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Report to the Chairman, Subcommittee on Energy Regulation and Conservation, Committee on Energy and Natural Resources, U.S. Senate

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AIR POLLUTION

Status of Dispute Over Alaska Oil Pipeline Air Quality Controls

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Resources, Community, and
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The Honorable Howard M. Metzenbaum
Chairman, Subcommittee on Energy
Regulation and Conservation
Committee on Energy and Natural Resources
United States Senate

Dear Mr. Chairman:

Your letter of February 29, 1988, raised questions concerning the adequacy of the Alyeska Pipeline Service Company's air pollution controls on the Trans Alaska Pipeline System. In subsequent discussions with your office, it was agreed that we would address the status of the dispute over whether operational and physical changes affecting control equipment at Alyeska's oil terminal in Valdez, Alaska, would require Alyeska to file for a new air quality control permit. The original permit was granted to Alyeska in 1974, 3 years before the current air quality legislation (Clean Air Act amendments, Aug. 1977) became effective. The 1977 amendments require that if major modifications in equipment or operations occur, then a new air quality control permit must be sought.

As a secondary matter, we also agreed to address the status of permit negotiations regarding the control equipment at each of the pipeline's 10 pump stations. This discussion is contained in appendix I.

Results in Brief

The State of Alaska and the Environmental Protection Agency (EPA), on one side, and Alyeska, on the other, have been at an impasse for the last several months over the January 1987 introduction of increased amounts of natural gas liquids (NGLs) into the pipeline. In late 1986, the pipeline's oil producers began using a new process that condenses more of the NGLs recovered from their oil fields, resulting in a greater amount of NGLs entering the pipeline and ultimately arriving at the Valdez terminal. These added NGLs increase the volatile organic compounds (VOC)[1] — a precursor to ozone—emitted from the Valdez terminal, raising the issue of whether air quality violations have occurred. The increase in

[1] VOCs, which consist of vapors from gasoline and other petroleum products, mix with other atmospheric chemicals in sunlight to form ozone. Although EPA has not established a national air quality standard for VOCs, one has been established for ozone; and EPA regulations require that any significant increases in VOC emissions translate into a significant increase in ozone. In addition, a number of epidemiological studies have associated increased health risks with exposure to VOCs.

VOCs and other changes to terminal facilities have led the state and EPA to conclude that these are major modifications and, therefore, Alyeska should apply to the state for a new air quality control permit, under which the terminal would be monitored for VOCs and other air pollutants. Alyeska disagrees that the modifications warrant a new permit.

Although the status of the Valdez terminal dispute is unsettled, some progress is being made. Both sides submitted proposals indicating the willingness of the state and Alyeska to work toward negotiating a settlement. A settlement specifying allowable VOC emissions levels and providing for air quality monitoring in and around Valdez would have two major benefits. It would enhance EPA's and the state's ability to

