DOE/EA-1259

DRAFT

ENVIRONMENTAL ASSESSMENT

FOR THE

WASHINGTON PUBLIC POWER SUPPLY SYSTEM (SUPPLY SYSTEM)

SUBLEASE FOR THE

ALUMINUM SMELTER PLANT

U.S. DEPARTMENT OF ENERGY

RICHLAND, WASHINGTON

AUGUST 1998

PREFACE

This environmental assessment (EA) has been prepared to assess potential environmental impacts associated with the U.S. Department of Energy's (DOE) Proposed Action of approving a sublease/transfer by the Washington Public Power Supply System (Supply System) to a company that would construct and operate a large aluminum smelter plant on the subleased/transferred property. The Supply System leases the property from DOE for the generation of commercial nuclear power. Any sublease/transfer of the Supply System leased property for any purposes must be approved by DOE. Approval of the sublease/transfer would also result in the use of the southern portion of the Hanford Site rail line. Information contained herein will be used by the U.S. Department of Energy, Richland Operations Office, to determine if the Proposed Action is a major federal action significantly affecting the quality of the human environment. If the impacts of the Proposed Action are determined to be major and significant, an environmental impact statement would be prepared. If the impacts of the Proposed Action are determined not to be major and significant, a Finding of No Significant Impact would be issued and the action could proceed. Criteria used to evaluate significance can be found in Title 40, Code of Federal Regulations (CFR) 1508.27.

This EA is prepared in compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended, the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508), and the U.S. Department of Energy Implementing Procedures for NEPA (10 CFR 1021). The following is a description of each section of the EA.

1.0 Purpose and Need for Action. This section provides a brief statement concerning the problem or opportunity the U.S. Department of Energy is addressing with the Proposed Action. Background information is provided.

2.0 Description of the Proposed Action. A description of the Proposed Action with sufficient detail to identify potential environmental impacts is provided.

3.0 Alternatives to the Proposed Action. This section describes reasonable alternative actions to the Proposed Action, which would address the Purpose and Need. A no action alternative, as required by 10 CFR 1021, also is described.

4.0 Affected Environment. This section provides a brief description of the locale in which the Proposed Action takes place.

5.0 Environmental Impacts. The range of environmental impacts, beneficial and adverse, of the Proposed Action are described in this section. Impacts of alternatives are briefly discussed.

6.0 Permits and Regulatory Requirements. This section provides a brief description of permits and regulatory requirements for the Proposed Action.

GLOSSARY

Acronyms

AAQS	Ambient Air Quality Standards (federal or state)
AC	alternating current
BACT	best available control technology
BPA	Bonneville Power Administration (DOE)
Btu	British thermal units
CFR	Code of Federal Regulations
CO	carbon monoxide
DC	direct current
DOE	U.S. Department of Energy
EA	environmental assessment
Ecology	State of Washington Department of Ecology
EIS	environmental impact statement
ESA	*Endangered Species Act of 1973*
kV	kilovolts
MACT	maximum achievable control technology
MW	megawatts
NAAQS	National Ambient Air Quality Standards
PNNL	Pacific Northwest National Laboratory (formerly PNL)
PSD	Prevention of Significant Deterioration
RL	U.S. Department of Energy, Richland Operations Office
SO_2	sulfur dioxide
TAPs	toxic air pollutants
TSP	total suspended particulates
WAC	Washington Administrative Code
WNP	Washington Nuclear Plant
WPPSS	Washington Public Power Supply System (Supply System)

UNIT CONVERSION CHART

Into metric units / Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			Length		
miles	1.61	kilometers	kilometers	0.62	miles
Area			Area		
square miles	2.59	square kilometers	square kilometers	0.39	square miles
square feet	2.296×10^{-5}	acres	acres	4.36×10^{4}	square feet
acres	0.404	hectares	hectares	2.47	acres
Volume			Volume		
cubic feet	7.48	gallons	gallons	0.13	cubic feet
Temperature			Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

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1.0 PURPOSE AND NEED FOR ACTION

The following sections describe the purpose and need and provide background information concerning this environmental assessment (EA).

1.1 PURPOSE AND NEED. The underlying purpose and need for the agency to take the Proposed Action.

The U.S. Department of Energy (DOE), Richland Operations Office (RL) needs to consider a request from the Washington Public Power Supply System (Supply System) for approval of a sublease from the Supply System, or transfer of fee simple title from DOE, for construction and operation of an aluminum smelter plant (Figure 1). The Supply System leases the property from RL and any sublease/transfer requires RL approval. In the event of fee title transfer, assets transferred would include both the aluminum smelter plant site and appropriate infrastructure. The construction and operation of the aluminum smelter plant would also result in the use of the southern portion of the Hanford Site rail system (Figure 2).

1.2 BACKGROUND. BACKGROUND information on the purpose and need, that led to the need for action.

In response to a request from the Tri-City Industrial Development Council (TRIDEC) for business recruitment, the Supply System offered either of two 60 hectare (150 acre) sites of their 404 hectares (1,000 acres) of property leased from DOE to attract a commercial aluminum company to locate in the Tri-City area. A commercial aluminum company screened a list of potential Tri-City area sites provided by TRIDEC to the two locations submitted by the Supply System. As part of granting a sublease or transfer action, DOE requires evaluation of potential impacts of the proposal under the *National Environmental Policy Act of 1969* (NEPA).

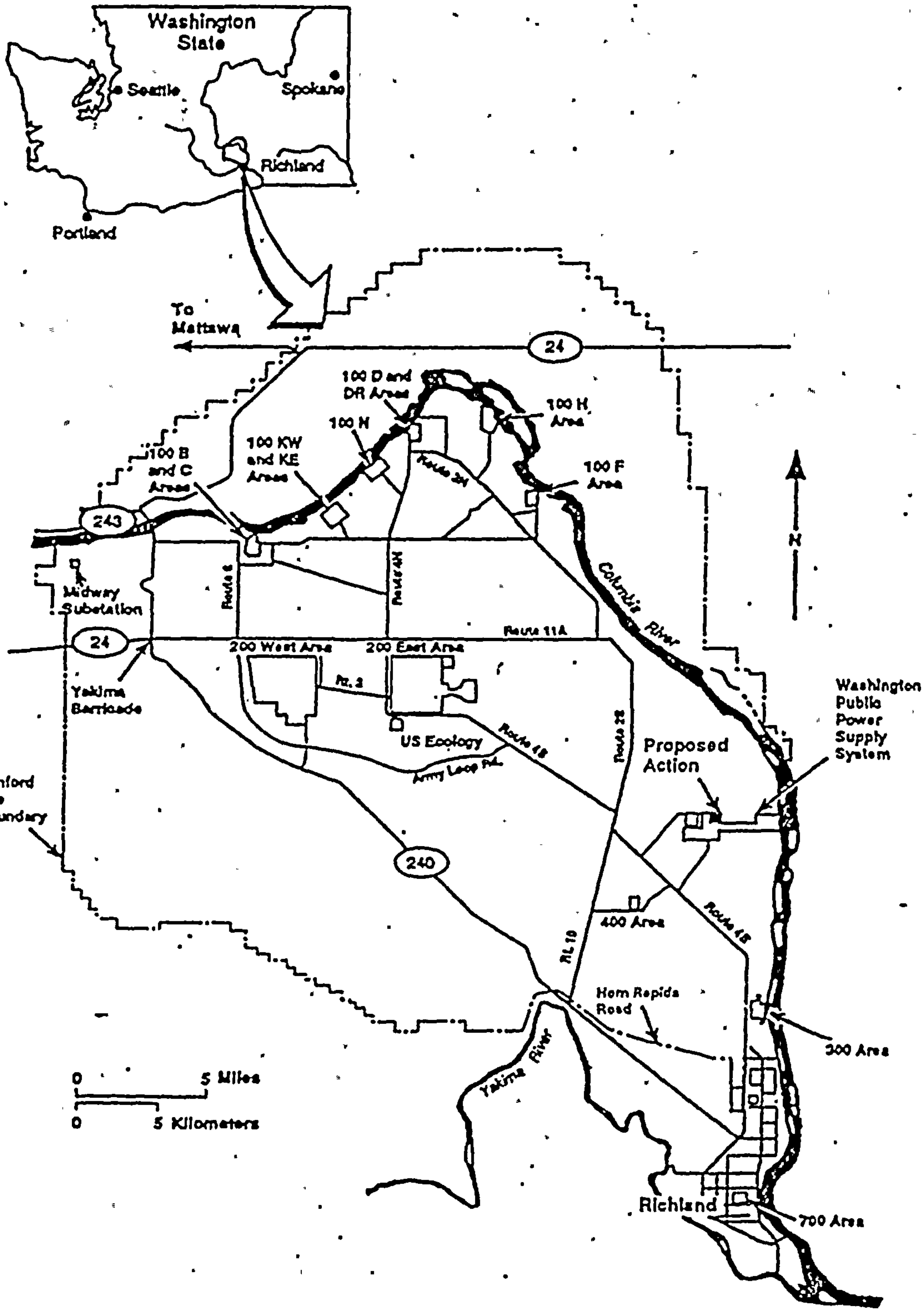

Figure 1. Hanford Site.

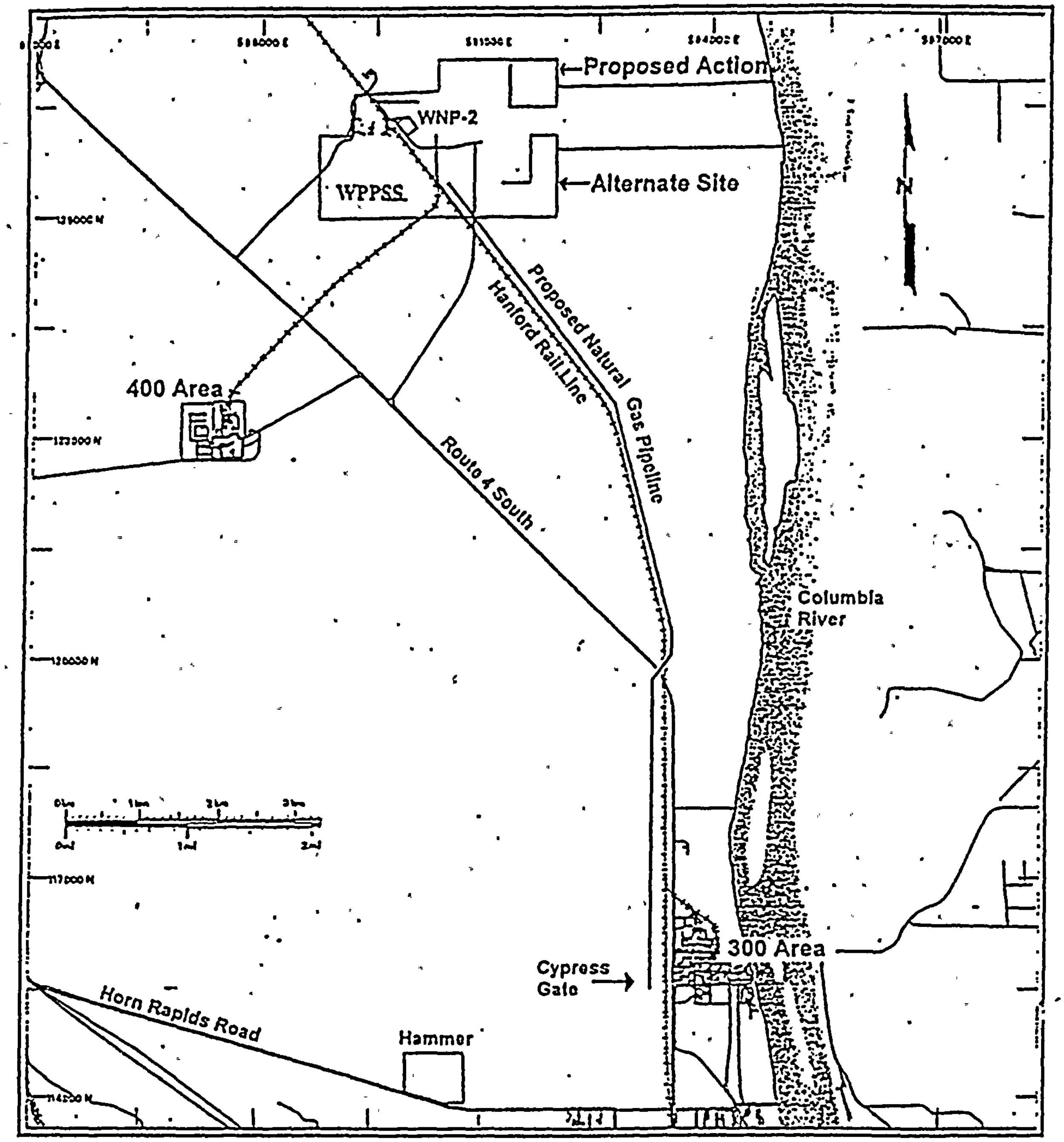

Figure 2. Southern Hanford Site Rail Line and Proposed Natural Gas Pipeline.

2.0 DESCRIPTION OF THE PROPOSED ACTION

Following RL approval of the proposed sublease/transfer, the Supply System would offer to a commercial aluminum company a long-term sublease or fee simple transfer of either one of two 60 hectare (150 acre) sites for siting, construction, and operation of a new aluminum smelter plant (Figure 3). Both sites are on the Supply System's 404 hectares (1,000 acres) industrial site located at the unfinished Washington Nuclear Plants-1 and -4 (WNP-1/4) site on the Hanford Site about 1.6 kilometers (1 mile) east of the WNP-2. The Preferred Alternative would occur adjacent to the Supply System's unfinished WNP-4. According to the Supply System's records, the area is environmentally clean, radiation free, and has highway and railroad access, water wells, waste water treatment facilities, and 230 kilovolts (kV) electrical power service from the Bonneville Power Administration (BPA) Ashe substation located adjacent to the site. Extension of the existing Supply System infrastructure, utilities, railroad, and other services to the aluminum smelter plant would be provided by the Supply System with assistance from Benton County. The sublease/transfer also includes the WNP-4 Containment Building and General Services Building structures for potential storage of raw alumina, spent potliners, and/or other uses. These two buildings would be surveyed for the presence of any endangered or threatened species prior to use.

The long-term sublease or transfer would be contingent upon approval by RL, BPA, and the Supply System Executive Board. If the initial aluminum company fails to take the Supply System sublease/transfer offer, the Supply System could offer a sublease/transfer to another aluminum company. The Supply System's current Official Statement of the estimated cost of site restoration for WNP-1 and WNP-4 are $46 million and $30 million, respectively. BPA could realize resource conservation cost savings by avoiding annual maintenance and eventual removal costs of those two facilities.

