanism for achieving an integration of the source materials and field drafts of the environmental impact statement. It was structured so that each section and subsection of the draft environmental impact statement could be assembled in a format which facilitated a "systems" analysis of the proposals or one which highlighted geo-political analysis.

° The Memorandum of Understanding to prepare an environmental impact statement was predicted upon then existing applications of the Arctic Gas System, and anticipated future applications of the El Paso Alaska Company (El Paso) for right-of-way permits and a Certificate to construct and operate a pipeline for a competing trans-Alaska water-based route. The Company, however, did not follow through with its announced intentions. The Memorandum of Understanding for a joint environmental impact statement was subsequently abrogated February 20, 1975, by the Secretary of the Interior.

° The Interagency Task Force and field teams were organized so that each would be able to conduct a multidisciplinary analysis of the companies' applications.

° In addition to the Interagency Task Force's consultation with the Washington office of the Federal agencies, representatives of the Task Force addressed the Federal Regional Councils. These councils represent all of the sections of the country which would be impacted by the proposals to transport natural gas from Alaska.

° The regulations (36 CFR 800) of the Advisory Council on Historic Preservation require that the Council be informed as early as possible when a Federal undertaking will impact on any cultural resources, especially those eligible for inclusion on the National Register of Historic Places. The Task Force formally alerted the Advisory Council to the preparation of the draft environmental impact statement.

° Even though the Canadian segment of the proposal lies within the territory of another sovereign nation, it was considered necessary for the U.S. Government to analyze the environmental impacts of the Canadian segment in order to understand the full range of impacts which would be created were the United States to give its

approval to the proposals to transport natural gas from Alaska to market areas in the lower United States. In order to develop a working relationship with the Canadian government, a series of meetings were held in the Spring of 1974 between Department of the Interior's Executive Director of the Interagency Task Force and the Canadian Deputy Minister for External Affairs. In the course of these meetings it was agreed that the Interagency Task Force would not undertake independent studies beyond those performed by or on behalf of the Canadian government as identified by the Pipeline Application Assessment Group or other duly constituted Canadian authorities nor would it request the Canadians to perform additional studies. The working draft of the Canadian segment of the environmental impact statement was sent to the Canadian Embassy for review and comment before the draft was filed with the Council on Environmental Quality.

° In order to give persons and organizations the opportunity to comment in advance on what they believed the environmental impacts of the proposed actions would be, the Task Force, in January, 1975, held information gathering meetings at eleven locations throughout the country. These meetings not only alerted the writing teams to the general concerns regarding the proposed gas transmission facilities, but also generated a large amount of information which centered on localized, specific environmental impacts.

° Each meeting had a morning, afternoon, and evening session so that the largest number of people could take part. Three hundred and eighty (380) people attended the eleven (11) public meetings at which a total of thirty-six (36) written statements were given and thirty-eight (38) oral statements were made. The oral statements and comments were either tape recorded or transcribed by a court reporter. Both the oral and written comments have been made a part of the public file. Approximately 130 written comments were received by the Task Force following the meetings.

° The draft environmental impact statement is being filed with the Council of Environmental Quality and widely circulated simultaneously to interested persons, organizations, and governmental jurisdictions. A 90-day review period will allow the draft statement to be reviewed widely and comprehensively.

° About sixty days after the release of the statement, public hearings will be held in various locations to receive comments on the draft environmental impact statement.

° Hearings will be held in:

Anchorage, Alaska	Sacramento, California
Juneau, Alaska	Reno, Nevada
Fairbanks, Alaska	Billings, Montana
Portland, Oregon	Bismarck, North Dakota
Spokane, Washington	Chicago, Illinois
	Washington, D.C.

° The times and locations of the above meetings and any additional hearings which may be scheduled will be published in the Federal Register at least 30 days before the first hearing.

° Subsequent to the hearings, an additional period of time will be allowed for individuals and organizations to file written comments with the Department of the Interior. In accordance with the Council on Environmental Quality Guidelines, comments on the draft statement will be included in the final environmental impact statement.

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