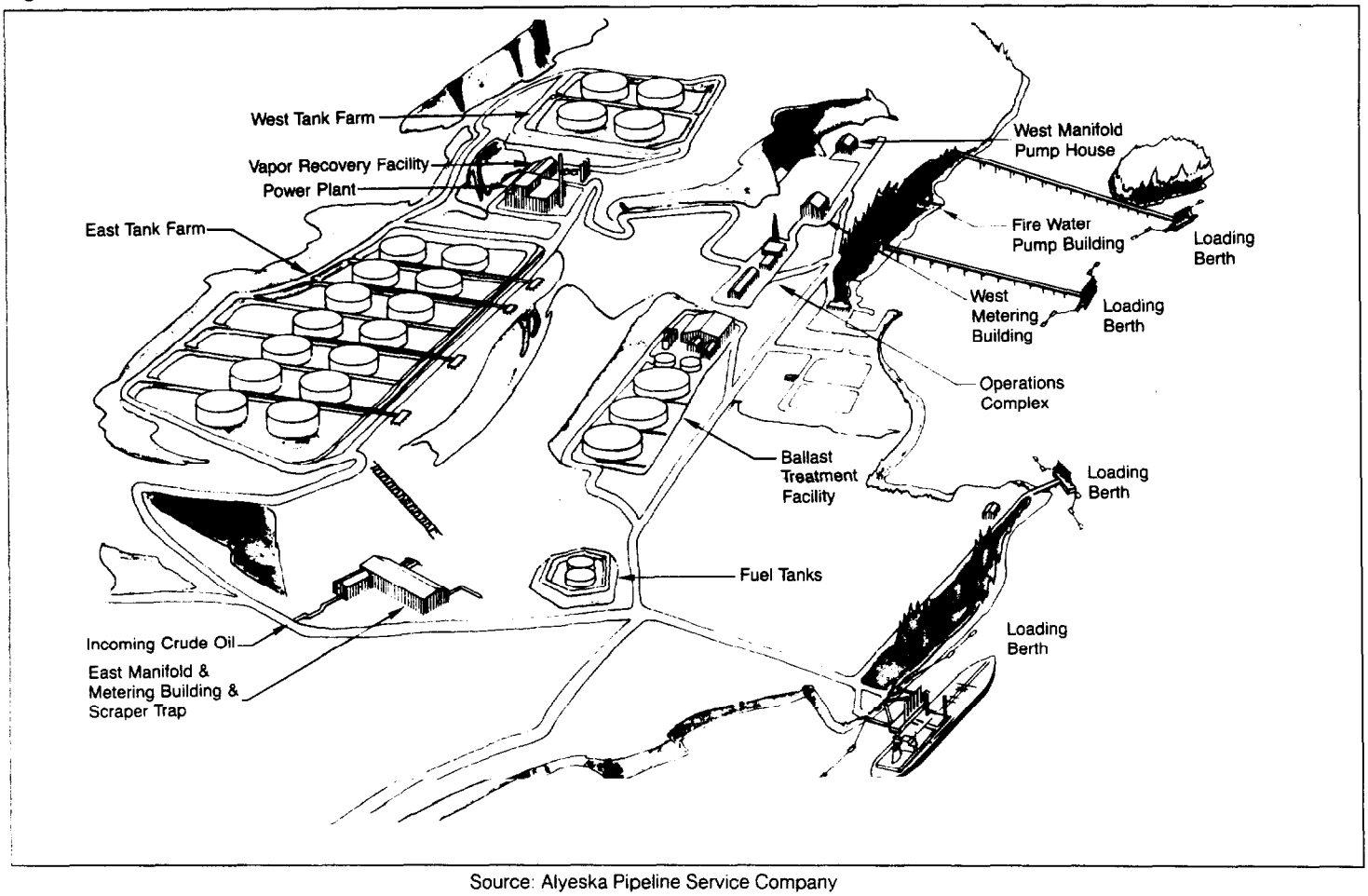
- exercise oversight and
- determine whether the Valdez terminal and related pipeline facilities are in compliance with applicable federal and state air quality laws and regulations.

Background

About 2 million barrels of oil a day, or about 25 percent of the total U.S. domestic production, is shipped through the Alaska pipeline that stretches 800 miles across Alaska from Prudoe Bay on the North Slope to the terminal and port in Valdez. Principal pipeline facilities include 10 pump stations that help move the oil along the pipeline to the terminal at Valdez. Facilities in Valdez include everything necessary for receiving and loading oil aboard tankers, including four tanker loading berths, a waste water treatment plant, a power plant, warehouses, metering equipment, sewage systems, and a vapor recovery system. The vapor recovery system, the primary focus of our review, uses waste gas incinerators to reduce VOC emissions from 18 oil storage tanks. Figure 1 displays the layout of the terminal facilities, including the vapor recovery system.

Although EPA is responsible for administering programs to carry out the provisions of the Clean Air Act, it can, while maintaining overall accountability, transfer operational responsibilities for these programs to state and local governments. EPA transferred such responsibilities to the state of Alaska—specifically, the Alaska Department of Environmental Conservation (ADEC)—between 1972 and 1983. These responsibilities include (1) granting permits to companies like Alyeska that own facilities that generate air pollution and (2) conducting oversight activities to ensure that the facilities operate in compliance with the Clean Air Act.