The initial construction phase of the Proposed Action would build a 60- to 75-thousand (K) metric ton per year capacity aluminum smelter plant over an 18 month to 2 year period. This plant would be termed as a prebake aluminum smelter (bringing in prebaked anodes), and would initially employ approximately 125 employees. If market demand for aluminum is adequate, the Proposed Action would include expansion of the aluminum smelter after initial construction to about a 120K- to 150K- metric ton plant that would include an anode bake production shop (making anodes). If the market demand continues to warrant further expansion, the capacity of the proposed aluminum smelter plant could expand to a 300K metric ton plant, with 600 to 1,000 employees

The building height would be approximately 15 meters (50 feet) with prefabricated steel sheeting for the exterior with the color to blend in with the environment. Stacks and towers would be approximately 40 meters (130 feet) high. Initially, 75 parking spaces (three shifts) would be needed. At full production, 350 parking spaces (three shifts) would be needed. The Supply System site currently is served by Ben Franklin Transit. All minor road and railroad extensions to service the Proposed Action would occur within the existing Supply System site. Construction time of the large plant would take about the same amount of time as initial construction.

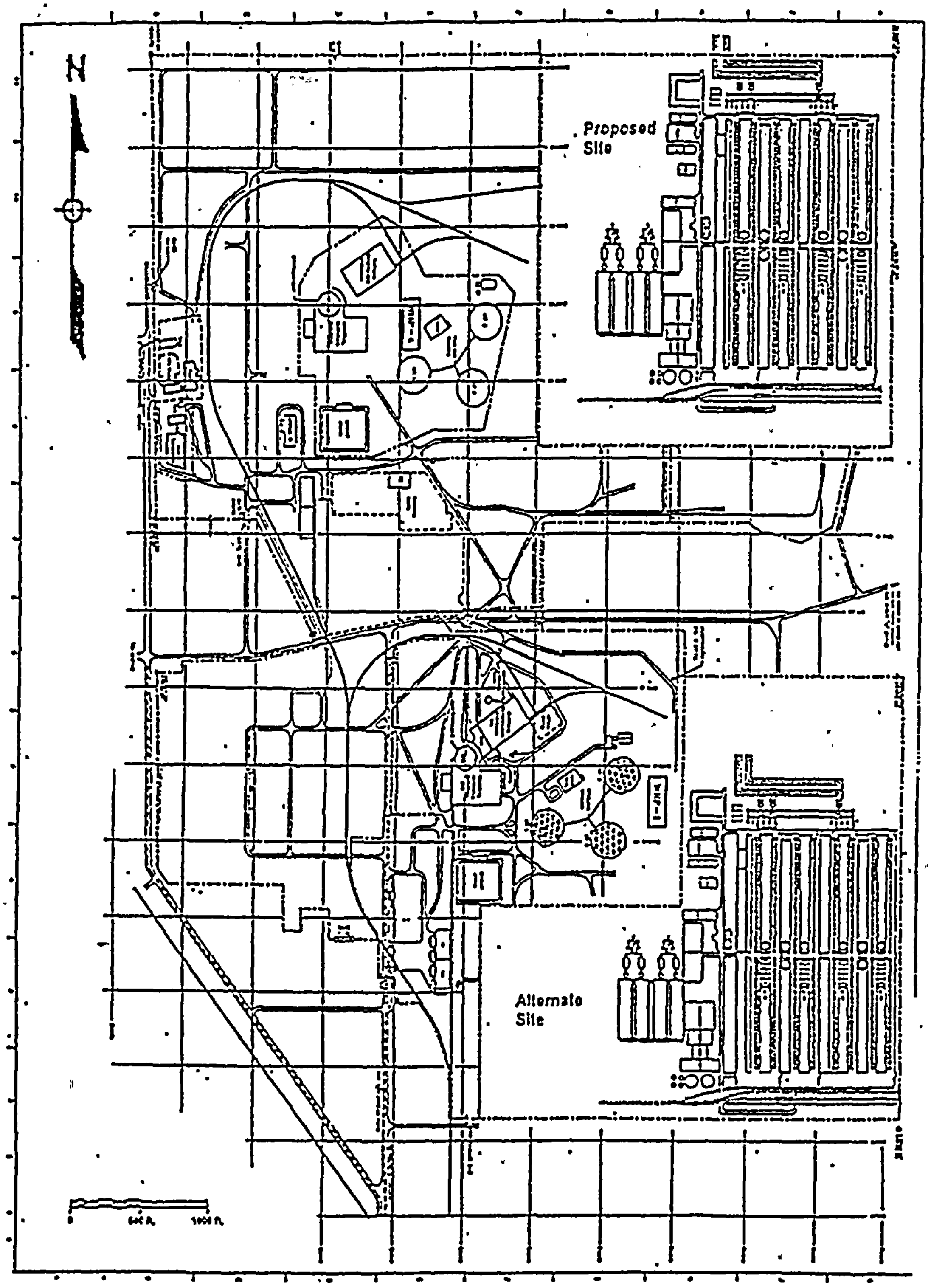

Figure 3. Proposed Siting for Aluminum Smelter Plant.

The proposed aluminum smelter plant would include the following elements:

- A single potline consisting of 120 prebake reduction cells (60K-metric ton capacity)
- An alumina offloading, handling and storage system including a 40K metric ton storage silo and suction unloader
- Fume treatment equipment to ensure that gaseous emissions produced by the reduction cells meet applicable regulatory requirement levels
- A complete anode bake production shop
- An electrical substation (supplied by BPA) for transforming the incoming 220 kV alternating current (AC) supply down to a variable direct current (DC) voltage
- An administration office including a canteen, showers and locker room.

The following table (Table 1) estimates resources that may be used annually by the proposed aluminum smelter plant.

Table 1. Resource Estimates for Aluminum Smelter Plant

Aluminum production	60K metric tons/year	300K metric tons/year
Alumina consumption	160K metric tons/year	800K metric tons/year
Anode handling	Prebake plant only (anodes from offsite)	Anode bake production shop (make anodes)
Natural gas consumption	800 metric tons/year	9,700 metric tons/year
Electrical consumption	900 gigawatt hours (gW-hr)/year	4500 gW-hr/year
Rail car traffic	42/week	210/week
Truck traffic	4 to 10/day	20 to 50/day
Parking spaces required	75	350
Employment	125	600 to 1,000

Water needed for the proposed aluminum smelter plant would be made available through the use of the Supply System's existing water rights (Appendix C) of water usage from the Columbia River for WNP-2. No new construction of water intakes or outfalls would occur at the Columbia River. The Proposed Action would tie-in to the existing 16" diameter pipe off of WNP-2's intake water line from the Columbia River. The discharge of industrial cooling water from the plant would exit through the existing WNP-1/4 outfall water line back to the river. If it is determined that the industrial water requires treatment, the commercial aluminum company would be responsible to treat the water before disposal. Industrial water would be treated in accordance with applicable environmental regulations and permits before any allowable discharge. Sanitary wastes would be disposed to the existing, permitted Supply System Sanitary Waste Disposal System.

The primary nondangerous solid waste that would be generated is referred to as dross. Dross is furnace slag which consists of aluminum metal and aluminum oxide that floats and has recycle value. The rate of dross generation is about 0.5% to 1% of the plant's primary metal production. Dross would be collected and stored in bunkers before transporting offsite for recovery. Cleaning the anodes produces small quantities of nondangerous solids, a fine carbon powder called blowdown, which consists of about 50% sodium and aluminum fluoride and 50% fine carbon. Blowdown material would be collected and sent offsite for disposal. All nondangerous waste would be disposed of offsite in accordance with applicable requirements.

Small quantities of dangerous waste such as batteries would be generated during maintenance activities. It is planned to recycle these materials locally. The largest amount of dangerous waste expected to be generated during operation is the spent potlining, consisting of carbon, refractory brick, steel, aluminum salts (fluorides, sodium, and calcium), and 0.5% cyanide. The dangerous waste would be staged before being shipped offsite for treatment and disposal in accordance with applicable regulations.

Approval of the sublease/transfer would result in use of the southern portion of the Hanford Site rail system from Horn Rapids Road north to the Supply System and the proposed aluminum smelter plant. Any modifications to the existing rail line to support the proposed action would occur on, for the most part, previously disturbed RL land leased to the Supply System. To support initial operations, approximately 42 rail cars per week would transport about 160K tons of raw alumina to the aluminum smelter plant from offsite. This increased rail traffic on the southern portion of the Hanford Site rail system adds to the approximate 900 rail cars per year shipped by Lamb-Weston, Inc., a local food processing company.

For the initial phase, freight shipments would involve 4 to 10 trucks entering and leaving the plant each day. Most of the finished product would be transported out by truck, with up to a third of the total sent by rail. At full production, the numbers would be about five times these values.

Because it burns cleanly and efficiently, natural gas would be used as fuel for most of the anode production process (anode baking and anode paste mixing), metal casting, and utility heating. Annual natural gas consumption during initial operations would be about 800 metric tons, or about 42 billion British thermal units (Btu). At full production that would include an anode bake production shop, annual natural gas consumption would increase to about 9700 metric tons, or about 510 billion Btu. Delivery of the natural gas to the proposed aluminum smelter boilers, hot water heaters, and furnaces would require installation of an approximately 6 inch diameter, 250 pounds per square inch (psi), main carbon steel pipeline and a distribution network of approximately 2 inch diameter pipes. The new pipeline would be tied into the existing natural gas main pipeline near the Cypress Gate at the southwest corner of the 300 Area on the west side of the Southern Hanford Site Rail Line (Figure 2). The main pipeline would cross under Route 4 South and the rail line where these intersect, about 1 mile north of the 300 Area. The main pipeline would be on the east side of the rail line corridor and terminate at the end of the railroad line inside the Supply System property. The smaller distribution pipeline would be connected from the main pipeline to the aluminum smelter plant within previously disturbed areas on leased Supply System property.

The main pipeline would be approximately 16 kilometers (10 miles) long, and would parallel and be within the existing and previously disturbed, 15-meter (50-foot) wide right-of-way of the Southern Hanford Site Rail Line in order to minimize potential impacts to the environment. The smaller distribution pipelines would be connected from the main pipeline to the aluminum smelter plant within previously disturbed areas on Supply System property. A control system would be installed to monitor and control the flow of natural gas.

Construction of the pipeline route along the railroad right-of-way and within Supply System property would involve excavating to a depth of approximately 1 meter (3.3 feet). The width of the ditch would be approximately 0.5 meter (1.7 feet). Excavated material would be stockpiled next to the ditch and used for backfill after pipe installation. The ditch would be bedded with approximately 10 centimeters (4 inches) of sand or clean, rock-free dirt. The pipe would be covered with approximately 5 centimeters (2 inches) of sand or rock-free dirt and backfilled with the excavated material. All construction materials would be transported to the work site by common truck carrier. The materials would be staged in a designated, previously disturbed laydown area. After completion of the construction, the laydown area would be restored to its former condition and reseeded as appropriate. Appropriate areas may be sprayed to prevent noxious weeds from getting established.

2.1 PROPOSED TIMING. Timing or schedule of the Proposed Action (including phasing, if applicable).

The Proposed Action would be accomplished in a phased approach. An approximate timetable for the Proposed Actions, if the sublease/transfer is approved, is as follows:

• Sublease/transfer approval of aluminum plant	Summer 1998
• Initial 60K- to 75K-metric ton construction	Spring 1999
• Potential expansion to 120K- to 150K- metric ton	2002 or after.
• Potential expansion to 300K metric ton	2006 or after.

2.2 ALUMINUM SMELTER INFORMATION. Aluminum smelter information that is related to the Proposed Action.

Primary aluminum is produced from alumina (aluminum oxide) refined from bauxite. For smelter use, it is calcined to drive off almost all bonded and free moisture and is delivered to the smelter in the form of a granular white powder similar in appearance to fine, white sand. This alumina would be shipped by rail from offsite to the proposed site to provide feed stock for the proposed aluminum smelter plant. To produce one metric ton of aluminum, 1.89 metric tons of alumina are required.

The alumina is dissolved in a molten salt bath of cryolite (sodium aluminum fluoride) and the dissolution of the metal and oxide is accomplished electrolytically. The molten cryolite bath is augmented with small additions of other salts (primarily aluminum fluoride) to reduce the melting point of the salt bath to 955 degrees Celsius (°C) (1751°Fahrenheit [F]).

The typical reduction cell consists of a large, steel shell. Insulation and refractory bricks are used to line the inside of the steel shell and carbon blocks are placed on the bottom and sides to completely cover all of the refractory. Joints in the carbon are sealed with a rammed mixture of carbon paste that is baked into a carbon bond by external heat. The carbon blocks on the bottom of the cell contain imbedded steel bars to carry electrical current from the cell. The assembled carbon cell lining and steel electrical conductors are the cathode of the electrolytic reaction and is the electrically negative pole of a DC reaction.

The electrically positive pole of the reaction is the anode, which is constructed of carbon. Electrical current flows from the anode into the molten bath and into the cathode carbon blocks and out of the cell via the steel cathode conductors. The cathode carbon is protected from exposure to air by the molten bath. Alumina dissolved in the bath is reduced electrolytically into aluminum and oxygen. The melting point of aluminum is about 680°C (1256°F). Thus, the aluminum metal produced is liquid at the 950°C (1742°F) operating temperature of the reduction cell.

Because of the required conversion of electrical energy to DC, the most efficient arrangement of melting pots is to connect individual pots electrically in series so that the power loss because of rectification can be minimized by maximizing the number of pots requiring only one rectification. Typically, between 120 and 240 pots are connected in series to form one potline operating at a nominal voltage of 700 to 1,000 volts DC.

Two measures are used for the relative efficiencies of aluminum reduction pots. The primary measure is energy efficiency expressed in DC kilowatt-hours per pound (kWh/lb) of aluminum produced. Energy efficiency is a straightforward measurement of the electrical cost of producing a pound of aluminum. A second measure used within the industry is current efficiency, expressed as a percentage of the theoretical maximum amount of aluminum that can be produced by the ampere-hours of electricity passing through the cell. Energy efficiency is in the 300,000 amperes range to 5.8 kWh/lb for modern prebake pots. Current efficiencies in new aluminum smelter plant operations under good control are as high as 93.5 percent, compared to about 88 percent efficiencies in older technology plants.

The aluminum metal from the rooms containing melting pots (potrooms) is received into holding furnaces, alloyed and fluxed to customer specifications, continuously cast into rolling ingots or extrusion billets, heat-treated, sawed to length, and shrink-wrapped for shipment as final product to the customer.

