FACT SHEET

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Date: March 1, 1996

Application No.: AK-004964-6

PROPOSED ISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO THE PROVISIONS OF THE CLEAN WATER ACT

ARCO Alaska, Inc.
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has applied for reissuance of a National Pollutant Discharge Elimination System (NPDES) permit to discharge pollutants pursuant to the provisions of the Clean Water Act. This fact sheet includes (a) the tentative determination of the Environmental Protection Agency (EPA) to issue the permit, (b) information on public comment and appeal procedures, (c) the description of the proposed discharge, (d) a listing of tentative effluent limitations and other conditions, and (e) a sketch or detailed description of the discharge location. We call your special attention to the technical material presented in the this document.

Persons wishing to comment on the tentative determinations contained in the proposed permit issuance may do so by the expiration date of the Public Notice. All written comments should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Director, Office of Water, will make final determinations with respect to the permit reissuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the Public Notice period.

The permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The proposed NPDES permit and other related documents are on file and may be inspected at the above address any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing to the EPA at the above address to the attention of the NPDES Permits Unit (MS: OW-130), or by calling (206) 553-1761. This material is also available from the EPA Alaska Operations Office, Room 537, Federal Building, 222 West 7th Avenue, #19, Anchorage, Alaska 99513, and EPA Alaska Operations Office, 410 Willoughby Avenue, Suite 100, Juneau, Alaska 99801.

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TECHNICAL INFORMATION

I. APPLICANT INFORMATION

ARCO Alaska, Inc. has applied for an NPDES permit for its Kuparuk Wastewater Treatment Plant (WWTP). The application and supporting information were submitted during June and July 1989. EPA assigned the application NPDES Permit Application No. AK-004964-6, and determined that the application for this facility was complete on July 28, 1989.

The facility is located about 12 miles from the Beaufort Sea in the Kuparuk River Unit Oil Field on Alaska's North Slope (see Figure 1). The plant treats sanitary and domestic wastewater from ARCO's Kuparuk Operation Center (KOC) and from outlying facilities, as well as small amounts of laboratory and clinic waste. It also treats filter and tube backwash water from the KOC's potable water plant.

II. BACKGROUND

A. Permit History

ARCO initially contacted EPA in October 1983 about the need for an NPDES permit for discharges to the tundra. EPA responded that an NPDES permit would not be issued at that time because the Alaska Department of Environmental Conservation (ADEC) had issued a state permit specifying secondary treatment limitations, and because the discharge to the tundra would be relatively minor, with little chance of reaching the Beaufort Sea. EPA noted that ARCO was expected to comply with appropriate secondary treatment limitations and state water quality standards.

ADEC first issued a Wastewater Disposal Permit to ARCO for the facility in 1980. It was reissued three times, most recently on June 22, 1988. The current permit is Wastewater Disposal Permit No. 8836-DB010.

ARCO submitted a "field-wide" NPDES application to EPA on October 4, 1988, for the above facility and four other types of discharges in the Kuparuk Field. EPA determined that the discharge from the Wastewater Treatment Plant was the highest priority of the five

categories for permit issuance and has proceeded to develop this fact sheet and draft permit for the facility. EPA developed and issued an individual NPDES permit for the facility on April 22, 1991, addressing public comments on the draft permit with certain changes in the requirements of the permit (Attachment I). The Trustess for Alaska appealed the issuance of the permit on September 23, 1991, EPA withdrew the permit on January 9, 1992. ARCO Alaska, Inc, and the Trustees for Alaska undertook discussions to resolve the disputed provisions of the permit and have since come to terms on mutually agreeable conditions. The focus of the appeal and resolution is that wastewater discharges should be routinely injected into subsurface sediments as a component of the oil field's waterflood project and that surface discharges to the unnamed lake and tundra wetlands will be limited to infrequent conditions of urgency.

B. Wastewater Sources

The majority of the wastewater handled at the Wastewater Treatment Plant (WWTP) is sanitary and domestic wastewater generated on-site at the Kuparuk Operations Center (KOC) and Central Production Facility No. 1 (CPF-1). The maximum flow from these sources is 145,000 gallons per day (gpd).

The KOC provides on-site housing and personnel facilities for employees from CPF-1 and the two other CPFs in the Kuparuk Field, as well as for construction personnel. The KOC complex includes an administrative office, security, emergency medical, and warehouse facilities. The population at the site varies with operational and development construction need. The KOC has an East Camp which can house 384 people on a routine basis, and a West Camp which can house up to 358 additional people (either overflow or housing of temporary technical and construction personnel). A third camp at the CPF-1 complex, called the Kuparuk Construction Camp, is used to house personnel for major construction projects. It can house an additional 648 people. In reality, the living quarters have seldom been filled to capacity in recent months. The population at the site as of January 1990 was approximately 400 people. As a result, the maximum flow has been below 95,000 gpd since at least January 1987.

The WWTP also handles sanitary and domestic wastewater which is trucked in on a routine basis from CPF-2, CPF-3, and the Seawater Treatment Plant (STP). These sources contribute a maximum of 4,000 gpd.

The WWTP also treats sanitary and domestic wastewater from the outlying drillsites. However, only one site is active at the current time, and ARCO does not expect additional drill rigs to be active in the next few years. These sites have small package plants for treatment of sanitary and domestic waste. Since the active site does not have an NPDES permit, ARCO has chosen to truck the treated wastewater and sludge to the WWTP for disposal. Both waste streams are added at the beginning of the WWTP treatment system. The maximum flow from this source is estimated to be 4400 gpd.

In addition to domestic wastewater, the WWTP handles small quantities of laboratory wastewater from the WWTP Lab (maximum of 25 gpd), the STP lab (maximum of 2 gpd), and the Corrosion Lab (maximum of 75 gpd). The WWTP also receives a maximum of 0.6 gpd of lab waste (specifically, spent x-ray development fluids) from the KOC clinic.

Finally, the KOC/CPF-1 site includes a potable water treatment facility, which treats water from a nearby surface reservoir for camp and field facility use. As of July 30, 1989, ARCO began routing backwash water from the potable water plant through the WWTP. The maximum flow rate when the housing is at full capacity would be 30,000 gpd.

The maximum total flow from all of the above sources is approximately 184,000 gpd (154,000 gpd excluding the filter backwash water), assuming that the housing facilities at the KOC are filled to capacity. ARCO has requested that EPA allow a maximum flowrate of 180,000 gpd in the permit.

C. Wastewater Treatment and Disposal

The WWTP consists of an adjacent North Plant and South Plant. The two plants are capable of operating independently or simultaneously with sewage transfer lines connecting them. The plants are normally run in parallel, with the North Plant being the "lead" plant because of its larger capacity (100,000 gpd design flow; 120,000 gpd hydraulic limit). The South Plant has a design capacity of 40,000 gpd, but has been successfully operated at 60,000 gpd. It is used only when the influent flow rate exceeds the capacity of the North Plant. Both plants were designed to provide tertiary treatment.

Primary treatment begins when the wastewater goes through the comminutors, where larger solid matter is shredded. The wastewater then enters the surge (storage) tank where the solid matter is kept in

suspension by aeration. From there, the wastewater is pumped to a rotostrainer which separates the larger solids and stores them for incineration. The effluent then enters the secondary stage of treatment.

Secondary treatment is an Activated Biological Filter (ABF) system; it consists of high rate trickling filters followed by activated sludge. This portion of the treatment removes non-settleable suspended matter, colloidal material, and some dissolved organic matter. Approximately 75% of the biochemical oxygen demand (BOD) is removed in this phase.

When circulation in the ABF towers is completed, the wastewater enters one of the aeration basins. The basins detain the liquid and provide for greater removal of dissolved matter such as glucose in the activated sludge process.

The wastewater next enters the secondary clarifier which slows the flow and allows the sludge to settle out. At the clarifier, surface scum and settled sludge are removed. Part of the sludge is recycled to the aeration tanks and the rest is stored for incineration.

Wastewater leaving the secondary clarifier flows to the physical-chemical treatment unit for tertiary treatment, and then to a mixed-media filter. ARCO does not currently use the chemical addition feature of the tertiary treatment unit, and reports that only one of the two plants has chemical addition capability. The filtration polishes the effluent before it enters the chlorination tank and leaves the WWTP.

The WWTP currently discharges to a flare pit holding lagoon and from there to a secondary lagoon. The lagoon was originally designed to operate without a discharge to the tundra or lake. This was based on the assumption that annual inputs of effluent and precipitation would be balanced by losses to evaporation and sublimation. However, this has proven to be a faulty assumption, and the lagoon has occasionally had to discharge to the tundra. This has caused concern because of potential hydrocarbon contamination from the flare pit. In the past 2-1/2 years, ARCO has not discharged to the tundra. Instead, the water from the secondary lagoon is returned to CPF-1 for treatment and use in waterflooding.

ARCO does not want to continue this arrangement, however, since the wastewater is corrosive to their piping and equipment, and they must incur the cost of treatment with corrosion inhibitors.

ARCO has therefore proposed to re-route the discharge to bypass the lagoons altogether. A elevated pipe has been laid along the western edge of the lagoons, and would discharge to the unnamed lake immediately south of the secondary lagoon. The height of the outfall is 10 ft above the lake surface.

D. Sludge Handling

Sludge is stored in a holding tank for later dewatering. The sludge is thickened, conditioned, and filter pressed to remove excess liquid (which returns to the surge tank for further treatment). Approximately 300 lb/day of sludge is generated. The sludge is taken from the filter press to the incinerators on a weekly basis, at the current sludge production levels. The sludge is incinerated along with trash from the base camp/CPF-1 site. The incinerators do not have an air quality permit, since they are below the size required to have one. There are no other permits currently applicable to ARCO's sludge handling practices. After incineration, the ash is hauled to the North Slope Borough's Oxbow Landfill.