Figure 1: Valdez Terminal



Source: Alyeska Pipeline Service Company

Until 1987, air quality in Valdez received little attention. According to an ADEC official, VOC monitors were installed in the Valdez area prior to construction of the terminal. Although the monitors indicated that a proposed national standard for VOCs had been occasionally exceeded, the monitors were disassembled after terminal operations began in 1977 and never reinstalled, because the proposed standard was never promulgated. From the time the terminal opened in 1977 until 1981, other air quality monitors in and around Valdez indicated compliance with ozone and other national air quality standards. In October 1981, Alyeska requested permission, and the state agreed, to remove the air quality monitors, because no violations had been observed. The state and EPA continued to conduct air quality inspections of the Valdez facilities, but

the inspections did not specifically address VOC emission levels because the air quality control permits granted by the state did not indicate the VOC emissions allowed. This lack of specificity, coupled with the absence of air quality monitoring data, hampers the ability of the state and/or EPA to determine whether violations have occurred.

EPA and ADEC Believe That a More Specific Air Quality Control Permit Is Needed

The original air quality control permit granted to Alyeska governing the operation of the Valdez terminal was issued in 1974 before the current federal air quality regulations became effective. The current regulations, resulting from the August 1977 Clean Air Act amendments, contained a grandfather provision exempting existing sources, such as the Valdez terminal, from the amendments' Prevention of Significant Deterioration (PSD) requirements. The PSD program is intended to limit air pollution in areas where the air is cleaner than the national air quality standards by applying the best available control technology. However, if a major modification in equipment or mode of operation occurs subsequent to 1977, then the source would be subject to the requirements associated with a PSD permit.

EPA and ADEC both believe that several changes have taken place to the Alyeska facility, many of which constitute a modification requiring Alyeska to obtain a PSD permit. First, the vapor pressure due to the January 1987 injection of an additional 50,000 barrels a day of NGLs has increased actual VOCs well in excess of 40 tons per year. In addition, several physical modifications have been made to the facility over the years that EPA and ADEC believe should have been evaluated for PSD applicability. For example, the oil burner tips of the waste gas incinerators have been modified.

Alyeska acknowledges that additional NGLs have been injected into the pipeline, causing the amount of potential VOC emissions to increase, and that equipment changes were made to the waste gas incinerators. However, it does not believe that either of these events constitutes a major modification that would trigger the need for a PSD permit.

Injection of Additional NGLs

Arguments regarding whether increasing the volume of NGLs shipped through the pipeline and the attendant increase in VOC emissions constitute a major modification are summarized as follows.

The threshold for determining whether a modification is major, with respect to VOCs, is an increase in emissions of 40 tons or more a year.

Because the January 1987 injection of an additional 50,000 barrels a day of NGLs into the pipeline has increased actual VOCs well in excess of 40 tons per year, EPA and ADEC believe the PSD definition of a modification applies.

Alyeska's arguments against the need for a PSD permit are based on the following definitions. Actual emissions are defined in ADEC's regulations as "average rate, in tons per year, that the facility actually emitted during the most recent two years of normal operation; facility-specific allowable emissions may be considered actual emissions." The regulations then define allowable emissions as the "calculated emission rate of a source or facility using the maximum rated capacity and enforceable limitations and conditions or operations." Alyeska maintains that allowable emissions are those allowed by ADEC-issued permits to Alyeska and, since the permits authorize certain sources and place certain conditions on their operations, facility-specific allowable emissions are the emissions at design capacity—the transport of 2.1 million barrels a day of oil (oil is defined in a 1974 grant of right-of-way agreement[2] as "unrefined liquid hydrocarbons, including gas liquids"). Alyeska pointed out that it has always injected some amount of NGLs into the pipeline and that the total amount of product transported has never exceeded 2.1 million barrels a day. Thus, according to ADEC's regulations and the right-of-way agreement, (1) actual emissions can be considered the same as allowable emissions; (2) allowable emissions are those resulting from 2.1 million barrels a day of oil flow, a flow rate that has never been exceeded; and (3) the oil can include an unspecified amount of NGLs. Alyeska officials, therefore, believe that the injection of additional NGLs does not require that they apply for a PSD permit.