2.3 ENVIRONMENTAL INFORMATION. Other environmental information that has been prepared, or will be prepared, directly related to the Proposed Action.

Following a submittal for a special use permit, on May 4, 1998 the Benton County Planning & Building Department initially issued a Determination of Nonsignificance (DNS) provided that the Proposed Action would mitigate potential adverse air impacts through adherence to Benton County and Washington State permit conditions. However, Benton County has delayed a final DNS for at least 60 days. Information on the existing Supply System buildings and operation has been previously evaluated in an environmental statement (NUREG-0812). Two Biological Resources Reviews (Appendix A) and two Cultural Resources Reviews (Appendix B) have been prepared for the Proposed Action.

4.0 AFFECTED ENVIRONMENT

The following sections provide a discussion of the existing environment to be affected by the Proposed Action and alternate site.

4.1 GENERAL HANFORD SITE ENVIRONMENT

The Hanford Site is 1,450 square kilometers (560 square miles) located in southeastern Washington State, in a semiarid region with rolling topography. Two topographical features dominate the landscape: Rattlesnake Mountain is located on the southwest boundary of the Hanford Site. The Columbia River flows through the northern part of the Hanford Site and forms part of the eastern boundary of the Hanford Site (Figure 1). Areas adjacent to the Hanford Site are primarily agricultural lands.

The Hanford Site has a mild climate with 15 to 18 centimeters (6 to 7 inches) of annual precipitation, with most of the precipitation taking place during the winter months. Temperature ranges of daily maximum temperatures vary from normal maxima of 2°C (36°F) in early January to 35°C (95°F) in late July. Monthly average wind speeds are lowest during the winter months, averaging 10 to 11 kilometers per hour (6 to 7 miles per hour), and highest during the summer, averaging 14 to 16 kilometers per hour (8 to 10 miles per hour) (PNNL-6415). Tornadoes are extremely rare; no destructive tornadoes have occurred in the region surrounding the Hanford Site.

The Hanford Site and the surrounding area are in attainment of the National Ambient Air Quality Standards (NAAQS) designed to protect the public health and welfare. During 1996, the Hanford Site and Supply System air emissions remained below all established limits set for regulated air pollutants (PNNL-11472). Atmospheric dispersion conditions of the area vary between summer and winter months. The summer months generally have good air mixing characteristics. Occasional periods of poor dispersion conditions occur during the winter months.

The vegetation on the Hanford Site is a shrub-steppe community of sagebrush and rabbitbrush with an understory consisting primarily of cheatgrass and Sandberg's bluegrass. The typical insects, small birds, mammals, and reptiles common to the Hanford Site can be found in the 200 Area plateau (PNNL-6415). Relatively undisturbed areas of the mature shrub-steppe vegetation are high quality habitat for many plants and animals and have been designated as "priority habitat" by Washington State.

Most mammal species known to inhabit the Hanford Site are small, nocturnal creatures, primarily pocket mice and jackrabbits. Large mammals found on the Hanford Site are deer and elk. Coyotes and raptors are the primary predators. Several species of small birds nest in the steppe vegetation. Semiannual peaks in avian variety and abundance occur during migration seasons. Additional information about the Hanford Site can be found in the publication entitled the *Hanford Site National Environmental Policy Act (NEPA) Characterization* report (PNNL-6415).

3.0 ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the Proposed Action are discussed in the following sections.

3.1 NO ACTION ALTERNATIVE.

CEQ and DOE NEPA regulations require DOE to analyze the "No Action alternative," i.e., to examine what would happen if nothing were done. Note that generally this is a continuation of the status quo.

The No Action alternative would be RL disapproval of the Supply System proposed sublease/transfer. There would be no construction of an aluminum smelter plant.

3.2 ALTERNATE ALUMINUM SMELTER PLANT SITES.

Other alternatives considered. CEQ regulations direct all agencies to identify reasonable alternatives that would achieve the purpose and need.

Other Alternatives to the Proposed Action are described in the following sections.

3.2.1 ALTERNATE ALUMINUM SMELTER PLANT ON THE HANFORD SITE.

The alternate site for the proposed aluminum smelter would be adjacent to the Supply System's unfinished WNP-1. The process flow for producing aluminum requires a configuration that is uniform in shape (square in shape) similar to the Proposed Action site, while the alternate site is L-shaped. The recommended site would use the existing Supply System infrastructure to the maximum extent possible by locating the proposed aluminum smelter plant as close as practical to WNP-4, whereas the alternate site is further away from WNP-4. The alternate site would require longer extensions to existing utilities and infrastructure than the Proposed Action because of the orientation of the Supply System site. Therefore, this alternate would be more costly to construct compared to the Proposed Action.

3.2.2 ALTERNATE ALUMINUM SMELTER PLANTS ON NON-HANFORD SITES.

The commercial aluminum company is considering other locations away from the Hanford Site. These sites are not analyzed in this EA because they are not within the purview of DOE.

RL and its contractors are a large portion of the local employment picture with almost one-quarter of the total nonagricultural jobs in Benton and Franklin counties. Ninety-three percent of Hanford Site personnel reside in the Benton and Franklin county areas. Therefore, work activities on the Hanford Site play an important role in the socioeconomics of the Tri-Cities (Richland, Pasco, and Kennewick) and other parts of Benton and Franklin counties (PNNL-6415). Other counties are less affected by changes in Hanford employment.

4.2 SPECIFIC SITE ENVIRONMENT

All of the Supply System property for both proposed sites for the aluminum smelter plant is located on, for the most part, previously disturbed land designated for industrial use (DOE/EIS-0222D). Installation of the natural gas pipeline would occur on previously disturbed areas along the Southern Hanford Site Rail Line, 15-meter (50-foot) wide right-of-way, and within the Supply System property. The proposed site of the aluminum smelter plant is approximately 2.8 kilometers (1.75 miles) from the Columbia River. The Proposed Action is outside of the Hanford Reach Study area. The Proposed Action is not located in the 100-year floodplain of the Columbia River, nor is it located within a wetlands area (NUREG-0812). The proposed site of the aluminum smelter plant averages about 115 meters (375 feet) above mean sea level and does not contain any prime farmland, state or national parks, forests, conservation areas, or other areas of recreational or aesthetic concern. The proposed aluminum smelter plant would be in view from the river several miles away to the south. The habitat at the site of the proposed aluminum smelter is typical of the general Hanford Site shrub-steppe habitat. The City of Richland (population approximately 32,000), located about 16 kilometers (10 miles) away in Benton County, adjoins the southernmost portion of the Hanford Site boundary and is the nearest population center.

4.2.1 Soils and Subsurface

The soil in the Supply System property is predominately loose to medium dense, fine to coarse eolian sand with scattered gravel (glaciofluvial sediments) to about 60 meters (200 feet) below the surface. The geologic strata under the surface layer, in descending order, are upper and lower Ringold Formation ranging from about 60 meters (200 feet) to 365 meters (1,200 feet), and the Columbia River Basalt Group below 365 meters (1,200 feet). The upper Ringold Formation consists of very dense, sandy gravel with interbedded sandy and silty layers. The lower Ringold Formation consists of very dense, interbedded layers of sandy gravel, silt, and soft sandstone (NUREG-0812). Basalt flows of the Columbia River Basalt Group and intercalated sediments of the Ellensburg Formation underlie the Ringold Formation. The region is categorized as one of low to moderate seismicity (PNNL-6415).

4.2.2 Hydrology

Water needed for the Proposed Action would be delivered from the Columbia River via the existing WNP-2 intake water line provided by the Supply System. The Supply System has water rights for use of up to 56 cubic feet per second (f^3/sec) (about 25,000 gallons per minute [g/min]) for consumptive industrial use. In addition, the WNP-2 Site Certification Agreement and Resolution #122 (Appendix C) allows the Supply System to provide water of up to 8.9 ft^3/sec (4000 g/min) for commercial development. The Supply System currently uses about 34 ft^3/sec (15,300 g/min) during WNP-2 operations. Estimated maximum quantities of water to be used by the full buildout aluminum smelter plant would be maximum of about 8.9 ft^3/sec (4000 g/min). The primary uses of the industrial water would be as a heat exchanger to cool electrodes, castings, anodes, and for air compressors. A maximum of about 8.02 ft^3/sec (3600 g/min) would be discharged through the existing WNP-1/4 outfall water line back to the river. Since the WNP-1/4 outfall water line currently is not in use, a National Pollutant Discharge Elimination System (NPDES) water permit would be required for its use. Maximum sanitary water discharges are estimated at 0.18 ft^3/sec (80 g/min). Sanitary water would be discharged to the existing Supply System Sanitary Waste Disposal System. All water usage would comply with applicable regulatory requirements.

The water table in the supply system area is approximately 9 meters (30 feet) to 12 meters (40 feet) below the surface (NUREG-0812), and is unaffected by contamination plumes from the 200 East and 200 West Areas.

4.2.3 Air Resources

An extensive database of meteorological information exists for the Hanford Site. Meteorological monitoring began on the Hanford Site in 1945. In the early 1980's, automated monitoring stations began monitoring winds, temperature, and other meteorological parameters at locations across the Hanford Site. Currently, 30 monitoring stations are in operation, including a station that is located in the vicinity of the WNP-2 plant. Data from this monitoring network provides a comprehensive database for modeling the atmospheric dispersion of pollutants and for estimating the likely air quality impacts from proposed facilities.

Atmospheric dispersion is a function of wind speed, duration and direction of wind, atmospheric stability, and mixing depth. Dispersion conditions are generally good if winds are moderate to strong, if the atmosphere is of neutral or unstable stratification, and if there is a deep mixing layer. Neutral and unstable stratifications occur about 56% of the time during the summer. Less favorable dispersion conditions occur when the wind speed is light and the mixing layer is shallow. These conditions are most common during the winter when moderately to extremely stable stratifications occur about 66% of the time. Less favorable conditions also occur near the surface in all seasons from about sunset to about an hour after sunrise as a result of ground-based temperature inversions and shallow mixing layers. Stationary high-pressure systems produce extended periods of poor dispersion conditions, particularly when they occur during the winter months (PNNL-6415).

NAAQS (Table 2) define levels of air quality that are necessary, with an adequate margin of safety, to protect the public health (primary standards) and the public welfare (secondary standards). Ambient air is that portion of the atmosphere, external to buildings (or a facility fenceline), to which people not directly associated with the pollution source may have access. National standards exist for sulfur oxides (measured as sulfur dioxide [SO_2]), nitrogen dioxide (NO_2), carbon monoxide (CO), total suspended particulates (TSP), fine particulates (PM_{10}), and ozone. The standards specify the maximum pollutant concentrations and frequencies of occurrence that are allowed for specific averaging periods. The averaging periods vary from 1 hour to 1 year, depending on the pollutant. Prevention of significant deterioration (PSD) standards (Table 2) are more restrictive than NAAQS; the PSD standards limit the ambient air quality impact from any single pollutant source.

Table 2. Limits for Most Restrictive NAAQS and PSD Standards.

Pollutant	Time Period	NAAQS[a] ($\mu g/m^3$)	PSD Limit[d] ($\mu g/m^3$)
CO	8 h	10,000	---
	1 h	40,000	---
NO_2	Annual	100	25
O_3	1 h	235	235
PM_{10}	Annual	50	17
	24 h	150	30
SO_2	Annual	80	20
	24 h	365	91
	3 h	1,300[b]	512
	1 h	1,040[c]	---

(a) All values are for national primary standards, unless indicated as being a national secondary or Washington State standard. Primary standards are set to provide levels of air quality necessary to protect the public health.

(b) A secondary standard. This standard sets a level of air quality necessary to protect public welfare from the adverse effects of a pollutant.

(c) Washington State standard

(d) PSD federal limits for Class II areas. More stringent limits are imposed Class I areas. Wild and scenic rivers may be classified as either Class I or II.

Federal regulations require the states to promulgate their own regulations to achieve or maintain compliance or "attainment" with ambient air quality standards. State and local governments have the authority to impose standards for ambient air quality that are stricter than the national standards. Washington State has established more stringent standards for sulfur dioxide and TSP. In addition, Washington State has established standards (Table 3) for total fluoride (TF), and other pollutants that are not covered by national standards.

Table 3. Washington State Fluoride Standards

Pollutant	Time Period	Primary ($\mu g/m^3$)
Fluorides (TF)	12 consecutive hours	3,700
	24 consecutive hours	2,900
	7 consecutive days	1,700
	30 consecutive days	840
	March 1 through October 31	500

The Hanford Site and surrounding areas are in attainment with ambient air quality standards. On occasion, particulate concentrations can reach relatively high levels in eastern Washington State because of exceptional natural events (i.e., dust storms, volcanic eruptions, and large brushfires) and agricultural activities (e.g., field burning, plowing fields) that occur in the region. The U.S. Environmental Protection Agency (EPA) has exempted the rural fugitive dust component of background concentrations when considering permit applications and enforcement of air quality standards. Similarly, Washington State ambient air quality standards have not considered "rural fugitive dust" from natural or some agricultural practices when estimating the maximum background concentrations of particulates in the area east of the Cascade Mountain crest.

To meet air regulatory requirements and keep within ambient air quality standards, the emission collection systems used in the proposed aluminum smelter plant would use applicable best available control technology (BACT) and maximum achievable control technology (MACT) before operation of the proposed aluminum smelter plant begins. Each BACT/MACT option is evaluated for its range of impacts and cost -effectiveness during the air permitting process. The control options providing the greatest control efficiency is selected unless eliminated on energy, environmental, or economic grounds. The commercial aluminum company would be required to obtain the appropriate PSD air permits controlling criteria pollutant emissions under Washington

Administrative Code (WAC) 173-400-110 and WAC 173-400-141. A Toxic Air Pollutants (TAPs) air permit would also be required under WAC 173-460. The State of Washington Department of Ecology (Ecology) and EPA have promulgated emission limits applicable to primary aluminum smelter operations (Table 4). New aluminum smelters that would be subject to 40 CFR 60 Subpart S might elect to comply with either the requirements of 40 CFR 60 Subpart S or 40 CFR 63 Subpart LL.

Table 4. Regulatory Emission Limits Applicable to Proposed Aluminum Smelter Plant.