E. Discharge Composition

The following pollutants may be present in the discharge, according to ARCO's NPDES application. The toxic and conventional pollutant categories are defined at 40 CFR 401.15 and 401.16. The category of nonconventional pollutants includes all pollutants not included in either of the other categories.

Conventional pollutants - biochemical oxygen demand (BOD), total suspended solids (TSS), pH, fecal coliform, and oil and grease.

Toxic pollutants - cadmium, chromium, copper, mercury, silver, and zinc.

Nonconventional pollutants - chemical oxygen demand (COD), total organic carbon (TOC), temperature, ammonia, chlorine, color, nitrate, organic nitrogen, phosphorus, sulfate, sulfide, surfactants, aluminum, barium, iron, and magnesium.

In developing the proposed permit conditions, EPA has evaluated the concentrations of these pollutants relative to the levels allowed under the regulations; refer to Part III. of this fact sheet for further information.

F. Compliance History

The ARCO facility has a good record of compliance during the period January 1987 - December 1989 with the state permit limits on flowrate, BOD_5, TSS, and fecal coliform. However, during this period, the effluent exceeded the chlorine limit of 2.0 mg/l and the minimum pH value of 6.0 on several occasions. The facility had no trouble meeting the maximum limit on pH.

G. Receiving Water

The receiving water is an unnamed lake on a tributary of the Ugnuravik River. The lake is typical of many lakes on the North Slope in that it is very shallow. ARCO took six measurements in the northern part of the lake (nearest the outfall area) in March 1988, and found the depths to range from 2 ft. 5 in. to 3 ft. The surface area of the lake is very large in comparison to other North Slope lakes, however, at approximately 57 acres. The shape of the lake is highly irregular, with several portions being connected by narrow channels.

The lake is drained by a stream which is a tributary of the Ugnuravik River. The stream joins the river about 2 miles downstream of the lake (or approximately 1 mile north of the CPF-1 site). See Figure 1 for a map of the facility and receiving water.

The Kuparuk Industrial Center, which is owned by the North Slope Borough and managed by the Piquniq Management Corporation, is also located in the area. The facility's sewage treatment lagoon is dewatered to the tundra adjacent to the stream in summer and fall, as necessary to prevent overflowing of the lagoon. The discharge point is about 1/2 mile above the junction with the Ugnu River. The facility's drinking water intake (which is only activated during breakup) is on the Ugnu River about 500' downstream of the confluence.

III. PERMIT CONDITIONS

A. General Approach

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act provide the basis for the effluent limitations and other conditions in the draft permit. EPA evaluates discharges with respect to these sections of the Act and the relevant NPDES regulations in determining which conditions to include in the permit.

In general, EPA first determines which technology-based limits are required, as well as any appropriate sludge conditions, best management practices, or other requirements. EPA then evaluates the effluent quality expected to result from these controls, to see if it could result in any exceedances of the water quality standards in the receiving water. If exceedances could occur, EPA must include water quality-based limits in the permit. The permit limits will thus reflect whichever limits (technology-based or water quality-based) are most stringent.

EPA must also include monitoring requirements in the permit to monitor compliance with effluent limitations. Effluent and ambient monitoring may also be required to gather data for future effluent limitations or monitor effluent impacts on receiving water quality.

The basis for each permit condition is described in more detail below.

B. Technology-Based Evaluation

1. Statutory Basis for Technology-Based Limits

The Act requires particular categories of industrial dischargers to meet effluent limitations established by EPA. The Act initially focused on the control of "traditional" pollutants (conventional pollutants and some metals) through the use of Best Practicable Control Technology Currently Available (BPT). Industries were required by section 301(b)(1)(A) of the Act to meet this level of control by July 1, 1977. Section 301(b)(3) of the Act allowed a deadline of March 31, 1989, under certain circumstances, but that deadline has also passed. Thus, permits issued after March 31, 1989, must include any conditions necessary to ensure that the BPT level of control is achieved.

In many cases, these limitations are based on effluent guidelines developed by EPA for specific industries. Where EPA has not yet developed guidelines for a particular industry, permit conditions must be established using Best Professional Judgment (BPJ) procedures (40 CFR 122.43, 122.44, and 125.3).

Section 301(b)(2) of the Act requires further technology-based controls on effluents. After March 31, 1989, all permits are required by sections 301(b)(2) and (3) of the Act to contain effluent limitations for all categories and classes of point sources which: (1) control toxic pollutants (40 CFR §401.15) and nonconventional pollutants through the use of Best Available Technology Economically Achievable (BAT), and (2) represent Best Conventional Pollutant Control Technology (BCT). BCT effluent limitations apply to conventional pollutants (pH, BOD, oil and grease, suspended solids, and fecal coliform). Nonconventional pollutants include all pollutants not included in the toxic and conventional pollutant categories. In no case may BCT or BAT be less stringent than BPT.

Like BPT requirements, BAT and BCT permit conditions must be established using BPJ procedures in the absence of effluent limitations guidelines for a particular industry.

As required by section 304(b)(2)(B) of the Act, when developing BPJ/BAT permit conditions, the Agency must consider the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the Director deems appropriate.

Region 10 must consider the same factors in determining BPJ/BCT permit conditions, as required by section 304(b)(4)(B) of the Act, but with one exception. Rather than considering "the cost of achieving such effluent reduction," any BCT determination includes "consideration of the reasonableness of the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived, and the comparison of the cost and level of reduction of such pollutants from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources." BCT effluent limitations cannot be less stringent than BPT; therefore, if the

candidate industrial technology fails the BCT "cost test", BCT effluent limitations are set equal to BPT.

2. Statutory Basis for Monitoring Requirements

Under Section 308 of the Act and 40 CFR §122.44(i), the Director must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations or to assist in the development of effluent limitations. EPA has included several monitoring requirements in this permit related to technology-based permit conditions.

3. BPJ/BAT Permit Requirements

The ARCO Kuparuk WWTP is a privately-owned sewage treatment plant. EPA has not promulgated either BPT or BAT effluent limitation guidelines for this class of discharges. In addition, the secondary treatment regulations for publicly-owned treatment works (at 40 CFR Part 133) do not address toxic and nonconventional pollutants. Therefore, they do not provide a basis for a BPJ/BAT determination for ARCO's facility.

Region 10 has, however, determined that a BAT limit can be placed on chlorine from domestic wastewater plants. The Region has applied a monthly average limit of 0.5 mg/l to discharges from several small municipal wastewater treatment plants in Idaho, and has determined that the same limit should apply to ARCO's discharge, which is also from a small domestic wastewater plant. This limit represents a reasonable monthly average chlorine limit which will minimize the discharge of chlorine, yet allow for adequate disinfection (Metcalf and Eddy, Inc., 1979; Water Pollution Control Federation, 1972). The Region is also imposing a daily maximum limit of 1.0 mg/l, to set an upper boundary on the chlorine concentration. Although ARCO does not currently meet these limits, EPA expects that the limits can be met with adjustments in ARCO's chlorination pratices. The limits have previously been applied to several Idaho facilities, and are technologically feasible and economically achievable.

4. BPJ/BCT Permit Requirements

BCT effluent limitation guidelines also have not been promulgated for privately-owned sewage treatment plants. A number of BPJ/BCT limits are included in this permit, as discussed below. The secondary treatment regulations provide the basis for all of the BPJ/BCT determinations except the prohibition on floating solids. The BPJ/BCT conditions are described below.

Biochemical Oxygen Demand, 5-day (BOD5) and Total Suspended Solids (TSS): The draft permit contains the following BPJ/BCT conditions on BOD_5 and TSS:

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD_5 (mg/l)	30	45	60
TSS (mg/l)	30	45	60

The draft permit also contains BPJ/BCT conditions on BOD_5 and TSS which require that the average monthly percent removal shall not be less than 85 percent.

The 30 and 45 mg/l BOD_5 and TSS limitations, as well as the percent removal requirements, are equivalent to those required of publicly-owned treatment works (POTWs) by the secondary treatment regulations (40 CFR Part 133). In addition, the 30 and 45 mg/l limits as well as the 60 mg/l maximum daily value are part of the Alaska secondary treatment regulations. Thus, the limitations pass the BCT cost test. The concentration limits are presently included in ARCO's state permit, and ARCO has had no difficulty meeting the limits. In addition, ARCO has indicated that they normally achieve a percent removal greater than 85 percent. Since ARCO has demonstrated its ability to achieve the limits with its current treatment system, and the limits pass the economic test, EPA has determined that these BPJ/BCT conditions are appropriate for the facility.

EPA has considered more stringent BPJ/BCT limits, but has determined that such limits are not appropriate. Plant performance from January 1987 to December 1989 indicated that BOD_5 and TSS levels were well within the above limits. However, the WWTP was not operating at full capacity. Thus, it may not be technologically feasible or economically

achievable (based on the BCT cost test) for ARCO to meet more stringent limits.

pH: EPA has determined based on BPJ that a pH limit of 6.0 to 9.0 is appropriate for ARCO's WWTP. This level of control is the same as that required by the secondary treatment limitations (40 CFR Part 133) for most publicly-owned treatment works. Therefore, the technology to achieve this pH range is feasible, and the BCT cost test is satisfied since the cost is not expected to exceed that for the same treatment at a POTW. However, a slightly more stringent limitation is necessary to meet water quality standards (see Part III.C. below).