Changes to Waste Gas Incinerators

Equipment changes made to the operating efficiency and effectiveness of the Valdez terminal's three waste gas incinerators are another PSD issue. According to a March 1988 ADEC inspection report, the incinerators were designed to have sufficient capacity to burn all the VOC vapors generated under maximum pipeline flow conditions—2.1 million barrels a day. However, the incinerators have undergone various alterations over the last several years. For example, in an attempt to save fuel, the original oil gun nozzles (the oil assists in the initial combustion of the waste gas) were replaced with much smaller nozzles. In addition, steam

[2]On January 23, 1974, the U.S. Department of the Interior, on behalf of the United States, entered into an Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline with the Alyeska partners. The right-of-way was granted for the purpose of the construction, operation, and maintenance of the pipeline and related facilities.

atomization nozzles, which improved the degree of smokeless combustion, were eliminated. These changes resulted in heavy smoking of the incinerators. Bigger oil nozzles were installed in the fall of 1987 and plans are being made to reinstall the steam atomization nozzles in 1988. The inspection report states that, in view of the modifications made, the possibility exists that present capacities are lower than the original design capacity and may not be sufficient to burn all vapors produced under the maximum pipeline flow levels. The ADEC inspection report states that the only sure way to clarify this question would require a source test for the incinerators.[3]

Air Quality Data Are Not Available

The question of whether operational and physical changes to the terminal have triggered the PSD requirement could more readily be resolved if current and accurate monitoring data existed. The primary reason why it is desirable to monitor VOC emissions is that they are a precursor to ozone. ADEC officials told us that they had no hard evidence to prove that an ozone problem exists in Alaska and, thus, were not requiring facilities to monitor VOC emissions.

Regarding the Valdez terminal, the original November 1974 operating permit issued by the state to Alyeska required the establishment and operation of an air quality monitoring network. Using the network—four stations containing ambient air monitors for various pollutants including ozone—Alyeska submitted monitoring data from 1977 to 1981. However, Alyeska requested permission on October 14, 1981, to discontinue monitoring since no violation of the standards had been observed. ADEC granted Alyeska's request on October 17, 1981. At the same time, a reporting requirement for measuring the operational effectiveness of the waste gas incinerators was also deleted.

EPA and state environmental agencies frequently use air quality models either in lieu of or to supplement monitoring data. The computerized models attempt to mathematically depict the effects of wind speed, wind direction, and other atmospheric conditions on the movement of airborne pollutants. A limited amount of modeling for VOC emissions in Valdez was attempted in the late 1970s. However, ADEC and EPA determined that modeling was virtually impossible because of the extremely mountainous terrain and very complicated wind patterns of the Prince William Sound Basin where Valdez is located.

[3]A probe would be placed in the incinerator's smoke stack to measure emissions under various specific operating conditions.

ADEC performs an annual air quality inspection of the terminal. These inspections are typically limited to a visible check of the emissions from the power plant boiler's smokestack; little attention is paid to the oil storage tanks or waste gas incinerators. In justifying the lack of detailed inspections, ADEC and EPA officials cited both the lack of staff and the nonspecific nature of the operating permit, which no longer requires emissions data to be monitored or the operating efficiencies of the waste gas incinerators to be recorded.

Recent Efforts to Reach Resolution

Since late-1987, three main parties—EPA and ADEC on one side and Alyeska on the other—have been actively discussing the need for Alyeska to amend its existing operating permit and/or apply for a PSD permit for the Valdez terminal. They articulated their positions in a July 6, 1988, letter sent to Alyeska by Alaska's Attorney General's office on behalf of ADEC and Alyeska's August 8, 1988, counterproposal to that letter. The ADEC proposal was predicated on Alyeska's applying for a new air pollution control permit while Alyeska's position was based on a review and rewrite of the existing permit. The highlights of what would be contained in the permit to be submitted by Alyeska are summarized in table 1.