Regulation	Pollutant	Emission limit
WAC 173-415, "Primary Aluminum Plants."	Fluorides	Minimum fluoride collection efficiencies are prescribed for each potline primary emission control system. A primary emission control system with a design removal efficiency of at least 95%.
	Particulates	15 pounds per ton of Al produced on a daily basis
	SO_2	60 pounds per ton of Al produced on a monthly average from all emissions
	Visible emissions	Shall not exceed 20% opacity for more than 6 consecutive minutes
	Fugitive emissions	Reasonably achievable control technology to control emissions
40 CFR 60 Subpart S, "Standards of Performance for Primary Aluminum Reduction Plants."	Fluorides	1.9 pounds per ton of Al produced for potroom groups at prebake plants
		0.1 pounds per ton of Al produced for anode bake plants
	Visible emissions	10% opacity from any potroom group
		20% opacity from any anode bake plant
40 CFR 63 Subpart LL, "National Emission Standards for Hazardous Air Pollutants for Primary Aluminum Reduction Plants."	Total fluorides	Shall not exceed 1.2 pounds per ton of Al produced
		Shall not exceed 0.02 pounds per ton of green anode from anode bake plants
	Polycyclic aromatic hydrocarbons	Shall not exceed 0.025 pounds per ton of green anode from anode bake plants
		Each pitch storage tank shall be equipped with an emission control system designed and operated to reduce inlet emissions of polycyclic organic matter (POM) by 95% or greater

4.2.4 Endangered Species

Biological Reviews #98-600-024 and #98-600-024a (Appendix A) were performed on the areas of the Proposed Action and the alternate location. No plant or animal species protected under the *Endangered Species Act* (ESA), on the federal list of "Endangered and Threatened Wildlife and Plants" (50 CFR 17), or on Washington State list of threatened or endangered species were found.

4.2.5 Plants and Animals

Only a few species of plants and animals are found in the immediate proximity of the Proposed Action due to the area being mostly previously disturbed as indicated in Biological Reviews #98-600-024 and #98-600-024a (Appendix A). However, the long-billed curlew and Loggerhead shrike were seen on or in the vicinity of the Proposed Action. Under *The Migratory Bird Treaty Act*, it is illegal to take, capture, or kill any migratory bird, or any part, nest, or egg of any such birds included in the terms of the conventions. To avoid adverse impacts to any of these species, ground clearing activities should be undertaken between August and early April to avoid disturbance to nesting birds.

Flora observed in the vicinity of the Proposed Action are listed in the Biological Reviews. A total of 6 Piper's daisy individuals were identified on the proposed site for the aluminum smelter plant. A total of 8 Piper's daisy individuals were identified on the alternate site. Two Piper's daisy individuals were identified near the terminal end of the proposed natural gas pipeline route, however both individuals were probably outside of the area that would be disturbed by installation of the pipeline. All of the Piper's daisies were observed on previously disturbed areas. The appropriate mitigation for this species in this situation would consist of attempting to transplant the individuals prior to site development.

An estimated 5 hectares (12 acres) of shrub land including sagebrush and bitterbrush in the south eastern part of the alternate site is undisturbed and probably would qualify as mitigable (DOE/RL 96-32) and (DOE/RL 96-88). In addition, access from the main rail line to the alternate site is partially disturbed, but passes through mature sagebrush.

4.2.6 Cultural Resources

Cultural Resources Reviews #98-600-024 and #98-600-024a (Appendix B) were conducted for the Proposed Action and alternate site. They concluded that, "....there are no known cultural resources or historic properties within the proposed project area."

5.0 ENVIRONMENTAL IMPACTS

The following sections describe potential impacts from the proposed action. Impacts are addressed in proportion to their potential significance.

5.1 CONSTRUCTION AND OPERATION IMPACTS.

Description of potential impacts from the construction and operation activities of the proposed action.

The following sections describe potential impacts from the construction and operation of the Proposed Action all on previously disturbed areas.

5.1.1 Soil or Subsurface Disturbance

Soil disturbance of previously disturbed soil would occur over the entire 60 hectares (150 acres), with structures covering about 50% of the area. This disturbance would be at a maximum depth of approximately 3 meters (10 feet). Soil disturbance for all of the utilities and rail line would occur on the Supply System's highly disturbed grounds. The natural gas main pipeline would run approximately 16 kilometers (10 miles) long, and would parallel and be within the existing and previously disturbed, 15-meter (50-foot) wide right-of-way of the Southern Hanford Site Rail Line. The smaller distribution pipeline would be connected from the main pipeline to the aluminum smelter plant within previously disturbed areas on Supply System property. Construction of the pipeline route along the railroad right-of-way and within Supply System property would involve excavating to a depth of approximately 1 meter (3.3 foot). The width of the ditch would be approximately 0.5 meter (1.7 foot). Excavated material would be stockpiled next to the ditch and used for backfill after pipe installation. The ditch would be bedded with approximately 10 centimeters (4 inches) of sand or clean, rock-free dirt. The pipe would be covered with approximately 5 centimeters (2 inches) of sand or rock-free dirt and then backfilled with the excavated material. Most of the soil and subsurface activities would be temporary during construction, therefore the anticipated impacts to the environment are not expected to be consequential.

5.1.2 Liquid Discharges to the Groundwater or Surface Waters

There would be no discharges to the groundwater. All sanitary wastes would be disposed of to the existing Supply System Sanitary Waste Disposal System. Maximum sanitary discharges are estimated at 80 g/min. Capacity of the Supply System Sanitary Waste Disposal System is 644,300 liters (170,000 gallons) per day. Approximately 1,500 people from the Supply System and DOE currently use less than 30% capacity of the disposal system.

If it is determined during the NPDES permitting process that the industrial water requires treatment, the water would be treated to NPDES permit levels by a water treatment facility provided by the aluminum smelter plant before disposal. It is estimated that industrial water discharge from the proposed aluminum smelter plant to the WNP-1/4 outfall water line would be about 20°C (68°F), similar to Supply System blowdown. Estimated maximum quantities of water to be used by the full buildout aluminum smelter plant would be about 8.9 ft^3/sec (4000 g/min). The average river flow of the Columbia River is 120,000 ft^3/sec (53,859,744.0 g/min), with the minimum regulated flow of the river is 36,000 ft^3/sec (16,157,923.2 g/min). In the thermal plume analysis of the environmental report for operation of WNP-1/4 and WNP-2 (WPPSS-ER), the maximum blowdown conditions projected from WNP-1/4 into the WNP-1/4 outfall was 33.4 ft^3/sec (14,990 g/min), and 17.8 ft^3/sec (7,990 g/min) at normal conditions. The thermal plume from WNP-1/4 blowdown or the industrial water from the proposed aluminum smelter would be dominated by the river flow within about 6 to 8 meters (20 to 25 feet) of exiting the WNP-1/4 outfall. During full WNP-1/4 operations, projected blowdown would have resulted in a temperature increment of less than -17.65°C (0.22°F) at minimum flow, and -17.77°C (0.01°F) at normal flow, in the Columbia River. The thermal plume analysis for WNP-2 blowdown discharges into the WNP-2 outfall at minimum river flow resulted in a heat load that would raise the bulk river temperature by less than -17.76°C (0.033°F), and -17.77°C (0.0067°F) at normal river flow. The temperature increment heat load on the Columbia River resulting from the Proposed Action would be less than for WNP-1/4 and WNP-2, due to the lower volume of industrial water (maximum of about 8.02 ft^3/sec [3600 g/min]) exiting the WNP-1/4 outfall into the river.

Potential impacts from existing aluminum smelters on the Columbia River were analyzed in a river report prepared for EPA (Appendix C). This study made observations, including bioassay experiments on adult salmon behavior, attributing elevated fluoride concentrations which might have a critical role effecting adult salmonids during migration. The study concluded that the low, narrow range of concentrations measured throughout the study area of several aluminum plants along the Columbia River did not cause a particular problem with fluoride discharge to the river. The study also concluded that organic compounds emitted by upriver aluminum smelter plants have accumulated in sediments behind McNary Dam. It is not known if the proposed aluminum smelter would contribute additional hydrocarbons to river sediments. The environmental effects of these hydrocarbons has not been determined.

5.1.3 Gaseous or Particulate Discharges to the Air

Small quantities of gaseous, particulate, or thermal discharge activities from typical construction activities (e.g., trucks transporting building materials and waste, operation of construction equipment, fugitive dust emissions from digging and backfilling) could be generated intermittently during the construction phase of the Proposed Action. Particulate emissions would be controlled by watering or other dust suppression techniques. In addition, small quantities of gaseous and particulate pollutants would be emitted by the transportation (via truck and rail) of raw materials for aluminum production, finished products, and waste. Potentially substantial gaseous and particulate emissions might occur during smelting and related operations.

The emission of criteria air pollutants by the proposed smelter would have to meet the applicable AAQS (both federal and state), PSD limits, and other applicable regulatory limits (refer to Section 4.2.3). The point of regulatory compliance for air releases has not been determined. However for purpose of analysis in this EA, air emissions from the proposed facility have to meet air quality standards and PSD limits at the fenceline of the proposed aluminum smelter. This would maintain pollutant concentrations within permitted federal and state limits on publicly accessible roadways (including Supply System access roads), at Supply System facilities (including WNP-2), and other portions of the Hanford Site.

At this point in the planning process, site-specific information is not available on pollutant emission rates for the proposed facility. However, a BACT/MACT protocol (Appendix D1) and modeling protocol information (Appendix D2) were made available by Ecology during a meeting with Benton County discussing the SEPA checklist. The modeling protocol for the proposed Oregon site includes estimates of emission parameters. It is assumed that the proposed facility on the Hanford Site would have similar or reduced pollutant emissions.

Options in the BACT/MACT protocol list various air emission control technologies that might be used in the proposed aluminum smelter plant, such as wet scrubbing for SO_2 emissions and afterburners to control CO emissions. The BACT options for TF control in approximate descending order of control effectiveness include: dry alumina scrubbers, dry plus secondary scrubbers, coated bag filter dry scrubbers, floating bed scrubbers, and spray towers. Most of the TF control options listed also reduce TSP emissions. Inherent in the dry alumina scrubber system are high-efficiency bag filters for particulate collection. This type of scrubber collects fluorides and particulate that are returned to the reduction cells and re-absorbed. Gases that are not re-absorbed are primarily water vapor, carbon dioxide, CO, and SO_2. Trace combustible hydrocarbon gases are collected by the alumina and returned to the cell, where they are oxidized and destroyed. MACT options might require the capture of polycyclic organic matter (POM) emissions through a closed system control device with a reduction efficiency of at lease 95 percent.

To assess the maximum pollutant emission rates that the proposed smelter could have and still remain in compliance with ambient air quality standards and prevention of significant deterioration limits, atmospheric dispersion modeling was conducted by Pacific Northwest National Laboratory (PNNL) specifically addressing the Proposed Action using EPA's Industrial Source Complex (ISC) model (Table 5). The ISC model uses a Gaussian plume model that offers a wide vary of options for configuring release characteristics and computing pollutant concentration and deposition values for a wide range of averaging periods. The model focused on particulates, SO_2, and CO, and produced estimates of ground-level pollutant concentrations averaged over the year and estimates of maximum impacts for short-duration periods (e.g., 1 hour, 3 hours, 24 hours). The model estimates the maximum pollutant emission rates from the proposed facility that would not result in a violation of regulatory limits; refer to Appendix D3 for more details.

Table 5. Projected Maximum Pollutant Emission Rates and Annual Emission Totals. (Values in excess of these rates and totals are likely to exceed NAAQS and PSD Limits. These preliminary values are based on a simple, preliminary characterization of the proposed facility.)

Pollutant	Time period	Regulatory limit in ($\mu g/m^3$)	Governing standard	Maximum pollutant emission rate (g/sec)	Maximum annual pollutant emissions (MT)
Particulates	Annual	17	PSD	28	900
	24 hour	150	PSD	14	440
SO_2	Annual	20	PSD	33	1,000
	24 hour	91	PSD	8	250
CO	8 hour	10,000	AAQS	390	12,000
	1 hour	40,000	AAQS	480	15,000

Unmitigated airborne emissions of CO, SO_2, particulates, and fluorides from the proposed aluminum smelter plant may have significant ambient air quality impacts, however emission controls would bring the plant within compliant permit standards. Federal regulations set NAAQS for criteria air pollutants and require the states to promulgate regulations to achieve or maintain compliance or attainment with those standards. Emissions are limited by applicable PSD and TAP limits. Appropriate BACT/MACT emission controls would be needed to ensure that the proposed facility operates in compliance with all pertinent air quality regulations. The emission control strategy to be employed at the proposed facility has not been identified at this point in time, however would be evaluated during the applicable air permitting process.

A hazard index approach was conservatively assumed (DOE/EIS-0189) for a large Hanford Site project called Tank Waste Remediation System (TWRS) which related noncarcinogenic health effects that would be additive for all chemicals (i.e., all chemicals would have the same mechanism of action and effect the same target organ). The hazard index represents the summation of hazards evaluated. A hazard index greater than or equal to 1.0 would be indicative of potential adverse health effects in the population of concern from exposure to multiple chemicals. Conversely, a hazard index less than 1.0 would suggest that no adverse health effects would be expected.

All carcinogenic risks were assumed to be additive. Consequently, the total incremental lifetime cancer risk (ILCR) would represent the summation of individual chemical cancer risks, from each emission source, for each alternative analyzed. Regulatory agencies have defined an acceptable level of risk to be between 1 in 10,000 and 1 in 1,000,000, with 1 in 1,000,000 being the point of departure and referred to as de minimis (below which there is no concern) risk. A risk below 1 in 1,000,000 was considered low, and a risk greater than 1 in 10,000 was considered high.

The commercial aluminum company would have to meet air quality requirements and permit standards regulated under WAC 173-400 and WAC 173-460 and applicable federal regulations before operation of the proposed aluminum smelter plant. These standards are based on, for the most part, cancer risk standards for potential air pollutants. Potential emissions from the source (see Table 5) must be sufficiently low to protect human health and safety for short-term, long-term, or cumulative exposures from potential carcinogenic and/or toxic effects. The applicable air quality requirements and permit standards are designed such that the proposed aluminum smelter plant may cause no more than one additional cancer above background cancer rate per million individuals continually exposed to an air pollutant. The proposed aluminum smelter plant would use applicable BACT/MACT air emission controls to meet air quality requirements and standards. The proposed aluminum smelter plant would be expected to have minimal health effects from mitigated air emissions.

5.1.4 Radionuclide Releases or Direct Radiation Exposure

There would be no radionuclide releases or direct radiation exposure expected from the Proposed Action.

5.1.5 Nondangerous Solid Waste Generated

It is expected that the only nondangerous solid waste generated during the construction phase of the Proposed Action would be typical construction debris. Existing offsite facilities would have adequate capacity to accept all waste volumes from the Proposed Action. All nondangerous waste would be disposed in accordance with applicable requirements.