Floating Solids: The draft permit prohibits the discharge of floating solids. This is consistent with the BPT level of control for domestic and sanitary wastes under the Coastal Subcategory. The same requirement has also been a condition of the state permit, and ARCO has no difficulty meeting it. Therefore, there is no additional cost to the permittee.

C. Sludge Conditions

At this time sludge from the wastewater treatment plants is incinerated and comes under the requirements of the state air pollution control program which has been approved by EPA (if any). Another federal regulation pertaining to a sludge of this type is the solid waste land disposal rules at 40 CFR 257 which pertains to sludge from industrial wastewater plants which is place on the ground. The Agencies sewage sludge regulations at 40 CFR 503 do not apply to this sludge because this wastewater plant is at an industrial facility which receives some industrial wastewater - the wastes from the various industrial labs.

D. Water Quality-Based Evaluation

1. Statutory Basis for Water Quality-Based Limits

Section 301(b)(1) of the Act requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977. All discharges to state waters must comply with state and local coastal management plans as well as with state water quality standards, including the state's antidegradation policy. Discharges to state waters must also comply with limitations imposed by the state as part of its coastal management program consistency determinations, and of its certification of NPDES permits under section 401 of the Act.

The NPDES regulations at 40 CFR 122.44(d)(1) require that permits include limits on all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality" (54 Fed. Reg. 23868-23899; June 2, 1989).

The regulations require that this evaluation be made using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

The regulations also specifically address when toxicity and chemical-specific limits are required. A toxicity limit is required whenever toxicity is at a level of concern (as discussed above) relative to either a numeric or narrative standard for toxicity. The only exception is where chemical-specific limits will fully achieve the narrative standard. A chemical-specific limit is required whenever an individual pollutant is at a level of concern (as described above) relative to the numeric standard for that pollutant. The regulations also provide three options for developing a chemical-specific limit needed to control a pollutant which does not have a numeric standard, but is contributing to a problem with the narrative standard.

2. Statutory Basis for Monitoring Requirements

Under Section 308 of the Act and 40 CFR §122.44(i), the Director must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations or to assist in the development of effluent limitations. EPA has included several monitoring requirements in this permit related to water quality-based permit conditions.

3. Applicable Water Quality Standards

The receiving water is classified by the Alaska Water Quality Standards as Classes (1)(A)(i)(ii)(iii)(iv), (B)(i)(ii), and (C) for use in drinking, culinary, and food processing; agriculture, including irrigation and stock watering; aquaculture; industrial water supply; water contact and secondary recreation; and growth and propagation of fish, shellfish, aquatic life, and wildlife. It is thus designated for all beneficial uses, and the most stringent of the water quality standards for these uses must be met. These standards are described in the December 1989 version of the Water Quality Standard Regulations at 18 AAC 70.

The Alaska water quality standards include numeric standards for toxicity and individual pollutants, but do not currently include a narrative standard. Thus, any limits necesary to ensure achievement of the standards are based on an evaluation of effluent quality with respect to numeric standards only.

Under the standards, the state may allow a receiving water mixing zone in which the effluent mixes with the receiving water. Water quality standards may be exceeded within this mixing zone, but not outside it. Since the Alaska standards do not currently contain a narrative standard or otherwise address whether acute toxicity is allowed within the mixing zone, all standards (including acute criteria) apply at the edge of the mixing zone. If the state approves and certifies the mixing zone described in part III.D.4. below, EPA believes that the proposed limits in the permit will ensure that the water quality standards are met at the edge of that zone. The state of Alaska will determine the appropriateness of the existence and size of the mixing zone as part of their 401 certification.

EPA's evaluation of the effluent quality with respect to the parameters addressed in the water quality standards is presented below in section III.C.6.

In issuing this permit, EPA has considered Alaska's antidegradation policy [18 AAC 70.010(c)]. Issuance of this permit will result in an increase in pollutants entering the receiving water and will reduce water quality in the vicinity of the discharge; however, this project and others like it are considered to provide important social and economic benefits to the State of Alaska. Since the discharge will not result in any exceedances of state water quality standards outside the mixing zone, the project complies with the state's antidegradation policy.

4. Wasteload Allocation and Mixing Zone

EPA is not aware of any other point or nonpoint contributions of pollutants to the lake where ARCO proposes to discharge, nor to the tributary which enters the lake. There is another point source appoximately 1.5 miles downstream on the tributary. This source is the sewage treatment plant for the Kuparuk Industrial Center. Their discharge occurs only in the fall of each year when the plant's sewage lagoon is drained down as necessay to prevent overflowing of the lagoon in the following spring. The discharge is made to the tundra adjacent to the tributary, but the distance to the stream is short enough that some of the discharge reaches the stream.

Since the ARCO discharge will be required to meet water quality standards at the edge of a mixing zone within the lake, their discharge is not expected to affect the tributary. Thus, their discharge does not need to be considered further in conjunction with the discharge from the KIC plant.

EPA has relied on a semicircular mixing zone of radius 247 feet in determining the limits in the draft permit. This mixing zone represents 10% of the surface area of the 22-acre portion of the lake nearest to the outfall. EPA considered allowing 10% of the entire area of the lake, but decided this would not be appropriate due to the lake's highly irregular shape. Many parts of the lake are interconnected with narrow channels which would not allow the same amount of mixing as in a more normally-shaped lake. In addition, the flow of the tributary into the 22-acre portion would tend to prevent outward mixing from the southern part of that portion. The agency therefore chose the portion of the lake nearest the proposed outfall site, as shown in Figure 1, and calculated the 10% area based on that portion.

EPA has determined that the amount of dilution which could occur in the mixing zone is very minimal. During the winter, no impact to the receiving water will occur as both the receiving water and effluent will be frozen, and mixing cannot occur. At breakup time, the accumulated effluent will mix with snowmelt, and with the lake water as it thaws. The mixing process at breakup is complex and is not amenable to computer modeling. The summer mixing was also not amenable to modeling because of the elevated outfall and shallow depth of the lake. ARCO's Technical Support Document (part of their application) estimated that dilution of the effluent in the receiving water was 2:1 at breakup time (based on the volume of snowmelt in the lake basin plus tributary inflow

to the lake, relative to the effluent volume). They estimated the dilution at 1:1 during the remainder of the summer since the only contribution of fresh water is the tributary inflow to the lake. EPA has considered the available information, and has concluded that in the agency's best professional judgment, the worst-case dilution in the mixing zone is 1:1, which equals a dilution factor of 2.

Since the minimum dilution factor is 2, the maximum effluent concentration ("wasteload allocation") for a parameter allowed at the end of the oufall pipe is twice the water quality standard value required to be met at the edge of the mixing zone. The wasteload allocation (WLA) values required to be met for each parameter are described in part III.D.6. The actual permit limits for toxic and nonconventional pollutants will be more stringent, for reasons described in the next section.

5. Permit Limit Derivation

In deriving the permit limits for the parameters ammonia, nitrate, color, copper, and zinc, Region 10 applied the statistical permit limit derivation approach described in the EPA guidance documents, "Permit Writer's Guide to Water Quality-Based Permitting for Toxic Pollutants" (U.S. EPA, 1987), and "Technical Support Document for Water Quality-Based Toxics Control" (U.S. EPA, 1985b). This approach takes into account effluent variability in setting limits which are low enough to ensure that the water quality standards are met. The approach also takes into account the difference in timeframes and frequency of sampling between the water quality standards and average monthly and maximum daily limits. In addition to the wasteload allocation values from part III.D.6. below, EPA used the following values in deriving limits using the formulas in the guidance documents:

Coefficient of variation	0.6
Probability value for long-term average calculation	99%
Probability value for limit calculation	
- ammonia, nitrate, color, copper, zinc	95%
Frequency of monitoring	
- ammonia, nitrate, color, copper, zinc	Weekly

The resulting limits which EPA is proposing for each parameter are also discussed in part III.D.6. In some cases, the maximum daily limit may appear to exceed the wasteload allocation value. However, this is due to the difference in timeframes between the two values. In reality, the

limit will ensure that both the acute and chronic WLA and standards are met.

6. Water Quality-Based Permit Requirements

Fecal Coliform Bacteria: The water quality standard for fecal coliform bacteria requires that the mean shall not exceed 20 FC/100 ml, and not more than 10% of the samples shall exceed 40 FC/100 ml. This is based on a minimum of five samples taken in a period of 30 days.

Given the 1:1 dilution of the effluent with the receiving water, the wasteload allocation for the effluent then requires that the mean not exceed 40 FC/100 ml, and that not more than 10% of the samples exceed 80 FC/100 ml. ARCO's data for January 1987-May 1989 indicate that they may occasionally approach or exceed this value. Thus, the permit must contain effluent limits for fecal coliform. EPA has determined that limits of 40 FC/100 ml average monthly and 80 FC/100 ml maximum daily will ensure that the standard for fecal coliform bacteria is met. ARCO should have little difficulty meeting these limits, based on past performance.

Since the effluent limits will be sufficient to ensure that the effluent complies with the most stringent water quality standard for fecal coliform bacteria at the edge of the mixing zone, they will also be sufficient to protect the drinking water source for the Kuparuk Industrial Center.

Dissolved Oxygen (DO): The strictest state standards for dissolved gas (i.e., DO) say that DO shall be greater than 7 mg/l in surface waters, but in no case above 17 mg/l. In addition, the concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.

The potential concern with ARCO's effluent is not with DO levels which are too high, but with reductions in DO due to discharged BOD and COD, plus reductions resulting from algal blooms which may result from discharge of the nutrients nitrogen (as nitrate and ammonia) and phosphorus (as phosphate).