Table 1: Highlights of ADEC and Alyeska Proposals

ADEC proposal	Alyeska proposal
Information and analyses to demonstrate that expected maximum emissions will not cause violations and that pollution controls represent best available control technology	Information and analyses to demonstrate that air quality standards are being met and that adequate controls are being applied
Clarification of Alyeska's reporting and testing requirements and of ADEC's right of access to the terminal for inspection purposes and information and analyses to demonstrate that emergency situations	Coverage of testing, reporting, access, and other ADEC concerns Information and analyses to demonstrate
Control of tanker vessel emissions	No controls over tanker vessel emissions
Installation of air quality monitors for VOCs, ozone, carbon monoxide, sulfur dioxide, and nitrogen oxides	Review of the need for air quality monitors for various pollutants
Submission by Alyeska of a plan for proposed repairs to the waste gas incinerators. ADEC would reserve right to solicit public comments and hold public hearings.	Submission of any information on incinerator repairs ADEC requests. Alyeska cites the urgency of the repair project and wishes to begin as soon as possible.
Imposition of an appropriate monetary settlement in exchange for ADEC's agreement not to pursue past violations and for the costs incurred by the state in these proceedings	No monetary settlement in that past violations, if committed, were unintentional and of a procedural nature without air quality significance

As indicated by the two proposals, while differences exist in many of the areas, the proposals indicate a willingness to work toward negotiating a settlement. Resolution of issues addressed in the letters, such as determining emission amounts (specifically for VOCs) by installing air quality monitors, would enhance EPA's and ADEC's ability to exercise effective oversight and to determine whether the Valdez terminal and related pipeline facilities are in compliance with applicable federal and state air quality laws and regulations.

In a September 1988 letter, EPA, with the concurrence of ADEC, requested that Alyeska provide additional information relating to physical and operational changes made to pipeline facilities and pipeline emission levels. Alyeska's response is due December 15, 1988.

Information discussed in this report was obtained from (1) interviews with EPA and ADEC air program officials and senior managers of Alyeska and (2) a review of applicable regulations, inspection reports, and various internal and external correspondence provided by these officials. (App. II discusses our objectives, scope, and methodology in greater detail.)

Our review was conducted between April 1988 and August 1988 in accordance with generally accepted government auditing standards. We discussed the factual information in the report with EPA, ADEC, and Alyeska officials and have included their comments where appropriate. However, as you requested, we did not obtain official agency comments on a draft of this report.

As arranged with your office, unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, copies of the report will be sent to appropriate congressional committees; the Administrator, Environmental Protection Agency; and other interested parties.

Major contributors to this report are listed in appendix III.