The primary nondangerous solid waste that would be generated is referred to as dross which consists of aluminum metal and aluminum oxide. Dross is furnace slag that floats and has recycle value. The rate of dross generation is about 0.5% to 1% of the plant's primary metal production. During the initial operation phase of the proposed action, about 600 metric tons per year would be collected and stored in bunkers before transporting offsite. After blowdown from cleaning the anodes, small quantities of nondangerous solids would be collected. This blowdown material, a fine carbon powder, consists of about 50% sodium and aluminum fluoride and 50% fine carbon. During the initial phase of operation, the plant is expected to produce approximately 32 metric tons per year. At full production, the numbers would be about five times these values.

In addition, other offsite facilities would be expected to have adequate capacity to accept all other waste volumes from the Proposed Action. All nondangerous waste would be disposed in accordance with applicable requirements. Therefore, these impacts to the environment are expected to be inconsequential.

5.1.6. Dangerous Waste Generated

Small amounts of dangerous waste could be generated (e.g., solvents, waste oil, etc.) during construction of the Proposed Action. These materials would be managed and disposed of according to applicable regulations.

The largest amount of dangerous waste expected to be generated during operation is the spent potlining, consisting of carbon, refractory brick, steel, aluminum salts (fluorides, sodium, and calcium), and 0.5% cyanide. The WAC-303-9904 classifies this dangerous waste as #K088, "Spent Potliners from Primary Aluminum Reduction." During the initial phase of operation, the plant is expected to produce approximately 1,500 metric tons per year. At full production, the numbers would be about five times these values. The waste would be staged in the unused WNP-4 reactor Containment Building or General Service Building before being shipped offsite by rail for treatment and disposal in accordance with applicable regulations.

Small quantities of other dangerous material such as solvents and waste oil might be generated during maintenance activities. These wastes would be disposed of in accordance with applicable regulations.

5.1.7 Consumption or Commitment of Resources

Consumption of nonrenewable resources (e.g., petroleum products, diesel fuel, gravel, concrete, etc.) would occur for short periods during the construction phase of the Proposed Action. The amount of consumption is typical for construction of a modern day aluminum smelter.

Electrical energy would be used in the operation of the proposed aluminum smelter. Capacity needed is estimated at 107 megawatts (MW) and use 900 gigawatt hours (gW-hr) per year during the 60K-metric tons per year production phase of operations. At full production of the 300K-metric tons per year, electrical capacity would be approximately five times these values at 535 MW and use 4500 gW-hrs per year.

Annual natural gas consumption during initial operations would be about 800 metric tons, or about 42 billion British thermal units (Btu). At full production that would include an anode production shop, annual natural gas consumption would increase to about 9700 metric tons, or about 510 billion Btu. These impacts to the environment are indeterminate due to the complexity of region-wide electrical usage planning.

5.1.8 Effects on Cultural Resources

Cultural Resources Reviews #98-600-024 and #98-600-024a (Appendix B) were conducted for the preferred alternative. The reports concluded: "....there are no known cultural resources or historic properties within the proposed project area."

Personnel would be briefed on the requirements of cultural resources, and would be directed to watch for cultural artifacts during excavation. If cultural features or artifacts are encountered, work in the vicinity of the discovery would stop, and the appropriate cultural resource staff would be notified. There would be no effects expected on cultural resources during the Proposed Action.

5.1.9 Effects on Federal or State Listed, Proposed or Candidate, Threatened or Endangered Species

The Biological Reviews #98-600-024 and #98-600-024a (Appendix A) list the flora and fauna observed at the proposed project site. The reviews conclude, "No plant and animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed in the vicinity of the proposed site." However, the estimated 5 hectares (12 acres) in the south eastern part of the alternate site is undisturbed and probably would qualify as mitigable habitat under (DOE/RL 96-32) and (DOE/RL 96-88). Access from the main rail line to the alternate site is partially disturbed, but passes through mature sagebrush. In addition, the reports indicated that the appropriate mitigation for the Piper's daisy would consist of attempting to transplant the individuals prior to site development. If the Proposed Action is constructed, the applicable areas should be resurveyed because the reviews are valid until April 15, 1999. Construction activities should be scheduled to occur between August and early April to avoid disturbance to nesting birds.

5.1.10 Effects on any Floodplain or Wetland

The proposed construction would not occur in the 100-year floodplain of the Columbia River, nor within any area designated as a wetland (NUREG-0812).

5.1.11 Effects on any Wild and Scenic River, State or Federal Wildlife Refuge, or Specially Designated Area

The Proposed Action would be outside the Hanford Reach Study Area, state or federal wildlife refuges, or specially designated areas. The proposed aluminum smelter plant would be in view from the river only along the 300 Area, which is about 16 kilometers (10 miles) away to the south. Intermittent odors and particulate matter in the air might be observed immediately east or south of the proposed plant along the river.

5.1.12 Reasonably Foreseeable Accidents Considered and the Potential Effects

The only reasonably foreseeable accidents under the construction phase of the Proposed Action, including land clearing, building, and backfilling activities, would be typical construction hazards. Areas would be appropriately identified during construction activities. All construction personnel would follow approved safety procedures for the construction and land clearing activities within the Proposed Action. Safety procedures would be followed for transporting building and waste materials to and from the proposed activities, including soil backfilling and water spraying for dust control. Public health and safety would not be affected because the area would be closed to the general public.

The possibility that an uncharted water line or electrical conductor could be broken by construction activities is considered to be low, because the Supply System utilities generally are well charted. Excavation permits would be required before any digging is permitted. Such permits would identify buried utilities. Pipelines and utilities would be avoided by construction equipment. Typical construction hazards occur. However, the risk of severe accidents is small.

Rail traffic on the southern Hanford Site rail line is expected to increase as materials are shipped to and from the aluminum smelter plant. Therefore, potential for collisions with vehicles on Route 4 South are expected to increase over current rail usage. However, warning signals, signs, and barriers would be maintained, and scheduling shipment during off-peak travel hours would be enforced. Risk of all rail accidents involving breach of containers for hazardous material on the Hanford Site is 1.49×10^{-8} accidents per train mile is based on rail crossings at about 140 locations on the Hanford Site.

With an estimated rail usage of 42 rail cars per week, the Proposed Action would produce about 43,680 train miles on the southern Hanford rail line, and result in an estimated 0.00065 rail accidents per year. Because the rail usage under the Proposed Action would occur only on the southern 10 miles of the Hanford Site rail line and crosses a highway at only one location, risk of accidents from the Proposed Action is more remote. In addition, the Hanford Site and Supply System workforce would be notified of the increased rail traffic. The risk of a severe railroad accident on the Hanford Site is small.

The largest amount of dangerous waste (hazardous waste designation under federal regulations) produced by the Proposed Action would be spent potliners. About 1,500 metric tons would be generated annually by the 60K-metric ton aluminum smelter plant and temporarily staged in the presently unused WNP-4 Containment Building or General Service Building. The two WNP-4 buildings are designed with much greater safety constraints to contain high-level radioactive materials than would be required to temporarily contain spent potliners before offsite shipment by rail for treatment and disposal.

Recent analysis of offsite rail shipments of hazardous waste and various radiological wastes to and from applicable DOE sites across the country for DOE waste management activities has been conducted (DOE/EIS-0200-F). This analysis concluded that reasonably foreseeable transportation accidents are not expected to result in disproportionately high and adverse human health effects to minority or low-income populations. The total number of life-threatening effects from rail transportation is less than 0.5 for any hazardous waste alternative. The expected number of transportation accident fatalities from trauma is no higher than one under any hazardous waste alternative. These fatalities from potential rail accidents are independent of the shipments contents. The potential accidents within the scope of the Proposed Action of this EA are well within the accident scenarios analyzed (DOE/EIS-0200-F).

Because employees in the aluminum smelting industry work in an environment surrounded by very large equipment and hot and molten metals, the most reasonably foreseeable accident considered during operation would be serious burns to employees. Local emergency response teams and care providers are trained to address potential accident victims. Public health and safety would not be affected because the area is closed to the general public.

5.2 SOCIOECONOMIC IMPACTS. Description of socioeconomic impacts that would result from the Proposed Action.

A construction crew of approximately 500 would be required to build the initial phase of the proposed aluminum smelter. The contractor would bring a construction management team and hire the construction craft personnel from the local area. The initial workforce of permanent employees at the proposed aluminum smelter would be 125. If the aluminum smelter is expanded to full-sized plant, the workforce would be increased to about 600 to 1,000 employees. The addition of up to 1,000 employees and about 2,000 to 3,000 family members to the population within Benton and Franklin counties would offset much of the impacts of 1,100 people laid-off from the Hanford Site in 1997 and the 8% unemployment rate in the Tri-City area (Benton County Planning & Building Department). Therefore no crucial impact to employment levels within Benton and Franklin counties is likely. For example, student growth in Richland schools from 1990 to 1995 has been 2% to 3% per year, and from 1996 to 1998 has been 1% per year. The Richland School District is currently building a new elementary school to accommodate the existing student body and for projected growth. All Richland School District modernizations and expansions are designed to meet growth in student count for the next 5 to 10 years.

5.3 ENVIRONMENTAL JUSTICE IMPACTS. Description of environmental justice impacts that would result from the Proposed Action.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or socioeconomic effects of their programs and activities on minority and low-income populations. Minority (primarily Hispanic) populations and low income populations are present near the Hanford Site (PNNL-11472). The analysis of the impacts in this EA indicates that there would be no adverse impacts to the offsite population from implementing the Proposed Action. Therefore, it is not expected that there would be any disproportionate impacts to any minority or low-income portion of the community.

5.4 CUMULATIVE IMPACTS. Description of the cumulative impacts that would result from the Proposed Action.

During the initial phase of annual operation of the Proposed Action, about 600 metric tons of nondangerous dross and 32 metric tons of nondangerous blowdown material from cleaning the anodes would be generated. In addition, the largest volume of dangerous waste type (K088) expected to be generated annually would be 1,500 metric tons of spent potlining. At full production, these numbers would be about five times higher. These materials would be staged and managed within the Supply System's property and disposed of offsite by the commercial aluminum smelter company in accordance with applicable federal and state regulations. As a result of the Proposed Action, waste disposal would not substantially effect any associated treatment or disposal sites.

Federal regulations set NPDES for water pollutant discharges and require the States to promulgate regulations to achieve or maintain compliance with those standards. States also can create their own water quality standards that are more restrictive than national standards. Appropriate water treatment would be needed to ensure that the proposed facility operates in compliance with all pertinent NPDES regulations. No new construction of water intakes or outfalls for industrial water would occur at the Columbia River, as existing Supply System piping systems would be used. Sanitary water would be disposed of into the existing Supply System Sanitary Waste Disposal System, which is currently under utilized. The Proposed Action would bring the Sanitary Waste Disposal System close to full capacity, the specific effects on the system would be evaluated through the NPDES permit that the commercial aluminum company would have to obtain from the state.

A summarization was made (DOE/EIS-0189) of the noncarcinogenic health hazards and carcinogenic risks associated with air emissions for each TWRS alternative. The hazard indices for the maximally exposed individual worker, maximally exposed individual noninvolved worker, and maximally exposed individual general public were well below the benchmark value of 1.0 for all alternatives. Therefore, none of the proposed TWRS remediation alternatives were expected to result in adverse health effects from air emissions.

Air quality requirements and permit standards regulated under WAC 173-400 and WAC 173-460 and applicable federal regulations would have to be met by the commercial aluminum company before operation of the proposed aluminum smelter plant. These standards are based on, for the most part, cancer risk standards for potential air pollutants. Emissions from the source must be sufficiently low to protect human health and safety for short-term, long-term, or cumulative exposures from potential carcinogenic and/or toxic effects. The applicable air quality requirements and permit standards are designed such that the proposed aluminum smelter plant may cause no more than one additional cancer above background cancer rate per million individuals continually exposed to an air pollutant. Similar to the findings of the hazard indices for the maximally-exposed individual worker, maximally-exposed individual noninvolved worker, and maximally-exposed individual general public for proposed remediation alternatives analyzed in DOE/EIS-0189, the proposed aluminum smelter plant would be expected to have no adverse health effects from mitigated air emissions.

To support initial operations, approximately 42 rail cars per week would transport materials to the aluminum smelter plant from offsite. This compares to an average of 930 coal car shipments per year on the southern Hanford Site rail line from 1993 through 1996. This increased rail traffic adds to the approximate 900 rail cars per year shipped by Lamb-Weston, Inc.

If the aluminum smelter operations are expanded to a full-sized plant with a workforce of 600 to 1,000, traffic on South Power Plant Loop Road, Route 4 South, and the streets of the Tri-City area would increase. However, when compared to the estimated 17,300 vehicles that pass the 300 Area each work day (DOE/EA-1178), the probability of traffic accidents per work day during full buildout of the proposed facility would be about equivalent or slightly less than those analyzed in DOE/EA-1178.

The initial proposed aluminum smelter plant would involve temporary construction personnel from offsite and approximately 125 new operating personnel. The addition of up to 1,000 employees and 2,000 to 3,000 family members to the population within Benton and Franklin counties would offset some of the impacts of 1,100 people laid-off from the Hanford Site in 1997 and the 8% unemployment rate in the Tri-City area. Based on the analysis in DOE/EIS-0189 for Hanford work force and Tri-City nonfarm employment, the addition of the employment from the Proposed Action is expected to create no adverse impact. No adverse socioeconomic impacts or any disproportionate impacts to any minority or low-income portion of the community are anticipated. The potential impacts from the Proposed Action are not expected to contribute substantially to the cumulative impacts from operations of the Supply System, Hanford Site, or Tri-City area.

5.5 IMPACTS FROM ALTERNATIVES

The No Action Alternative and Alternate Site are discussed in the following sections.

5.5.1 Implementation of the No Action Alternative. Qualitative discussion on impacts that would result from implementation of the no action alternative.

The No Action Alternative would have no sublease/transfer for a company to construct and operate a large aluminum smelter plant on the subleased/transferred property. There would be no increased use of the southern portion of the Hanford Site rail system, and no natural gas pipeline would be built north of the 300 Area. Supply System property and the surrounding environs would continue with its current activities. No new impacts would be expected.

5.5.2 Implementation of Alternate Site. Qualitative discussion on impacts that would result from implementation of alternate site.