EPA considered modeling the DO behavior (for summer conditions), but there were too many unknown and unique factors to make modeling worthwhile. For instance, the pattern of spring runoff on the North Slope, as compared to rivers in the Lower 48, is unusual. On the North

Slope, 85% of the flow occurs in a 2 to 3-week period at breakup, while only 15% of the flow remains to be spread over the rest of the summer.

However, the shallow depth of the lake and outflow stream, together with the frequent wind on the North Slope, will alleviate these concerns in the summer due to frequent replenishment of oxygen from the air. The biggest problem is likely to occur at breakup, since oxygen is normally excluded from ice as it forms and would therefore be depleted in the effluent which is deposited as ice over the winter. The gradual thawing of the effluent and lake should help prevent the oxygen depletion which would occur if thawing were very rapid.

pH: The pH shall not be less than 6.5 or greater than 8.5, and shall not vary more than 0.5 pH unit from the natural condition, according to the most stringent of the state standards for pH.

Region 10 determined that a BPJ/BCT pH limit of 6.0 to 9.0 would satisfy the technology-based requirements of the Act.

The limit of 6.0 is within 0.5 pH unit of the natural condition found in a number of tundra ponds in the Kuparuk Field (ARCO's Technical Support Document and 1989 data) and near Barrow (Hobbie, 1980). No pH data are available for the lake at ARCO's facility; however, EPA expects the lake's pH to be similar to that of the other ponds. In addition, the limit should enable the discharge to meet the 6.5 standard after mixing. ARCO currently has a minimum pH limit of 6.0 in their state permit. Their monthly average pH values are normally 6.5 or above; thus, the effluent will frequently meet the standard at the point of discharge. ARCO has had some difficulty, however, in keeping minimum pH values from dropping below 6.0. Values in the range 4.3 - 5.8 were reported for 7 of the 36 months between January 1987 and December 1989. ARCO feels that recent changes in pH control will eliminate this problem in the future.

The technology-based maximum limit of 9.0 is more than 0.5 pH unit above that reported as natural condition for other North Slope ponds. Thus, it will take additional mixing beyond that needed to meet the minimum pH standard. Hobbie (1980) reported that the ponds were poorly buffered; if the same is true of the lake at ARCO's facility, a discharge at pH 9 could have a large effect on the lake's pH. EPA has therefore determined that an upper pH limit of 8.5 is more appropriate, and necessary to ensure the water quality standard protecting the natural condition is met. ARCO should have no difficulty meeting this

limit, since none of the maximum values in the January 1987-December 1989 period would have exceeded it, and in fact, the highest value was 7.8.

In conclusion, EPA is proposing pH limits of 6.0-8.5 for the draft permit.

Turbidity and Sediment: ARCO reported total suspended solids (TSS) values in the range 0-20 mg/l during the period March 1988-December 1989, with all but one value less than 14 mg/l. Values prior to March 1988 were substantially higher but are not considered here because they reflected a different set of treatment plant and influent conditions than those currently occurring at the plant. The present levels are very low compared to the secondary treatment limits.

The state standard for turbidity is expressed in units (NTUs) which differ from the "mg/l of TSS" units in which the effluent data are given. Thus, a direct comparison of effluent data to the standard is not possible.

An evaluation can be made of suspended solids levels, however. Although no data on TSS are available for the lake, Pollen (1983) reported suspended solids (SS) values for two tundra ponds and two natural streams in the Prudhoe Bay and Barrow areas. The observed range of SS values was 2.0 - 8.0 mg/l. ARCO's values are thus very close to the natural levels.

Based on the above information, EPA expects that the WWTP effluent will comply with the state turbidity standard after mixing.

The state standard for sediment calls for no increase in concentrations of sediment, including settleable solids, above natural conditions. Based on the discussion above, EPA expects ARCO's effluent to be low in TSS. It is therefore expected to meet the sediment standard.

Temperature: According to ARCO's application, the maximum temperature of their discharge is 23°C. The most stringent state standard says that a temperature of 13°C shall not be exceeded, and that the weekly average temperature shall not exceed site specific requirements needed to preserve normal species diversity or to prevent the appearance of nuisance organisms.

During the long winter, the ambient air temperature is extremely cold (generally -10° to -20°F, but as low as -60°F). As a result, the effluent will freeze immediately after it exits the outfall pipe. In addition, the lake

itself will be frozen solid. Achievement of the temperature standard will easily occur in the effluent under these conditions.

In summer, the ambient air temperature will be warmer, but will generally be less than the maximum effluent temperature. This will provide some cooling of the effluent. ARCO's Technical Support Document reported that temperatures in tundra ponds in August 1986 ranged from 2.0°C up to 21.0°C, with a mean of 10.2°C. The three measurements (of 29) which exceeded 15°C were all for water depths of 3-4," much shallower than occurs in the lake at the WWTP. Data collected in 1989 for five lakes and ponds in the Kuparuk field showed a range of 9.0-13.1°C, with a mean of 10.9°C. Pollen (1983) observed temperatures ranging from 1.3 up to 15.0°C.

There are no temperature data available for the lake at the ARCO site in summer. Even if they are on the high end of the range reported above, the ambient air temperatures and large surface-to-volume ratio of the shallow mixing zone area are expected to provide sufficient cooling of the effluent. Thus, EPA expects that the effluent will be able to meet the temperature standard at the edge of the mixing zone.

Dissolved Inorganic Substances: The most stringent conditions in the standard for this parameter require that the total dissolved solids (TDS) from all sources shall not exceed 500 mg/l, and neither chlorides nor sulfates shall exceed 200 mg/l. In addition, the increase in TDS shall not exceed one-third of the natural concentration in the water body, and shall not cause corrosion, scaling, or process problems if used for industrial water supply.

No data are available for chlorides in the WWTP effluent. A measurement of sulfate indicated 75.0 mg/l, which is well below the 200 mg/l standard, and therefore does not require a permit limit. Data are also not available for TDS in either the effluent or the lake. Since the WWTP effluent has low concentrations of most inorganic constituents for which ARCO provided data, the TDS concentration is expected to be low. Thus, EPA expects that the effluent will meet the state standard at the edge of the mixing zone.

Toxic and Other Deleterious Organic and Inorganic Substances: This standard requires that "substances shall not individually or in combination exceed 0.01 times the lowest measured 96-hr LC_{50} for life stages of species identified by ADEC as being the most sensitive, biologically important to the location, or exceed criteria cited in Quality Criteria for Water (U.S. EPA, 1986) or Alaska Drinking Water Standards (18 AAC 80), whichever is less.

(a) Metals: The concentrations of metals reported in ARCO's application were compared to wasteload allocation concentrations based on aquatic life and human health values in Quality Criteria for Water. Since the criteria for several of the metals are hardness-dependent, a hardness value had to be chosen. ARCO measured the hardness of the lake on September 2 and 3, 1989, and found it to be 222 and 226 mg/l (as $CaCO_3$). It is likely that these values are somewhat higher than the hardness present in the lake earlier in the summer, based on general trends seen in other tundra ponds (Hobbie, 1980). Since the criteria values which are dependent on hardness decrease (become more stringent) as hardness decreases, EPA has determined that it would be best to choose a value less than 222 mg/l as more representative of conditions earlier in the summer. For this reason, a value of 200 mg/l was selected.

Copper: The maximum effluent value reported for copper was 105 ug/l, which exceeds both the acute wasteload allocation (WLA) of 68 ug/l, and the chronic WLA of 42 ug/l. The effluent can therefore exceed the aquatic life criteria at the edge of the mixing zone, and effluent limits are needed. The necessary effluent limits (derived as described in part III.D.5.) are a maximum daily value not to exceed 47 ug/l, and an average monthly value not to exceed 34 ug/l.

Zinc: The maximum effluent value of 340 ug/l did not exceed the acute WLA of 420 ug/l or the chronic WLA of 382 ug/l, but in EPA's opinion shows reasonable potential for exceeding the chronic WLA. EPA has therefore derived an average monthly limit of 209 ug/l and a maximum daily limit of 288 ug/l. These limits will ensure that the aquatic life criteria are met at the edge of the mixing zone.

Cadmium, chromium (hexavalent and trivalent), lead, nickel, arsenic, iron, barium: The effluent values for all of these parameters were well below the levels which would have "reasonable potential" to cause an exceedance of the applicable aquatic life and human health criteria at the edge of the mixing zone. Therefore, no limits are required for these parameters.

Silver: The level of silver in the effluent was below the detection limit of 2 ug/l. It is therefore well below the level which would have the "reasonable potential" to cause the WLA of 26 ug/l to be exceeded. This is a WLA based on the acute standard for aquatic life. No chronic standard has been developed for silver.

Mercury: The mercury level in the effluent was below the detection limit of 1 ug/l. This is well below the acute WLA of 4.8 ug/l. However, the detection limit is too high to tell whether the chronic WLA of 0.024 ug/l will be met. The detection limit is within the range of acceptable analytical performance, and EPA has no reason to expect mercury in the discharge. Thus, no limits are necessary.

(b) Sulfide: The sulfide concentration measured in the effluent was below the detection limit of 0.2 mg/l. This detection limit meets acceptable analytical standards, but is too high relative to the chronic WLA of 0.004 mg/l to determine whether the WLA will be met. (No acute standard exists for sufide.) EPA does not expect sulfide to be a problem, even if discharged at levels exceeding the chronic WLA but below the detection limit. Any sulfide present would be readily oxidized to sulfate as the effluent is exposed to air upon dropping from the outfall pipe to the lake. Therefore, limits are not needed.