Sincerely yours,

Hugh J. Wessinger
Senior Associate Director

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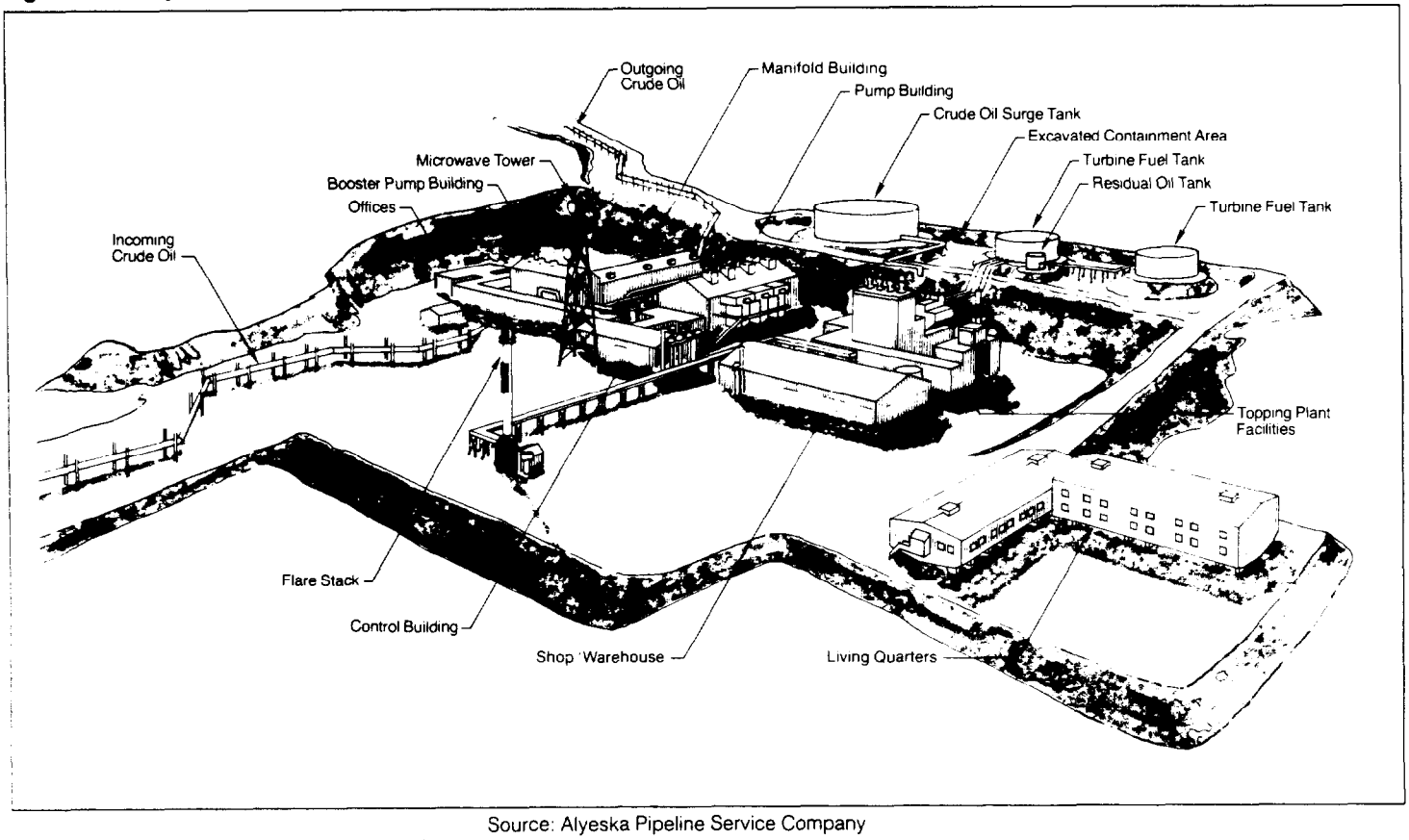
Abbreviations

ADEC	Alaska Department of Environmental Conservation
EPA	Environmental Protection Agency
GAO	General Accounting Office
NGLs	natural gas liquids
PSD	Prevention of Significant Deterioration
VOC	volatile organic compound

Status of Pipeline Pump Station Emissions

Ten operating pump stations assist the movement of the crude oil through the pipeline.[1] Pump station facilities (see fig. I.1) include a main pump building, shop and warehouse building, crude oil relief tanks for pipeline pressure relief when required, and living quarters. The facilities, usually in remote locations, were designed to withstand temperatures down to minus 60 degrees Fahrenheit and winds of up to 100 miles an hour.

Figure I.1: Pump Station



Source: Alyeska Pipeline Service Company

Located within the main pump building are gas-turbine driven mainline pumps. Most of the pumps can move up to 25,000 gallons of oil per minute, which is more than 850,000 barrels per day.

[1]The pump stations are numbered between 1 and 12. Station 11 was never built. Station 5 has no pumps; rather, it operates as only a pressure relief facility.