The alternate site for the aluminum smelter would be adjacent to the Supply System's unfinished WNP-1. However, the process flow for producing aluminum requires a configuration that is uniform in shape (square in shape) similar to the Proposed Action site, while the alternate site is L-shaped. The alternate site is not as close in its proximity to WNP-4 and to the existing BPA substation. In addition, an estimated 5 hectares (12 acres) of shrub land including sagebrush and bitterbrush in the south eastern part of the alternate site is undisturbed and probably would qualify as mitigable under DOE/RL 96-32 and DOE/RL 96-88. Access from the main rail line to the alternate site is partially disturbed, but passes through mature sagebrush. This alternative would cost more to construct compared to the Proposed Action, otherwise impacts would be similar to the Proposed Action.

6.0 PERMITS AND REGULATORY REQUIREMENTS

The Hanford Site is owned by DOE. The aluminum company would have to coordinate with RL and the Supply System concerning emergency preparedness and training, environmental stewardship, and potential cultural resource issues. The aluminum company would be responsible to obtain applicable NPDES permits and notify the State of Washington Department of Health per WAC 246-272 and provide a limited discharge permit to be submitted to Ecology per WAC 173-216 before making the proposed waste water tie-in into the existing permitted Supply System Waste Water Disposal System.

Before operation of the proposed aluminum smelter, the commercial aluminum company would be required to obtain the appropriate air permit(s) controlling criteria pollutant emissions under WAC 173-400-110 and WAC 173-400-141, and a TAPs air permit under WAC 173-460. Environmental regulatory authority over the Supply System is vested in federal agencies and in Washington State agencies. The commercial aluminum company would comply with all of these and other environmental requirements in a manner acceptable to the relevant regulatory agencies.

7.0 ORGANIZATIONS CONSULTED

Consultation has been made in the preparation of this draft EA with Benton County, the Supply System, TRIDEC, Ecology, and the potential commercial aluminum company.

Before approval of this EA, a draft version will be sent for a 30 day review period to:

- Nez Perce Tribe,
- Confederated Tribes of the Umatilla Indian Reservation,
- Wanapum People,
- Yakama Indian Nation,
- U.S. National Park Service,
- U.S. Fish and Wildlife Service,
- U.S. Nuclear Regulatory Commission,
- BPA,
- Energy Facility Site Evaluation Council,
- Washington State Departments of Ecology, Fish & Wildlife, and Health,
- Benton County,
- Franklin County,
- Port of Benton,
- City of Richland,
- Supply System,
- Hanford Education Action League,
- Heart of America,
- Physicians for Social Responsibility,
- available in the DOE reading room (Washington State University Tri-Cities),

and placed on the Hanford Homepage.

All comments received during the comment period would be considered in the preparation of the final EA, and in the DOE decision whether to resolve the EA as a Finding of No Significant Impact (FONSI), or as a determination to prepare an Environmental Impact Statement.

APPENDIX A

BIOLOGICAL RESOURCES REVIEW

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

April 28, 1998

Mr. Randall J. Staudacher
Fluor Daniel Hanford, Inc.
P. O. Box 1000, MSIN H8-64
Richland, WA 99352

Dear Mr. Staudacher:

BIOLOGICAL REVIEW OF THE WPPSS INDUSTRIAL SITES, 600 Area, #98-600-024.

Project Description:

- Two 150 acre sites on the eastern edge of the land managed by the Washington Public Power Supply System are being evaluated as potential sites for an aluminum smelter. Site "A" is located to the east and northeast of the WNP-4 reactor, Site "B" is located east and southeast of the WNP-1 reactor. If one of these sites is selected as the location for the smelter, it is expected that the entire 150 acres will be cleared and leveled in preparation for facility construction.

Survey Objectives:

- To determine the occurrence in the project area of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act,
- To evaluate the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

Survey Methods:

- Pedestrian and ocular reconnaissance of the proposed sites were conducted by C. A. Duberstein, J. M. Becker, C. A. Brandt, and M. R. Sackschewsky on 27 April 1998. The Braun-Blanquet cover-abundance scale (Bonham 1989) was used to determine percent cover of dominant vegetation,
- Priority habitats and species of concern are documented as such in the following: Washington Department of Fish and Wildlife (1994, 1996), Washington State Department of Natural Resources (1997), and for migratory birds, U.S. Fish and Wildlife Service (1985). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the USFWS are maintained at 50 CFR 17.11 and 50 CFR 17.12.

Survey Results:

- Lists of all plants and animals observed within each of the proposed industrial sites are provided in Tables 1 and 2, respectively.

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- The southern 2/5 and western 1/4 of Site A have been previously disturbed (Figure 1). The Western 1/4 is within a perimeter fenceline for WNP-4 and appears to have been used as a construction laydown area, it is currently dominated by cheatgrass, hoary aster, and pale enveningprimrose, with significant amounts of yarrow and bur sage. The southern 2/5 of the site (outside the fence line) appears to have been used for borrow activities, it is currently dominated by needle-and-thread grass, cheatgrass, and hoary aster. The remaining portions of Site A does not appear to have been physically disturbed, although it has burned, probably in the early 1980's. The undisturbed portion of Site A is dominated by cheatgrass, Sandberg's bluegrass, with a large number of additional species. Shrub cover is sparse, with small clumps of Big sagebrush, and scattered individuals of gray and green rabbitbrush. An inactive security training facility is located in the center of Site A.

- The eastern 200 m of Site B is relatively undisturbed except for fires that probably occurred in the early 1980's (Figure 2). The southern 5 ha of this portion of Site B has recovered well and the shrub cover is between 15 and 20%, with a relatively even mix of big sagebrush and Antelope bitterbrush, and an understory of Sandberg's bluegrass and cheatgrass. The remaining areas within the undisturbed portion of the site are dominated by Sandberg's bluegrass, cheatgrass, and needle-and-thread grass. West of the undisturbed section is a strip, approximately 250 m wide, that consists of two large borrow pits, and an area between these two that appears to be an additional pit that has been filled in and revegetated. Vegetation in this area consists primarily of cheatgrass, with an assortment of other species, mostly weedy species. The western portion of Site B is primarily within the existing fence line around WNP-1, except for a small area in the northwest corner. The western portion of Site B has been highly disturbed, and appears to have been used as construction lay down areas and for other construction support. Vegetation within the fence lines of Site B is primarily cheatgrass, with significant amounts of barren six-weeks and hoary aster, with an assortmetn of other, primarily weedy species.

- One plant species on the Washington State Sensitive plant list (Piper's daisy – *Erigeron piperianus*), and one plant species on the Washington State Watch list (Stalked-pod milkvetch – *Astragalus sclerocarpus*) were observed in both of the proposed industrial sites.

- A total of 6 Piper's daisy individuals were identified within Site A, all of these were within the western portion of the Site, inside of the WNP-4 fence line (Figure 1). A total of 8 Piper's daisy individuals were identified within Site B, all of these were in the disturbed western section, 4 were inside of the WNP-1 fence, and 4 were in the northwest corner of Site B (Figure 2).

- The stalked-pod milkvetch were observed both inside and outside the fence lines within both of the proposed sites, but all were in relatively disturbed sites.

- Animal species of concern included the Loggerhead shrike (Washington State Candidate, former federal candidate), observed within Site B, and the Long-billed curlew (Washington State Monitor) observed in both Sites. Most of the other bird species observed are protected under the Migratory Bird Treaty Act.

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Considerations and Recommendations:

- No plant and animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed in the vicinity of the proposed site.
- The majority of both of the sites consist of highly degraded or otherwise low quality habitat. However, the estimated 5 ha of shrub land in the south eastern part of Site B would probably qualify as mitigable habitat under the Hanford Site Biological Resources management Plan (DOE/RL 1996a) and Hanford Site Biological Resources Mitigation Strategy (DOE/RL 1996b)
- The populations of Piper's daisy in both of the Sites consist of relatively few, widely scattered individuals in highly disturbed habitats. Piper's daisy normally occurs with sagebrush on silty to sandy soils, but it does sporadically occur in disturbed settings. If one of these sites is selected for development, appropriate mitigation for this species in this situation would consist of attempting to transplant the individuals prior to site development.
- The stalked-pod milkvetch occurs in sandy soils throughout the Hanford Site. The populations within the proposed industrial sites are sparse and are primarily within disturbed habitats. No specific mitigation for this species would be required.
- The long-billed curlew inhabits grassy areas throughout the Hanford Site, and the Loggerhead shrike occurs primarily in association with shrub lands but forage in other habitats if suitable perch sites are available. If one of these Sites is selected for development, the ground clearing should be scheduled to occur between August and early April to avoid disturbance to nesting birds and to assure compliance with the migratory bird treaty act.
- Development of either of the Sites would not result in serious impacts to species or habitats of concern. However, based on ecological considerations, Site A is preferable because Site B has slightly more Piper's daisies, and approximately 5 ha of Site B is a relatively healthy Sagebrush / Bitterbrush community that may require compensatory mitigation.

Sincerely,

CA Brandt, Ph.D.
Project Manager
Ecological Compliance Assessment

CAB:mrs

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REFERENCES

Bonham, Charles D. 1989. Measurements for Terrestrial Vegetation, John Wiley & Sons, Inc. pp. 127-128.

U. S. Department of Energy. 1996a. Draft Hanford Site Biological Resources Management Plan. DOE/RL 96-32.

U. S. Department of Energy. 1996b. Draft Hanford Site Biological Resources Mitigation Strategy. DOE/RL 96-88.

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Washington Department of Natural Resources. 1997. Endangered, Threatened & Sensitive Vascular Plants of Washington (August 1997).

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TABLE 1. PLANT SPECIES OBSERVED IN SITES A AND B			
Species	**Common Name**	**Site A**	**Site B**
Achillea millifolium	Yarrow	X	X
Agropyron cristatum	Crested wheatgrass	X	X
Agropyron dasystachyum	Thickspike wheatgrass	X	X
Ambrosia acanthicarpa	Bur sage	X	X
Amisinckia tesselata	Tesselate fiddleneck	X	X
Amsinckia lycopsoides	Tarweed fiddleneck	X	X
Artemisia tridentata	Big sagebrush	X	X
Asclepias speciosa	Milkweed		X
Asparagus officinalis	Asparagus	X	X
Astragalus caricinus	Buckwheat milkvetch	X	X
Astragalus sclerocarpus	Stalked-pod milkvetch	X	X
Balsamorhiza careyana	Carey's balsamroot	X	X
Brodiaea douglasii	Douglas clusterlily	X	X
Brodiaea howellii	Howell's clusterlily	X	
Bromus tectorum	Cheatgrass	X	X
Centaurea diffusa	Diffuse knapweed	X	X
Centaurea repens	Russian knapweed		X
Chaenactis douglasii	Hoary false yarrow		X
Chondrilla juncea	Rush skeletonweed	X	X
Chrysothamnus nauseosus	Gray rabbitbrush	X	X
Chrysothamnus viscidiflorus	Green rabbitbrush	X	X
Comandra umbellatum	Bastard toadflax	X	X
Conyza canadensis	Horseweed	X	
Crepis atribarba	Hawksbeard	X	X
Cryptantha circumscissa	Matted cryptantha	X	X
Cymopteris terebinthinus	Turpentine spring parsley	X	X
Delphinium nuttalianum	Upland larkspur	X	X
Descurainea pinnata	Tansy mustard	X	X
Draba verna	Spring whitlow	X	X
Elaeagnus angustifolia	Russian olive	X	
Epilobium paniculataum	Tall willowherb	X	X
Erigeron piperianus	Piper's daisy	X	X
Erigeron poliospermus	Cushion fleabane		X
Erigeron pumilus	Shaggy fleabane	X	X
Eriogonum niveum	Snow buckwheat	X	X
Erodium cicutarium	Fillaree	X	X
Erysimum asperum	Western wallflower	X	X
Festuca octoflora	Barren six-weeks	X	X
Festuca ovina	Sheep fescue	X	

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TABLE 1. PLANT SPECIES OBSERVED IN SITES A AND B

Species	Common Name	Site A	Site B
Gilia sinuata	Shy gilia	X	X
Grayia spinosa	Spiney hopsage	X	
Holosteum umbellatum	Jagged chickweed	X	X
Lactuca serriola	Prickly lettuce	X	X
Layia glandulosa	Tidytips		X
Lepedium latifolium	Broadleaf pepperweed	X	
Leptodactylon pungens	Prickly phlox		X
Linaria dalmatica	Dalmatian toadflax	X	X
Lomatium macrocarpum	Large-fruit desert parsley	X	X
Machaeranthera canescens	Hoary Aster	X	X
Melilotus sp.	Sweet clover	X	X
Microsteris gracilis	Pink microsteris	X	X
Oenothera pallida	Pale eveningprimrose	X	X
Opuntia polycantha	Prickly pear	X	X
Orobanche corymbosa	Broomrape	X	
Oryzopsis hymenoides	Indian ricegrass	X	X
Penstemon acuminatum	Sand beard-tongue	X	X
Phacelia hastata	Whiteleaf scorpionweed	X	
Phacelia linearis	Threadleaf scorpionweed	X	X
Phlox longifolia	Long-leaf phlox	X	X
Plagiobothrys tenellus	Popcorn flower		X
Plantago patagonica	Indian wheat		X
Plectritis macrocera	White cupseed		X
Poa bulbosa	Bulbous bluegrass	X	X
Poa sandbergii	Sandberg's bluegrass	X	X
Polemonium micranthum	Annual Jacob's ladder	X	X
Psoralea lanceolata	Dune scurfpea	X	
Pursia tridentata	Antelope bitterbrush	X	X
Rumex venosus	Sand dock	X	X
Salsola kali	Russian thistle	X	X
Sisymbrium altissimum	Jim Hill mustard	X	X
Sitanion hystrix	Bottlebrush squirreltail	X	X
Stipa comata	Needle-and-thread grass	X	X
Taraxacum officinale	Dandelion	X	
Tragopogon dubius	Salsify	X	X
	Total number of species	65	64

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TABLE 2. ANIMAL SPECIES OBSERVED IN SITES A AND B		
Common Name	**Site A**	**Site B**
MAMMALS		
Badger	X	X
Coyote	X	X
Grasshopper mouse	X	X
Jack rabbit		X
Mule deer	X	X
Pocket gopher	X	X
Pocket mouse	X	X
REPTILES		
Gopher snake		X
Side-blotched lizard	X	
BIRDS		
American kestrel	X	
American robin	X	X
Canada goose	X	
Horned lark	X	X
House finch	X	
House sparrow	X	
Loggerhead shrike		X
Long-billed curlew	X	X
Osprey	X	
Pheasant	X	
Savannah sparrow		X
Say's phoebe		X
Vesper sparrow		X
Western meadowlark	X	X
White crown sparrow	X	X

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FIGURE 1. HABITATS AND FEATURES WITHIN SITE A.