(c) Nitrate: If all of the nitrate/nitrite-N present in the discharge (26.4 mg/l) is present as nitrate, the effluent would exceed the wasteload allocation of 20 mg/l. This WLA is based on the 10-day human health advisory of 10 mg/l. Effluent limits are therefore necessary, and were derived as described in part III.D.5 using a 10-day average for the chronic WLA. The average monthly limit is 20 mg/l, and the maximum daily limit is 28 mg/l.

(d) Ammonia: The ammonia criteria vary with pH and temperature. EPA expects the pH of ARCO's receiving water to be in the range of 5.8-8.3, and the temperature to be in the range of 0-15°C, based on data for other ponds and lakes in the Kuparuk area. Based on these variations, the most stringent acute and chronic water quality criteria for total ammonia are for pH 8.25, temperature 15°C. The criteria are the same for both cold water species present and cold water species absent. The chronic criterion value is 0.76 mg/l NH_3, if expressed in terms of total ammonia (U.S. EPA, 1985a). The value becomes 0.62 mg/l if converted to mg/l N units. With the dilution factor of 2, the chronic WLA is then 1.2 mg/l. The acute criterion for total ammonia is 4.0 mg/l NH_3, or 3.3 mg/l N. The acute WLA is then 6.6 mg/l since the dilution factor is 2. The ammonia (as N) value reported in ARCO's application was 0.75 mg/l. Although this level does not exceed either the acute or chronic WLA, in EPA's judgment this level does have the "reasonable potential" to cause an exceedance of the chronic standard at the edge of the mixing zone. Effluent limits are therefore required. The limits were derived as described in part III.D.5. The average monthly limit is 1.0 mg/l, and the maximum daily limit is 1.4.

(e) Hydrocarbons: Benzene in the effluent was below the detection limit of 1 ug/l. This value is less than the human health WLA of 1.32 ug/l. Since EPA has no reason to expect benzene in the effluent, no limits are needed.

The compounds ethylbenzene, toluene, and 1,2-, 1,3-, and 1,4-dichlorobenzene were all less than the detection limits of 1 ug/l, and are far below the levels which would constitute "reasonable potential" for exceedance of the human health criteria.

(f) Toxicity: The applicable standard requires that "substances shall not individually or in combination exceed 0.01 times the lowest measured 96-hr LC_{50} for life stages of species identified by ADEC as being the most sensitive, biologically important to the location." Measurements of whole effluent toxicity address the "in combination" portion of this standard.

No 96-hr LC_{50} data are available for ARCO's effluent. Thus, a comparison to the standard is not possible until LC_{50} data are collected.

In September of 1988, ARCO had two bioassays performed with a green alga, Selenastrum capricornutum. One was on WWTP effluent, and the other on a sample consisting of 90% filter backwash from the drinking water plant and 10% WWTP effluent. The tests were 96-hr static tests aimed at determining the chronic toxicity of these samples to Selenastrum, as measured by changes in algal growth.

The test results for the second sample were reported in terms of an LC_{50}; i.e., the concentration of effluent which would kill 50% of the organisms. This is not an appropriate measure for an algal growth test, since the test measures growth (or inhibition of it), and not survival. The term EC_{50} (effect concentration) is therefore more appropriate. In addition, the EC_{50} ("LC_{50}") was reported as approximately 0. This is misleading since (1) it is not possible to have an EC_{50} of this magnitude for a relatively non-toxic effluent, and (2) no EC_{50} can be determined since none of the test concentrations showed an effect on growth of 50% or more.

Test results for both samples were also reported in terms of a "no observable effect concentration (NOEC)." The NOEC is the highest concentration of effluent for which the observed response is not significantly different from the control. For the first sample the NOEC was 12.5%, and for the second sample, 50%.

These results can be compared to the EPA guidance of 1.0 TU_c (chronic toxic unit), which is a chronic criterion to be applied at the edge of the mixing zone (U.S. EPA, 1985b and 1987). The WLA in this case is 2 TU_c. The effluent results are converted from an NOEC in percent effluent to a toxicity "concentration" in chronic toxic units by taking 100 divided by the NOEC value. The first sample then has 100/12.5 = 8 TU_c, and the second has 100/50 = 2 TU_c. These results indicate the possibility of chronic toxicity occurring at the edge of the mixing zone. However, the tests were done prior to the change in inputs to the plant (due to backwash water), and prior to treatment adjustments.

Based on the above discussion, EPA has determined that it would be appropriate to collect 96-hr LC_{50} data and additional NOEC data for ARCO's effluent. The data will enable EPA and ADEC to evaluate effluent toxicity relative to the state standard and EPA guidance on chronic toxicity.

Region 10 has selected Ceriodaphnia dubia (water flea) and Pimephales promelas (fathead minnow) as the test organisms. These are standard species which have well-developed protocols (U.S. EPA, 1989a), and which have been used nationwide to evaluate effluent toxicity. Their sensitivity is expected to be similar to that of Alaskan organisms. In addition, toxicity tests with these organisms have the advantage that both 96-hr LC_{50} data and 7-day chronic NOEC values can be determined from a single 7-day test. EPA has also required that 48-hour LC_{50} data for Ceriodaphnia be reported, as it is a more common measure of acute toxicity for this organism.

EPA has required two organisms, since organisms vary widely in their sensitivity to particular effluents, and it is difficult to predict in advance which organism would be most sensitive.

Testing is required quarterly for a minimum of one year. At that time, ARCO may request that the monitoring frequency be reduced to once per year, using the more sensitive of the two species. EPA will grant the reduction in number of tests per year if toxicity does not appear to be a problem relative to the state standard or EPA guidance. The Region will reduce the number of species to be tested if one species is clearly more sensitive than the other one.

The draft permit also contains a provision which requires ARCO to develop and submit a toxicity evaluation and reduction plan within 90 days if EPA determines that chronic toxicity or a violation of the water quality standard could be occurring outside the mixing zone. The plan may include additional toxicity testing if needed to follow up on initial results or gather information for a possible toxicity limit in the future. Upon approval by EPA, the plan shall be implemented and become an enforceable part of the permit.

Chemical testing for parameters limited by the permit is required on splits of samples collected for toxicity testing. Flow rate information is also required. These data will help provide clues as to the source of any observed toxicity, and indicate whether the effluent was within the normal operating range at the time of sampling.

Color: The standard requires that the receiving water not exceed 15 color units, and that there shall be no detrimental effects on established water supply treatment levels, nor interference with or making the water unfit or unsafe for the use. The standard is measured in color units on

the platinum-cobalt scale. The WLA for color is therefore 30 color units. ARCO's application reports a color value of 35 Hazen units, which are equivalent to the color units for the standard.

Since the effluent's color value exceeds the WLA, effluent limits are needed. An average monthly limit of 15 color units and a maximum daily limit of 21 color units will ensure that the color standard is met at the edge of the mixing zone. These limits were derived as described in part III.D.5.

Petroleum Hydrocarbon, Oils and Grease. This standard requires that total hydrocarbons (TH) in the water column shall not exceed 15 ug/l, and total aromatic hydrocarbons shall not exceed 10 ug/l. In addition, water column values shall not exceed "0.01 times the lowest measured continuous flow 96-hour LC_{50} for life stages of species identified by the department as the most sensitive, biologically important species in a particular location."

TH is defined as those compounds measured by Standard Method 503B (the Partition-Infrared Method for oil and grease analysis). No TH data are available for the discharge; thus, oil and grease measurements, which are measured by a slightly different method (Standard Method 503A), were used to estimate compliance with the state standard. Although Method 503B would detect most constituents measured by Method 503A as well as volatile components not measured by 503A, volatile compounds have not been present in the discharge in detectable amounts.

Since the new outfall line has been built, the effluent will no longer pass through the flare pit. Thus, it will not receive hydrocarbon contamination from that source. ARCO reported an oil and grease value of 1.3 mg/l in their application, which is low since the major source of oil and grease is kitchen waste. If the 1.3 mg/l oil and grease value is similar to a total hydrocarbon measurement, the effluent will greatly exceed the WLA of 30 ug/l. However, data are needed on total hydrocarbons (TH) to confirm that this is the case.

Weekly monitoring has therefore been added for total hydrocarbons for one year. As noted previously, the required method for TH monitoring is Standard Method 503B. EPA will evaluate the data at the end of the year to determine whether a TH limit is needed, and will reopen the permit to include such a limit if necessary.

Radioactivity: The WWTP effluent is not expected to have any radioactive components. Thus, achievement of the water quality standard for radioactivity is not a concern.

Chlorine: The most stringent water quality standard for total residual chlorine is "shall not exceed 2.0 ug/l for salmonid fish or 10.0 ug/l for other organisms." This is the standard necessary to protect the "water supply-aquaculture" use, as well as the "growth and propagation of fish, shellfish, other aquatic life, and wildlife" use.

EPA has determined that the 10.0 ug/l standard is most appropriate for the unnamed lake where the discharge will occur, since salmonid fish are not expected to be present. The corresponding WLA (based on dilution considerations) is 20.0 ug/l. The Alaska Department of Fish and Game (ADFG) has documentation of grayling upstream of the CPF-1 site on the Ug River, and of anadromous char to the bend in the river below the CPF-1 site (Weber, pers. comm.). However, given the small size of the Ug River and the tributary, they expect that the fish may swim there, but not overwinter. In addition, North Slope lakes and ponds must be at least 6 ft. deep to allow enough space under the ice for fish to survive over the winter. The unnamed lake is only 2 ft. 5 in. to 3 ft. deep, based on measurements taken by ARCO in 1988 in the area of the lake closest to the outfall. Both ARCO and ADFG expect nine-spine stickleback and perhaps four-horned sculpin to be present since they are extremely common in North Slope ponds and streams.