The relief tanks take in oil during emergencies, maintenance, and repair. A pressure relief system automatically detects and relieves excessive pipeline pressure. When actuated, the valves divert oil from the pipeline to the tanks. The oil is reinjected into the mainline as soon as normal conditions resume. As with the tanks at the Valdez terminal, vapor emissions are also produced from the tanks at the pump stations. However, rather than operating waste gas incinerators to minimize these vapors—the best available control technology—flares are used to minimize these vapors. EPA officials told us that although flaring is not as efficient as the incinerators, EPA has decided, because the pump stations are generally in remote areas, that flaring is an acceptable control technique.

Like the terminal, each of the pump stations also has an operating permit. Pump stations 2 and 7 are distinguishable from the others because they were built after the enactment of the PSD program. According to ADEC officials, their permits are more sophisticated because emission limits are spelled out. Thus, ADEC has a definitive position that the additional emissions would trigger the modification threshold for requiring another permit review.

In July 1988, ADEC proposed that Alyeska take the following actions with respect to the pump stations. First, Alyeska would apply for permits for pump stations 2 and 7. The applications would contain a description of all air quality control devices, including efficiency and other design criteria; development of ambient air data; a detailed demonstration that expected maximum emissions will not cause violations; and a demonstration that the emission controls represent the best available control technology. Regarding pump station 1, Alyeska would initiate monitoring programs for VOCs, ozone, sulfur dioxide, nitrogen oxides, and carbon monoxide in a manner directed by ADEC, choosing this station for monitoring on the basis that if no problems are found at the first station, it is unlikely that problems would exist at the remaining stations.

In Alyeska's August 1988 counterproposal, Alyeska stated that it would review and rewrite its air quality permits for pump stations 1, 2, and 7 to clarify control requirements and include reasonable provisions for unavoidable breakdowns. The review would include demonstrations that ambient air quality standards and emission limitations are being met and that adequate controls are being applied. With respect to monitoring, Alyeska proposed to agree to review the need for ambient air quality monitoring at pump station 1 and any other stations designated

by ADEC, and to undertake such monitoring as it and ADEC may agree upon.

As with the Valdez terminal, it appears that ADEC and Alyeska have a basis upon which to reach agreement on the changes needed to the pump stations' existing air quality permits and the degree to which air emissions monitoring should be undertaken. While the potential impacts of emissions from the pump stations do not seem to be as great as those from the terminal, resolution of the remaining differences, resulting in improved permits and monitoring networks, will increase EPA's and ADEC's ability to determine the degree to which the pump stations are conforming to the standards set in applicable air quality laws and regulations.

Objectives, Scope, and Methodology

The Chairman, Subcommittee on Energy Regulation and Conservation, Senate Committee on Energy and Natural Resources, asked us to examine allegations that the emission control systems of the Alaska pipeline were not operating properly. There was concern that this may have resulted in significant amounts of pollutants being emitted into the environment.

In subsequent discussions with subcommittee staff, it was agreed that the main issue we would pursue is whether the injection of additional NGLs into the pipeline and/or modifications made to the Valdez terminal's waste gas incinerators require Alyeska to amend its existing permit and/or file for a PSD permit. It was also agreed that as a secondary matter, we would gather and provide information on the status of permit negotiations regarding emission control equipment at the pump stations (see app. I).

Our work consisted primarily of holding discussions with senior officials of EPA's Region 10 in Seattle, Washington; the Alaska Department of Environmental Conservation in Juneau, Anchorage, and Valdez, Alaska; the Alaska Attorney General's office in Anchorage; Alyeska in Anchorage and Valdez; and environmental interest groups in Anchorage. We reviewed a number of key documents received from these officials, including applicable laws and regulations, inspection reports, and various internal and external correspondence outlining the positions of their organizations. We also received a detailed briefing and tour of the Valdez oil terminal from Alyeska officials.

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.

Richard L. Hembra, Associate Director, (202) 252-0600
William F. McGee, Group Director
Dennis A. Matteotti, Evaluator-In-Charge
Cynthia Y. Robinson, Secretary