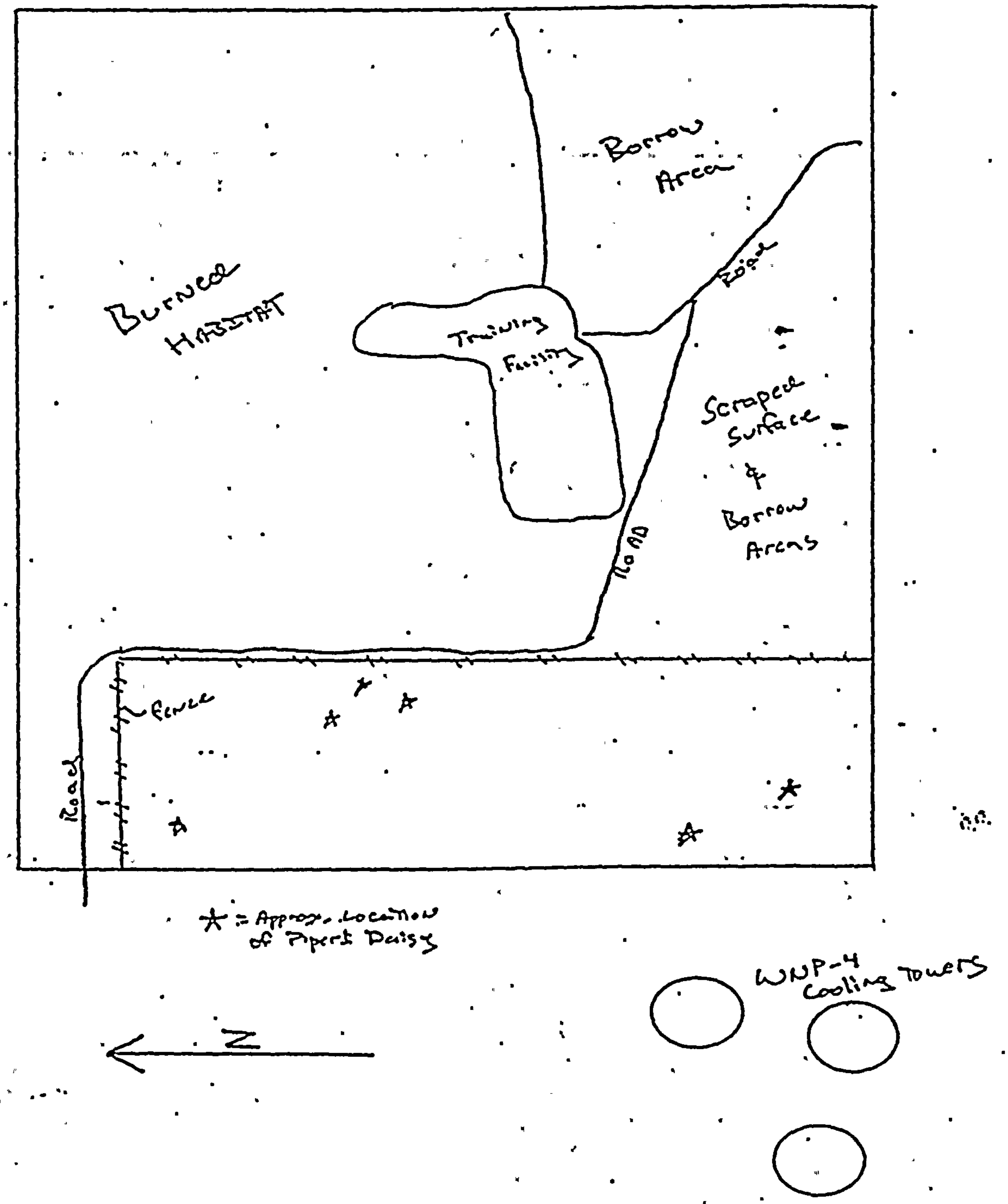

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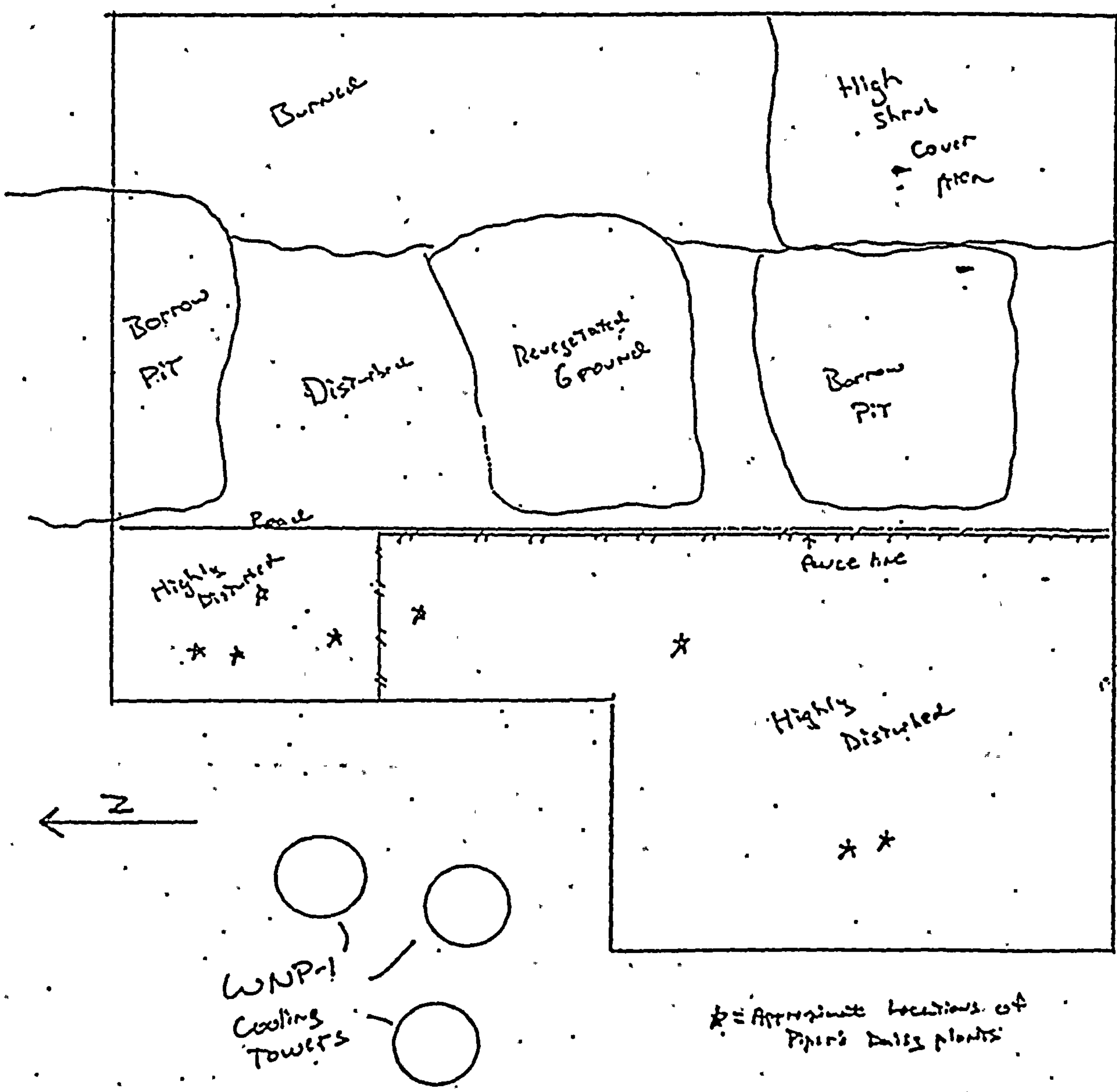
FIGURE 2. HABITATS AND FEATURES WITHIN SITE B.



Pacific Northwest National Laboratory

Operated by Battelle for the U.S. Department of Energy

May 21, 1998

Mr. Randall Staudacher
Fluor Daniel Hanford, Inc.
P. O. Box 1000, MSIN H8-64
Richland, WA 99352

Dear Mr. Staudacher:

BIOLOGICAL REVIEW OF THE NATURAL GAS LINE TO THE WPPSS INDUSTRIAL SITES PROJECT, 600 Area, #98-600-024a.

Project Description:

- Install a natural gas line along the railroad tracks between the 300 Area to the proposed WPPSS industrial sites adjacent to WNP-1 and WNP-4.

Survey Objectives:

- To determine the occurrence in the project area of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act,
- To evaluate the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

Survey Methods:

- Pedestrian and ocular reconnaissance of the proposed sites were conducted by C. A. Duberstein, J. M. Becker, J. L. Downs, and M. R. Sackschewsky on 19 May 1998. The Braun-Blanquet cover-abundance scale (Bonham 1989) was used to determine percent cover of dominant vegetation,
- Priority habitats and species of concern are documented as such in the following: Washington Department of Fish and Wildlife (1994, 1996), Washington State Department of Natural Resources (1997), and for migratory birds, U.S. Fish and Wildlife Service (1985). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the USFWS are maintained at 50 CFR 17.11 and 50 CFR 17.12.

Survey Results:

- The vegetation between the 300 Area and approximately 1 mile north of the intersection of the Railroad and Route 4 South consists of mature Sagebrush, Bitterbrush, snowy buckwheat, and rabbitbrush with an understory of cheatgrass and Sandberg's bluegrass, with some small stands of larger bunchgrasses. However, much of the vegetation within 50 meters of the rail road is relatively disturbed.

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- From approximately 1 mile north of the railroad intersection with Route 4S to the WPPSS plants the vegetation is dominated by cheatgrass, dune scurfpea, Hoary aster, and pale evening primrose.

- The access from the main rail line to Industrial Site Option A is highly disturbed, the vegetation is diverse but is primarily sparse cheatgrass. However, 2 Piper's daisies (Washington State Sensitive plant species) were observed near the terminal end of the proposed gas line route, one at the western most junction on the north side of WNP-4 and the other just south of the air intake structure at the end of the proposed gas line route.

- The access from the main rail line to Industrial Site Option B is partially disturbed, but passes through mature sagebrush steppe in the south-east corner of the proposed industrial site. A listing of all of the plant species observed along the proposed gas line routes is attached as Table 1.

- Animal species observed along the proposed natural gas line routes are listed in the attached Table 2. Loggerhead shrikes (Washington State Candidate, former federal candidate)were observed between Route 4S and the WPPSS complex, and at the southeast corner of Site Option B. A long-billed curlew was observed between Route 4S and the WPPSS complex.

Considerations and Recommendations:

- No plant and animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed in the vicinity of the proposed site.

- The gas line should be placed as near as possible to the existing rail lines and fiber optic cables. North of Route 4S there is probably adequate room between the rail line and the existing access road for placement of the gas line. This would minimize the amount of higher quality habitat that will be disturbed. The pipeline contractor should be required to minimize, to the extent practicable, the width of the disturbance while installing the gas line.

- The only area along the proposed routes where significant habitat disturbance is likely to occur is near the southeast corner of the proposed Industrial Site Option B.

- The Piper's daisies that were observed near the terminus of the proposed route to Site A occurred in disturbed habitats, and both individuals were probably outside of the area that would be disturbed by the installation of the gas line. If this line is constructed, the area should be resurveyed, and any individuals that may be disturbed should be transplanted as mitigation.

- The long-billed curlew inhabits grassy areas throughout the Hanford Site, and the Loggerhead shrike occurs primarily in association with shrub lands but forage in other habitats if suitable perch sites are available. Construction of the proposed natural gas line near the existing railroad tracks should not significantly affect the habitat for these species.

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- Ground clearing for the construction of the gas line should be scheduled to occur between August and early April to avoid disturbance to nesting birds and to assure compliance with the migratory bird treaty act.
- No adverse impacts to species, habitats, or other biological resources are expected to result from the proposed actions.
- This Ecological Compliance Review is valid until 15 April 1999.

Sincerely,

CA Brandt, Ph.D.
Project Manager
Ecological Compliance Assessment

CAB:mrs

REFERENCES

Bonham, Charles D. 1989. Measurements for Terrestrial Vegetation, John Wiley & Sons, Inc. pp. 127-128.

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Washington Department of Natural Resources. 1997. Endangered, Threatened & Sensitive Vascular Plants of Washington (August 1997).

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Table 1. Plant Species Observed along Proposed Natural Gas Line Routes					
Species Name	**Common Name**	**Section 1***	**Section 2***	**Access A***	**Access B***
Achillea millefolium	Yarrow	X	X	X	X
Agropyron cristatum	Crested Wheatgrass				X
Agropyron dasystachyum	Thickspike wheatgrass	X		X	
Agropyron spicatum	Bluebunch wheatgrass	X	X	X	
Agoseris heterophylla	False dandelion				X
Ambrosia acanthicarpa	Bur sage	X	X	X	X
Amsinckia lycopsoides	Tarweed fiddleneck	X	X	X	X
Artemisia tridentata	Sagebrush	X	X	X	X
Asparagus officinalis	Asparagus			X	
Astragalus caricinus	Buckwheat milkvetch	X	X	X	
Astragalus sclerocarpus	Stalked-pod milkvetch			X	
Balsamorhiza careyana	Carey's balsamroot	X	X		X
Brodeaia douglasii	Cluster lily	X	X	X	X
Bromus tectorum	Cheatgrass	X	X	X	X
Centaurea diffusa	Diffuse knapweed		X	X	X
Centaurea maculosa	Spotted knapweed		X	X	
Chaenactis douglasii	Hoary false yarrow	X	X	X	X
Chondrilla juncea	Rush skeleton weed	X	X	X	X
Chrysothamnus nauseosus	Gray rabbitbrush	X	X	X	X
Chrysothamnus viscidiflorus	Green rabbitbrush	X	X	X	
Comandra umbellatum	Bastard toadflax				X
Conyza canadensis	Horseweed		X		
Crepis atrabarba	Hawksbeard	X	X	X	
Cryptantha circumscissa	Matted cryptantha	X	X		X
Cryptantha pterocarya	Winged cryptantha			X	
Cymopterus terebinthinus	Turpentine spring parsley	X	X	X	X
Descurainia pinnata	Tansy mustard		X		
Descurainia sophia	Flixweed		X		
Draba verna	Spring whitlowgrass	X	X	X	X
Epilobium paniculatum	Tall willowherb	X	X	X	X
Erigeron filifolius	Threadleaf fleabane	X	X		
Erigeron piperianus	Piper's daisy			X	
Erigeron pumilus	Shaggy fleabane			X	
Eriogonum niveum	Snowy buckwheat	X	X	X	X
Eriogonum viminium	Broom buckwheat				X
Erodium cicutarium	Stork's bill	X	X	X	X
Erysimum asperum	Wall flower			X	
Festuca microstachys	Small six-weeks				
Festuca octoflora	Slender sixweeks	X	X	X	