The maximum daily limit for chlorine based on BPJ/BAT is 1.0 mg/l. This level is 50 times higher than the WLA at the end of the pipe. It would, therefore, indicate the need for a very stringent water quality-based limit if dilution were the only process taken into account in determining chlorine concentrations at the edge of the mixing zone. However, ARCO has requested that Region 10 take into account the fact that chlorine is not a conservative pollutant, and is subject to a variety of processes which would further reduce its concentration prior to reaching the edge of the mixing zone.

These processes include volatilization of chlorine gas, and the reaction of chlorine (a strong oxidant) with other chemical constituents in the effluent and receiving water. During the summer, chlorine is likely to be volatilized from the effluent as it drops the distance of 10' to the lake from the outfall, and as it moves away from the outfall within the lake. The lake's shallow depth means that the waters are likely to be well-oxygenated (and thus stripped of chlorine), especially if the weather

is windy. It is less certain what will happen to chlorine during the winter. The effluent freezes as it falls from the outfall to the lake, and the chlorine may be excluded from the ice (volatilized) as the effluent freezes. This pattern would be similar to that for oxygen, which is chemically somewhat similar to chlorine. If the chlorine remains in the effluent even as it freezes, it would become subject to volatilization and the other processes as thawing occurs in the spring.

Chlorine is also likely to react with other compounds in the effluent and lake. The primary reaction is likely to be the oxidation of organic matter to carbon dioxide and water (Dotson et al., 1986; Dotson and Helz, 1985). Other oxidation-reduction reactions, such as the conversion of ammonia to nitrate, are also expected to occur. It is possible that some chlorinated organic compounds may be formed, but their concentrations are expected to be small.

In estimating the effect of these processes in reducing the chlorine concentration at the edge of the mixing zone, EPA has relied on the first order rate equation

$C = C_o e^{-kt}$ where C_o is the effluent concentration, C is the concentration at the edge of the mixing zone, k is the decay rate constant, and t is the time necessary for the effluent to reach the edge of the mixing zone.

This is an appropriate equation to use since the decay of chlorine in the environment is a first order process (e.g., Heinemann et al., 1983).

For the decay rate constant k, EPA has selected the most conservative of the constants cited in Johnson (1978). This constant is two or three orders of magnitude more conservative than the constant representing the fastest rate of decay.

The above equation also requires an estimate of the travel time to the edge of the mixing zone. Since there is no easy way to model the mixing of the effluent within the lake (see part III.D.4), the travel time was determined by taking the volume of water contained in the 247 ft semicircular mixing zone (assuming an average depth of 2.8 ft), and dividing by the maximum flow rate of the effluent (180,000 gal/d). This provides an estimate of the time (9.63×10^5 sec) which would be required for the water in the mixing zone to be displaced outward by the effluent.

EPA recognizes that this travel time is probably an upper bound on the actual travel time, since it does not take into account wind or wave action. It therefore allows for the maximum amount of chlorine reduction. However, EPA expects that the use of a conservative (slow) decay rate, in combination with the ample margin of safety in meeting the standard (see below), will allow room for variation in the travel time while ensuring that the water quality standard for chlorine is met. Smaller flow rates will take longer to reach the edge of the mixing zone, and will thus allow for even greater decay of chlorine.

If 8.3×10^6 sec^{-1} is used as k, and 9.63×10^5 sec is used as t, then an initial concentration of 1.0 mg/l (the daily maximum limit based on BPJ/BAT) results in a concentration at the edge of the mixing zone of 0.34 ug/l. If a dilution factor of 2 is also taken into account, the concentration at the edge of the mixing zone would be 0.17 ug/l. This is smaller than the standard of 10 ug/l by a factor of 59. Thus, the technology-based chlorine limits are stringent enough to ensure that the water quality standard for chlorine will be met.

Residues: Floating solids, visible foam, and oily wastes are prohibited based on the water quality standard for residues. These limitations were also in the state permit.

7. Summary

In EPA Region 10's opinion, the ARCO wastewater plant discharge will not result in a violation of the Alaska Water Quality Standards outside of a semicircular mixing zone of radius 247 ft, provided that the company complies with the limits and conditions in the draft NPDES permit.

IV. OTHER LEGAL REQUIREMENTS

A. Oil Spill Requirements

Section 311 of the Act prohibits the discharge of oil and hazardous materials in harmful quantities. Routine discharges specifically controlled by the draft permit are excluded from the provisions of Section 311. However, this permit does not preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties for other, unauthorized discharges of toxic pollutants which are covered by Section 311 of the Act.

B. Endangered Species Act

EPA has concluded that the discharges authorized by this permit will have no effect on any endangered or threatened species or its critical habitat. EPA is requesting concurrence from the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on the draft permit, and will consider their comments in the final permit decision. EPA will initiate consultation should new information reveal impacts not previously considered, should the activities be modified in a manner beyond the scope of the original opinion, or should the activities affect a newly listed species.

C. Coastal Zone Management Act

ARCO had certified that the activities authorized by this draft permit are consistent with local and state Coastal Management Plans. The draft permit and consistency determination will be submitted to the State of Alaska for state interagency review at the time of public notice. The requirements for State Coastal Zone Management Review and approval must be satisfied before the permit may be issued.

D. Marine Protection, Research, and Sanctuaries Act

No marine sanctuaries as designated by this Act exist in the vicinity of the permit area.

E. State Water Quality Standards and State Certification

Since state waters are involved in the draft permit, the provisions of Section 401 of the Act apply. Furthermore, in accordance with 40 CFR §124.10(c)(1), public notice of the draft permit has been provided to the State of Alaska and Alaska State agencies having jurisdiction over fish, shellfish, and wildlife resources, and over coastal zone management plans.

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Response to Public Comments

ARCO Alaska Kuparuk Wastewater Treatment Plant
NPDES Permit No. AK-004964-6

General Comments

1. **Comment:** The U.S. Fish and Wildlife Service (USFWS) states that the lake will potentially be degraded by eutrophication, increased turbidity, increased chemical and biological oxygen demand, chlorine reaction products, and many other factors associated with sewage treatment and other chemical wastes. The use of this lake for waste treatment water disposal will likely result in the loss of potentially high-value wetland and lake habitat and is clearly not the preferred environmental alternative.

   USFWS observes that no site-specific studies of bird use of this lake have been undertaken. However, based on inspection of an aerial photograph, it appears to be part of a lake basin complex which is a wetland type on the North Slope that is typically of high value to nesting and feeding waterfowl, especially king eiders, red-throated loons, and non-breeding pintails (Bergman et al. 1977). The lake offers early open-water habitat in late spring, when most surrounding waterbodies are still ice-covered, and may thus be intensively used at this time. In addition, the lake has the type of irregular shoreline, including many small points and a narrow peninsula, that would be very attractive to many species for nesting.

   USFWS further contends that there is a strong potential for adverse effects on the water quality of the receiving stream and to the Ugnuravik River into which the stream discharges.

   USFWS notes that the Alaska Coastal Zone Management Program (ACZM) provides the following:

   > 60 AAC 80.130. Habitats.

(a) Habitats in the coastal area which are subject to the Alaska Coastal Management Program include ... (3) wetlands and tideflats; ... and (7) rivers, streams, and lakes;

(b) The habitats contained in (a) of this section must be managed so as to maintain or enhance the biological, physical, and chemical characteristics of the habitat which contribute to its capacity to support living resources; and

(c) In addition to the standard contained in (b) of this section, the following standards apply to the management of the following habitats: ...

(3) wetlands and tideflats must be managed so as to assure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances; ...

(7) rivers, streams, and lakes must be managed to protect natural vegetation, water quality, important fish or wildlife habitat and natural flow.

USFWS finds that the *preferred environmental alternative* for the discharge of wastewater from Kuparuk WWTP is for ARCO to continue its current practice of using the treated wastewater in waterflooding operations. This practice results in no known environmental degradation and is both feasible, since it is the current method, and prudent, given the large amount of degraded lake, wetland, and stream habitat that will result from surface disposal.

The Trustees for Alaska (Trustees) also contends that the ACMP requires that coastal habitats "must be managed so as to maintain or enhance the biological, physical, and chemical characteristics of the habitat which contribute to its capacity to support living resources" (6 AAC 80.130 (b)). The ACMP allows uses which do not conform to these standards only if it is established that: (1) there is a significant public need for the project; (2) there is no feasible prudent alternative; and (3) all feasible and prudent steps are taken to maximize conformance to the standards (6 AAC 80.130 (d)). Trustees finds that the permit fails on all three counts.

Response: EPA agrees that no surface discharge of processed wastewater effluents is preferable to the discharge of these effluents to the receiving waters of the unnamed lake adjacent to the Kuparuk WWTP, the stream draining this lake, and the Ugnuravik River. ARCO has requested approval "to permanently

augment the water injection supply source for the CPF-1 waterflood project by commingling the treated effluent of the Kuparuk WWTP with the produced water system at CPF-1" (Drumm/ARCO Alaska, 2/5/91). The Alaska Oil and Gas Conservation Commission has evaluated the ARCO proposal and approved "the use of WWTP effluents to permanently augment the water injection supply at CPF-1" (Johnston/AOGCC, 3/4/91).

EPA is issuing the permit to ARCO Alaska as an additional option for the discharge of the waste stream from the Kuparuk WWTP. The permit contains limitations and conditions which will protect the receiving waters from degradation. The ***permit has been modified*** at Part I.C to provide environmental monitoring requirements which will establish the validity of the assumptions and analyses supporting the permit and ensure that the receiving waters are not impacted. The ***permit has been modified*** at Parts I.C.3-4 to include a provision to modify or expand the environmental monitoring program and/or modify, suspend or revoke the permit if the results of the monitoring indicate that the receiving water is in jeopardy of unreasonable degradation.

2. **Comment:** Trustees observe EPA's admission that the proposed permit will result in an increase in pollutants entering the receiving waters, thereby reducing water quality "in the vicinity" of the discharge. This is a violation of Alaska's antidegradation policy, which requires that water quality standards with natural characteristics of higher quality than the water quality criteria "must be kept at the existing quality" (18 AAC 70.010 (c)). The issue of whether permits may authorize the degradation of water quality is the subject of a current challenge by the Trustees and the Northern Alaska Environmental Center to a wastewater permit for a sewage treatment plant operated by ARCO Alaska, Inc. in the Prudhoe Bay operating area.

Trustees also contend that EPA does not have the discretion to rely on a mixing zone in formulating the limits in the permit. Mixing zones must be applied for be an applicant, and are approved and certified by ADEC only after a determination that such zones are as small as practicable and will not cause specified adverse environmental effects (18 AAC 70.032 (a) and (d)). As ARCO has not applied for a mixing zone and ADEC has not granted one, the permit may not allow a relaxation of limits based upon dilution of the effluent within a receiving water.

Trustees observe further that a smaller mixing zone than otherwise required may be necessary if a pollutant or combination of pollutants attract fish or other organisms into the mixing zone. [See USEPA's Technical Support document for Water-Quality Based Toxics Control, at p. 63-65.] Fish have been reported to be attracted to chlorine pollutants.

Response: EPA utilized a proposed "mixing zone" of 247 ft in the analyses and fact sheet supporting the draft permit in consultation with ADEC and in accordance with 18 AAC 70.032. *ADEC accepted the resulting conditions in it preliminary consistency determination without comment and has approved a 250 ft mixing zone* (McGee/ADEC, 4/11/91; Attachment I).

3. **Comment:** Trustees note that there is no baseline data for fecal coliform, dissolved oxygen, total suspended solids, total dissolved solids, copper, zinc, cadmium, chromium, lead, nickel, arsenic, iron, barium, silver, mercury, sulfide, nitrate, or ammonia. The lack of baseline data for the parameters makes it impossible to determine whether the pollutants will, when added to background concentrations of the parameters, result in the exceedence of water quality standards.

Response: EPA will require monitoring of ambient conditions in the environmental monitoring program provided in the permit. The ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water.

4. **Comment:** Although EPA's effluent monitoring criteria appear to be adequate if all assumptions are met concerning mixing and flushing, USFWS finds that there appears to be inadequate study of the lake to make most of the assumptions. USFWS contends that violation of State water quality standards in early summer, following the melt of eight months of winter discharge, is inevitable.

Trustees further note that EPA's determination of the "worst case" dilution is 1:1 and finds that this determination is incorrect. Because the receiving waters are frozen for most of the year, the worse case dilution must be zero. Moreover, even during those few summer months when the tributary is not frozen, EPA has failed to calculate the quantity of the tributary inflow. Accordingly,

EPA's assumption that there will be a dilution factor of 1:1 is without adequate support.

Response: EPA has relied upon the analysis of the spring floods in the Ug watershed undertaken by G.N. McDonald and Associates (1988; provided in ARCO's application) in assessing the dilution achievable during and after breakup. This study indicate that watershed flows through the lake will reach 75-100 cfs during breakup and will decline to "no flow conditions" at the end of the summer. We remain persuaded that there is adequate flow within the watershed to achieve dilution of at least 1:1 for an effluent discharge up to 180,000 gal/day during breakup and through the month of June.

EPA has re-evaluated the flow of the watershed in the mid- and late summer after an on-site inspection of the facility on Sept. 19, 1990. The ***permit has been modified*** at Parts I.A.1.a-c. to provide for a limit of 100,000 gal/day on the effluent flow for the period July 1st through July 31st and to prohibit any discharge for the period August 1st through October 14th.

In addition, the ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water.

5. **Comment:** USFWS specifically contests the calculations of toxicity of contaminants based on an assumed lake hardness of 200 mg/l. In its studies of ponds and lakes in the Prudhoe Bay/Kuparuk oil fields, USFWS has found many lakes with a hardness <100 mg/L. Results of these studies indicate that waterbodies with a hardness of >100 mg/l are typically small ponds adjacent to well-trafficked roads, which are strongly influenced by calcium inputs from road dust because of their small size.

Response: EPA invited the submittal of specific measurements of hardness from ARCO and USFWS. On the basis of data submitted by ARCO (Stokes/ARCO, 11/20/90) and USFWS (Snyder-Conn/USFWS, 11/7/90) the analyses supporting the permit limits were re-assessed using a hardness value of 122 mg/L. The ***permit has been modified*** at Parts I.A.1.a-b. to provide for reduced limits on copper and zinc.

Part I.A.1: Effluent Limitations

6. **Comment:** USFWS states that the toxicity of chlorine alone will undoubtedly affect macroinvertebrates. The proposed chlorine maximum daily limit for total residual chlorine is 1 mg/l. Acute toxicities of a range of invertebrates is from 0.266-0.673 mg/l (USEPA 1985). However, Daphnia (a dominant zooplanter in North Slope ponds and lakes) may be much more sensitive. Ward et al. (1976, Ibid.) observed 100 percent mortality of 3-day-old Daphnia magna at 0.070 mg/l chlorine, and Arthur et al. (1975, Ibid.) found that the 7-day LC50 of this species was 0.002 mg/l chlorine, and between 0.004-0.014 mg/l chlorine in tests in which the organisms were fed. These data suggest that Daphnia in the lake, as well as other indigenous, locally important invertebrates will be killed. Even if the chlorine breaks down immediately, the chlorine reaction products formed (e.g., chloramines) will be toxic to many of these species. Invertebrates provide food to many migratory birds and are especially important to incubating birds and young chicks. Thus, the discharge limitation for chlorine is not protective of locally important invertebrate species, and may result in lowered use of the lake by birds. We request that discharge limitations on chlorine be revised to account for the no-mixing winter condition, a hardness of 100 mg/l (or a hardness based on a series of hardness measurements from water collected at several locations in the lake and verified using standard additions procedures), and bioassays of indigenous invertebrates.

Response: EPA has reported its evaluation of total residual chlorine within the fact sheet (Part III.D.6). Additional information was requested of ARCO Alaska pertaining to the decay of TRC in frozen effluent. ARCO conducted a field experiment on chlorine decay in ice using a design which was considered and approved by Region 10 staff (Gross/ARCO, 2/20/91). The test consisted of placing beakers of effluent from the Kuparuk WWTP in the arctic weather and measuring TRC in the melting effluent after daily periods of exposure. The test indicated that 89% of the TRC was lost during the first 24-hours of exposure and that chlorine decay continued to occur during additional exposure. In fact, the calculated decay rate of 9.5×10^{-6} sec^{-1} is greater than the conservative decay rate utilized in the development of the permit limits (8.3×10^{-6} sec^{-1}). EPA has encouraged ARCO Alaska to continue this useful line of inquiry into the behavior of total residual chlorine in ice. Region 10's inquiries across the nation indicated that the issue has not been well researched.

EPA has provided for bioassays of the water flea (Ceriodaphnia dubia) and the fathead minnow (Pimephales promelas) in the permit. As reported in the fact sheet, these tests are judged to be appropriate in assessing the toxicity of the effluent. *ADEC has the opportunity to require bioassays of indigenous species and to provide direction as to appropriate protocols in the State's certification of the permit.*

7. **Comment:** ARCO's comments center on the limits which EPA has established for total residual chlorine (TRC) in the WWTP effluent. The permit calls for a daily maximum TRC of 1.0 mg/l. This is well below the allowable TRC level which is currently permitted under the existing Alaska State Department of Environmental Conservation Waste Water Discharge permit. Further, as detailed in the Fact Sheet (p. 23, ¶ 6), an initial discharge TRC concentration of 1 mg/l results in a concentration at the edge of the mixing zone of 0.17 ug/l, which is 1/59th of the Water Quality Standard of 10 ug/l. This means that the discharge concentration could be 59 times greater (59 mg/l) at the discharge before water quality limits would be exceeded outside the mixing zone.

ARCO observes that EPA's conclusion that a more stringent Best Available Technology Economically Achievable (BAT) limit can be attained using adjustments in chlorination practices is based upon three Idaho treatment plants. ARCO disagrees with these findings. Since the issuance of the draft permit, we have conducted operational experiments to determine if the plant could comply with the proposed limits by adjustments in chlorination practices. We have found that it is infeasible to operate steadily within both the TRC and the fecal coliform limits given normal plant volume fluctuations. We therefore request that EPA reconsider their finding of BAT. We suggest that BAT is closer to 1.0 mg/l as a monthly average value when fecal coliform limits are as proposed.

ARCO further believes that the BAT proposed by EPA is not economically achievable. Plant modifications would have to be made to bring the plant into compliance with the proposed limits. Our estimates are that it could cost in the range of $200,000 to convert from a chlorination system to an ozone anti-bacterial process. This expenditure to eliminate the chlorine component in the discharge is not justified.

An alternate solution would be to increase the chlorine contact time within the plant. We believe this is likely to be even more costly

due to the space restrictions within the existing facility. Minimizing interior space is a major consideration and therefore equipment sizing is critical to the cost of the facility. The Kuparuk WWTP was sized for compliance with the permit standards envisioned by the State of Alaska when it was designed in the 1979-1980 time frame.

ARCO believes that the Best Available Technology Economically Achievable (BAT) is represented by the state-of-the-art technology and operating techniques which are currently employed at the Kuparuk WWTP. We further believe that the appropriate limit on TRC concentration in the discharge is 1.0 mg/l as a daily maximum and that a monthly average limit is unnecessary. If a monthly average limit must be imposed, it should be set at 1.0 mg/l.

Response: EPA finds that the TRC limits provided by the permit represent a reasonable and achievable application of technology. Information provided by ARCO Alaska has shown that dechlorination is a preferred option in achieving chlorine limits at the Kuparuk Seawater Treatment Plant (Gross/ARCO, 8/23/90).

8. **Comment:** Trustees observe that EPA determined that salmonid fish "are not expected to be present" in the unnamed lake into which the discharge flows. Alaska Department of Fish and Game (ADFG) studies flatly contradict this determination. Salmonids, or members of the family Salmonidae, include salmon, trout, and whitefishes. During field studies performed during 1986-1987, ADFG captured a least cisco (related to the whitefish) in a tributary of the Ugnuravik River (Hemming, 1988). ADFG also reported the presence of broad whitefish in other North Slope mine sites connected to tundra stream systems similar to those connected to the Ugnuravik River. Because salmonid fish <u>are</u> likely to be present in the unnamed lake, the more stringent water quality standard for total residual chlorine of 2.0 ug/l, rather than 10.0 ug/l, should be applied to the permit in order to assure that state water quality standards will be met.

Response: EPA conferred with ADFG regarding the issue of salmonids in the receiving waters of the unnamed lake adjacent to the Kuparuk WWTP. ADFG replied that "we have no data on fish presence in this tundra pond and are cautious about using the referenced fisheries data to demonstrate the presence of fish in this pond (Ott/ADFG, 11/30/90).

9. **Comment:** Trustees finds that EPA's regulations prohibit a contaminant level of fecal coliform that is greater than four coliform bacteria per 100 milliliters (40 CFR 141.14). The average monthly and maximum daily discharge limitations which EPA set in the draft NPDES permit are ten and twenty times greater, respectively, than the fecal coliform drinking water standards for public water systems. The KIC facility is a public water system since it "regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year" (40 CFR 141.2.)

Response: EPA has reviewed 40 CFR 141.14. The reference limits apply to the water quality of processed drinking water rather thna source water. The record of fecal coliform measurements maintained at the Kuparuk Industrial Center indicates that fecal coliform occurs in the tundra drainage to levels of 25 FC per 100 ml water; these bacteria are produced by arctic mammals such as caribou.

10. **Comment:** Trustees observe that the data collected from lakes and ponds in the Kuparuk field demonstrate that temperatures range from 9.0-13.1^{o} C (Fact Sheet at p. 17). The state's most stringent water quality standard for temperature prohibits temperature from exceeding 13^{o} C (Ibid., p 16). According to ARCO's application, the temperature of its discharge has reached 23^{o} C, well in excess of the water quality limit. During the summer, the air temperature of the Kuparuk field is sometimes much warmer than the effluent temperature. Of greater relevance, the unnamed lake was reported to have reached 21^{o} C (approx. 70^{o} F) during the summer. EPA states that sufficient cooling is expected to result from ambient air temperatures and the large surface to volume ratio of shallow mixing zone area. This determination is without support in the records and should be reconsidered.

Response: EPA has considered the issue and determined that additional cooling of the effluent can be achieved by increasing the surface area of the discharge stream in contact with the atmosphere. The installation of a deflector plate to produce a spray has been found suitable for achieving this objective. Therefore, the ***permit has been modified*** at Part I.A.d to achieve a high air to water ratio in the effluent stream.

11. **Comment:** USFWS requests that wastes from the medical clinic, laboratory, photographic processing, corrosive laboratory, and nondomestic, non-sewage wastes from other facilities be specifically excluded from disposal under this NPDES permit. These sources may introduce short-term, potentially toxic waste streams into the effluent that would be difficult to monitor and, therefore, should not be accepted for discharge to the lake.

Trustees contend that EPA erred in authorizing a domestic wastewater discharge that includes not only sewage, but laboratory waste. ADEC's denial was based on 18 AAC 72.027(b)(2) which

states that "No person may discharge oil, petroleum products, or industrial solvents into a sewer designed to handle only sewage or stormwater."

Response: *ADEC has indicated its objection to the discharge of chemical wastes from the labs at the Kuparuk WWTP and its intention to prohibit these discharges in its preliminary consistency determination and State certification.*

12. **Comment:** Trustees find that, absent any direct correlation between suspended solids and settleable solids or turbidity, the background suspended solids and ARCO's final TSS data cannot possibly indicate that the settleable solids component of the Alaska standard for sediment and the Alaska turbidity standard will be met. The data relied upon by EPA indicate that the range of final TSS concentrations (0-20 mg/l) may exceed the range of background concentrations (0-8 mg/l) by up to 12 mg/l. Thus, those data indicate that ARCO's discharges will cause a violation.

Response: EPA has provided for an environmental monitoring program which will verify the accuracy of the assumptions and analyses utilized in developing the permit limits. The ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water. A provision exists to modify or expand this monitoring program and/or modify, suspend or revoke the permit if the results of the monitoring indicate that the receiving water is in jeopardy of unreasonable degradation.

Part I.A.1: Effluent Monitoring Requirements

13. **Comment:** Trustees are concerned about the effects of the effluent from this facility on the drinking water for the Kuparuk Industrial Center (KIC) located downstream. The KIC complex obtains its water from the Ugnuravik River ("Ugnu") during the spring thaw when the water level rises above the intake trap and into the drinking water reservoir for the industrial workers. Because of the manner in which the water is collected at the KIC, it is essential that testing be done during the spring thaw, when a high fecal coliform count could cause the greatest danger to the workers at the KIC.

Response: EPA has provided for an environmental monitoring program which will verify the accuracy of the assumptions and analyses utilized in developing the permit limits. The ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water. EPA agrees that it is essential that testing be done during the spring thaw as well as throughout

the summer as the flows decrease. The Agency will ensure that such provisions are contained within the monitoring plan.

14. **Comment:** Trustees contend that a monitoring frequency of 5 times per month is inadequate to assure that the KIC workers will be adequately protected from the contamination, especially since most of the water may be collected at the KIC facility in a matter of days. Thus, the monitoring frequency must be increased during the critical intake time. We suggest that the permit require the applicant to monitor for fecal coliform once every six hours during the first two weeks after the spring thaw.

    Response: EPA finds that the required frequencies of effluent monitoring are in accordance with state guidelines and are appropriate for the Kuparuk WWTP. In addition, EPA has provided for an environmental monitoring program which will verify the accuracy of the assumptions and analyses utilized in developing the permit limits. The ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water. A provision exists to modify or expand this monitoring program and/or modify, suspend or revoke the permit if the results of the monitoring indicate that the receiving water is in jeopardy.

Part I.C: Ambient Monitoring Program

15. **Comment:** USFWS suggests that the receiving lake itself be subject to weekly monitoring to assure that its water quality meets the State/Federal water quality standards for turbidity, dissolved oxygen, metals and other parameters for which effluent monitoring is required in the draft permit.

    Trustees state that ARCO should be required to employ a sampling procedure which tests the water at or near the surface of the unnamed lake to assure that Alaska's water quality standard for fecal coliform is met. To be most effective, such sampling should be located at the point at which the unnamed lake drains into the tributary which leads to the KIC.

    Trustees state that the effect of the Kuparuk Base Camp's discharge on the receiving waters should be determined by ambient and downstream monitoring, because of the lack of baseline data and EPA's admitted difficulty in modeling for many of the permit parameters.

    Trustees further state that ambient and downstream sampling is especially appropriate where, as here, temperature, flow, and other

factors make modeling difficult of impossible and add a high level of uncertainty to the ascertainment of the effluent's impact upon the receiving waters. EPA lists a number of instances where modeling for this permit could not be utilized due to the many unknown and unique factors effecting the Base Camp.

Trustees also believe that it is reasonable to impose a sampling protocol requiring ARCO to (1) sample the water at an unimpacted location upstream or upgradient of Drillsite 1E (or at a comparable unimpacted stream if there is no unimpacted sampling point in this stream) to obtain baseline data, and (2) sample the water at a point located downstream of the Base Camp airstrip and upstream of the first intake for KIC to determine the effect of the Base Camp effluent upon the unnamed lake, tributary and KIC reservoir. The sampling protocol should encompass the scope of the sampling, the most appropriate location of the upstream and downstream sampling points, and the amount and kind of sampling. If the sampling shows that the Base Camp discharges are resulting in degradation of the receiving stream, ARCO should be required, within a year of the issuance of the final permit, to modify its discharges to assure that State water quality standards are met.

Response: EPA has provided for an environmental monitoring program which will verify the accuracy of the assumptions and analyses utilized in developing the permit limits. The ***permit has been modified*** at Part I.C to provide for monitoring of ambient conditions and the receiving water. Provisions are made for review and approval of the monitoring plan and its subsequent reports by EPA, ADEC and North Slope Borough. A provision exists to modify or expand this monitoring program and/or modify, suspend or revoke the permit if the results of the monitoring indicate that the receiving water is in jeopardy of unreasonable degradation.

Modifications in Accordance with the 401 Certification

16. The *permit has been modified* at Part I.A.1.h to restrict the wastes discharged at the facility to domestic and medical waste and prohibit the discharge of laboratory chemicals.

17. The *permit has been modified* at Part I.A.1.i to require that the discharge shall meet State water quality limits for fecal coliform organisms and total residual chlorine at the edge of a 250 ft mixing zone established by ADEC.

18. The permit has been changed such that all requests, information, data, and reports are provided to and reviewed by ADEC as well as EPA.