Mr. Randall Staudacher
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Table 1. Plant Species Observed along Proposed Natural Gas Line Routes					
Species Name	Common Name	Section 1*	Section 2*	Access A*	Access B*
Gilia minutiflorua	Small flowered gilia			X	
Gilia sinuata	Shy gilia	X	X		X
Holosteum umbellatum	Jagged chickweed	X	X	X	X
Hymenopappus filifolius	Columbia cutleaf	X	X		
Lactuca serriola	Prickly lettuce	X	X	X	X
Lagophylla ramosissima	Hareleaf		X		X
Layia glandulosa	Tidy-tips	X	X		X
Linaria dalmatica	Dalmatian toadflax		X	X	X
Lomatium macrocarpum	Big seed desert parsley	X	X		X
Lygodesmia juncea	Skeleton weed	X	X		X
Macheranthera canescens	Hoary Aster	X	X	X	X
Melilotus officinalis	Yellow sweet clover			X	
Mentzelia albicaulis	White stem stickleaf	X	X		
Microsteris gracilis	Pink microsteris	X	X		X
Oenothera pallida	Pale evening primrose	X	X	X	X
Opuntia polycantha	Prickly pear	X	X		
Oryzopsis hymenoides	Indian ricegrass	X	X	X	
Petalostemon ornatum	Prairie clover	X	X	X	
Phacelia hastata	Whiteleaf scorpion weed	X	X	X	
Phacelia linearis	Threadleaf scorpionweed	X	X	X	X
Phlox longifolia	Long leaf phlox	X	X	X	X
Plagiobathrys tenellus	Popcorn flower				X
Plantago patagonica	Indian wheat	X	X		X
Poa sandbergii	Sandberg's bluegrass	X	X	X	X
Polemonium micranthum	Annual Jacob's ladder		X		
Psoralea lanceolata	Dune Scurf pea	X	X	X	X
Purshia tridentata	Bitterbrush	X	X		X
Rumex venosus	Sand dock		X	X	
Salsola kali	Russian thistle	X	X	X	X
Sisymbrium altissimum	Jim Hill mustard	X	X	X	X
Sitanion hystrix	Bottlebrush squirreltail		X	X	X
Sphaeracea munroana	Globe mallow	X			
Sporobolus cryptandrus	Sand dropseed		X	X	
Stipa comata	Needle-and-thread grass	X	X	X	X
Taraxicum officinale	Dandelion.		X		
Tragopogon dubius	Salsify	X	X	X	X

* Section one is from the 300 Area to the Route 4S intersection, Section 2 is from the Route 4S Intersection to WPPSS property, Access A is within WPPSS Property to the Proposed Option A plant site, Access B is within WPPSS property to the Proposed Option B plant site.

Mr. Randall Staudacher
98-600-024a
Page 6 of 6

Table 2. Animal Species Observed Along the Proposed Natural Gas Routes

Species	Section 1*	Section 2*	Access A*	Access B*
Birds				
American Kestrel	X			
Barn Swallow				X
Chipping Sparrow	X			
European Starling	X			
Loggerhead Shrike		X		X
Horned Lark	X	X		
House Finch			X	
Long-billed curlew		X		
Prairie Falcon				X
Swift				X
Western Killdeer			X	
Western meadow lark	X	X	X	X
Mammals				
Coyote		X		
Mule Deer	X	X		X
Pocket Gopher	X	X		X

APPENDIX B

CULTURAL RESOURCES REVIEW

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

April 27, 1998

No Historic Properties

Mr. R.J. Staudacher
Fluor Daniel Hanford, Inc.
P. O. Box 1000/H8-64
Richland, WA 99352-1000

Dear Mr. Staudacher:
SURVEY RESULTS FOR THE WPPSS INDUSTRIAL SITES PROJECT. HCRC #98-0600-024.

In response to your request received April 7, 1998, staff of the Hanford Cultural Resources Laboratory (HCRL) conducted a cultural resources review of the subject project, located in the 600 Area of the Hanford Site. According to the information that you supplied, the proposed project will involve two 150 acre sites that have been zoned for heavy industry.

A literature and records review showed that the project area includes undisturbed ground that had not been previously surveyed for cultural resources. A pedestrian survey of the project area was conducted between April 21 and 23, 1998, by Laurie L. Hale. No historic properties were recorded during the survey. A survey report narrative is enclosed.

The HCRL must be notified if any changes to project location or scope are anticipated. This project is a Class III case, defined as a project which involves new construction in a disturbed, low-sensitivity area and as a Class V case, defined as a project which involves undisturbed ground. Copies of this letter will be sent to D. W. Lloyd, DOE, Richland Operations Office, as official documentation. If you have any questions, please call me at 376-6098. Please use the HCRC# above for any future correspondence concerning this project.

Very truly yours,
Laurie L. Hale
Laurie L. Hale
Cultural Resources Specialist
Cultural Resources Project

Concurrence:
Darby Stapp, Project Manager
Cultural Resources Project

cc: D. W. Lloyd, RL (2)
G. D. Cummins
R. J. Swan
File/LB

902 Battelle Boulevard ▪ P.O. Box 999 ▪ Richland, WA 99352

CULTURAL RESOURCES REPORT NARRATIVE
HANFORD CULTURAL RESOURCES LABORATORY

A. NAME AND FULL DESCRIPTION OF THE PROPOSED UNDERTAKING

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

The proposed project area has been zoned for heavy industry in the 600 Area of the Hanford Site. Two 150 acres sites compose the project area near WPPSS No. 1 and WPPSS No.4 (Figures 1 and 2). Because portions of the two sites had not previously been disturbed, archaeological survey of the undisturbed areas was necessary.

B. LOCATION AND GENERAL ENVIRONMENTAL SETTING

The Hanford Site is located in South-central Washington State and is managed by the Department of Energy, Richland Operations (Figure 3). The WPPSS Industrial Sites project area is located near the Washington Public Power Supply System reactors No. 1 and No. 4. The southern part of the surveyed area was named Block 1 and the northern part was named Block 2 because of the order in which they were surveyed. Block 1 contains a large sagebrush community in the southern half and a bunchgrass and cheatgrass community in the northern half. This northern half was burned over a decade ago and is now almost devoid of shrubs. The topography is composed of gently undulating stabilized dunes.

Block 2 of the project area contains very few large shrubs. It also was burned over a decade ago. The topography is mostly flat with remnant small-scale vegetation hummocks. Surface sediments in both blocks are Holocene eolian and fluvial sandy silt. The closest source of permanent water is the Columbia River, approximately 2.6 km to the east. Elevation in the project area is about 143 m (470 feet).

The vegetation in Block 2 and the northern half of Block 1 is a recovering steppe-shrub community (Daubenmire 1970) and is dominated by annual and perennial grasses, especially cheatgrass (Bromus tectorum) and Sandberg's bluegrass (Poa sandbergii). Table 1 summarizes the plant species observed within the project area during the survey. Animals or their sign that were observed within the project area include coyote (Canis latrans), Meadowlark (Sturnella neglecta), White crowned sparrow (Zonotrichia leucophrys), Badger (Taxidea taxus), Curlew (Numenius americana), Northern pocket gopher (Thomomys talpoides), Cottontail rabbit (Sylvilagus sp.), and deer (Odocoileus hemionus).

Table 1. Flora in the WPPSS Industrial Sites Project Area.

	Species	Common name
Annual grass	Bromus tectorum	Cheat grass
Perennial grass	Poa Sandbergii	Sandberg's bluegrass
Annual/biennial forbs	Lactuca serriola	Prickly lettuce
	Salsola kali	Russian thistle
	Phacelia linearis	Narrow-leafed phacelia
	Sisymbrium altissimum	Tumble mustard
	Tragopogon dubius	Yellow salsify
	Holosteum umbellatum	Jagged chickweed
	Oenethera pallida	White-stemmed evening primrose
	Amsinkia lycopsoides	Tarweed fiddleneck
	Erysimum asperum	Rough wallflower

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

Table 1. Continued.

Annual/biennial forbs (cont.)	Lavia glandulosa	Tidytips
	Descurainia pinnata	Western tansymustard
Perennial forbs	Balsamorhiza careyana	Carey's balsamroot
	Achillea millefolium	Yarrow
	Astragalus sp.	Vetch
	Opuntia polycantha	Prickly pear cactus
	Brodiaea douglasii	Brodiaea
	Brodiaea howellii	Brodiaea
	Machaeranthera canescens	Hoary aster
	Delphinium sp.	Larkspur
	Phlox longifolia	Longleaf phlox
	Cymopteris terebinthinus	Turpentine desertparsley
	Lomatium macrocarpum	Large-fruited biscuitroot
	Eriogonum niveum	Snow buckwheat
Shrubs	Artemisia tridentata	Big sage
	Purshia tridentata	Bitterbrush
	Chrysothamnus nauseosus	Gray rabbitbrush
	Chrysothamnus viscidiflorus	Green rabbitbrush

Aerial photograph(s): EG&G 5675 # 125, 05-07-87 (Scale 1:19900).

USGS topographic map(s): Wooded Island, Washington 7.5 Minute Quadrangle, 1978 edition.

Legal descriptions: T 12 N, R 28E, Section 33 and T 11N, R 28E, Section 4.

UTMs: (See Figure 1.)

Location	Zone	m Northing	m Easting
A	11	5149823	322540
B	11	5149802	323536
C	11	5149373	323459
D	11	5149332	323206
E	11	5149509	323212
F	11	5159600	293900
G	11	5149400	323140
H	11	5149407	322951
I	11	5149305	322953
J	11	5149345	322807
K	11	5149754	322821
L	11	5149792	322541

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

Location	Zone	m Northing	m Easting
M	11	5148423	323233
N	11	5148420	323320
O	11	5148666	323340
P	11	5148671	323371
Q	11	5147563	323394
R	11	5147601	323243

C. PRE-FIELD RESEARCH

1. Sources of information checked: [X] Survey and Site Location Maps [X] Previous Reports [X] Aerial Photographs [X] GLO Plats [X] Other

GLO'S

The General Land Office survey for T 12N, R 28E and T 11N, R 28E was conducted in 1867. Adjacent GLO plats were surveyed between 1863 and 1908. No roads or trails were shown on the GLO plat for the survey area.

15' 1917 Coyote Rapids Washington Quadrangle Map

No trails or roads went through the project area on the 1917 Pasco, Washington Quadrangle.

Survey and Site Location Maps/Previous Reports and studies

Survey and site location maps were examined to determine previous surveys completed and sites and isolates known to be located within 1.0 km of the current project. This database contains the location of all known cultural resource sites recorded since 1947, project areas intensively surveyed since 1987, and sites, and isolated artifacts located during those surveys. No cultural resources were found to have been recorded in the vicinity of the current project area. D. Rice conducted the only archaeological surveys near the project area in 1973 and 1974. He recorded no archaeological materials within 1 km of the proposed project area.

D. EXPECTED HISTORIC AND PREHISTORIC LAND USE AND SITE SENSITIVITY

1. Are there known sites in the general area? [ ] Yes [X] No

2. Are sites expected? [ ] Yes [X] No
No historic or prehistoric sites or isolated finds have been found near the project area.

E. FIELD METHODS

1. Areas examined and type of coverage:
The survey followed procedures outlined in Chatters, 1989. Transects were spaced 20 m apart. Participants scanned an area 5 m to either side of the transect center line, thus having potential for 100% discovery of concentrations of surface artifacts larger than 10 m in diameter, as well as most smaller concentrations. The lowest estimated discovery rate, at 50%, was expected for single, isolated artifacts.

The surveyor walked 8 transects oriented north/south in Block 1. The westernmost transect was located 1.64 km east of Geneva Junction on the Hanford Rail System with subsequent transects spaced 20 m apart to the east. Block 2 was covered in 41 north/south transects with 2 east/west

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

transects along the north block boundary. The westernmost transect in Block 2 was located approximately 20 m east and 400 m south of the northeast corner of the perimeter fence of WPPSS No. 4. Subsequent transects in Section 2 were spaced 20 m apart to the east except for the two transects walked east/west along the northern boundary of Block 2. Total coverage by the survey for Block 1 was 12.6 ha and for Block 2 was 31.22 ha. A total of 43.82 ha was surveyed.

2. Areas not examined and reasons why: The paved parking area, security training building, and associated physical fitness track were not surveyed because no bare ground surface was visible. All portions of the project area outside of the two surveyed blocks indicated in Figure 1 were highly disturbed and were not surveyed.

3. Personnel conducting and assisting in this survey:
   Laurie L. Hale, HCRL.

4. Date(s) of survey:
   April 21-23, 1998.

5. Visibility on surface: ~20%
   Visibility of subsurface: <5% from animal diggings.

6. Problems encountered: None.

F. RESULTS

No cultural materials were observed during survey of the project area.

G. CONCLUSIONS AND RECOMMENDATIONS:

It is the finding of the HCRL staff that there are no known cultural resources or historic properties within the proposed project area. The workers, however, must be directed to watch for cultural materials (e.g., bones, artifacts) during all work activities. If any are encountered, work in the vicinity of the discovery must stop until an HCRL archaeologist has been notified, assessed the significance of the find, and, if necessary, arranged for mitigation of the impacts to the find. The HCRL must be notified if any changes to project location or scope are anticipated. This is a Class III case, defined as a project which involves new construction in a disturbed, low-sensitivity area, and a Class V case, defined as a project which involves undisturbed ground.

H. REFERENCES

Chatters, J. C. 1989 *Hanford Cultural Resources Management Plan*, PNL-6942, Pacific Northwest Laboratory, Richland, Washington.

Daubenmire, R. 1970 Steppe vegetation of Washington. Wash. Agric. Expt. Sta. Tech. Bull., 62, 131 pp.

Rice, D.G. 1973. Archaeological Investigation at the Washington Public Power Supply System Hanford No.1 Nuclear Power Plant Benton County, Washington. H.O. 44724, prepared by University of Idaho for U.S. Department of Energy.

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

I. ATTACHMENTS

1. Site forms for each site recorded ? [ ]
2. Isolate forms for each isolate recorded? [ ]
3. Overview location map [X]
4. Quad map of surveyed area? [X]
5. Other attachments? [ ]

J. CERTIFICATION OF RESULTS

I certify that I conducted the investigation reported here, that my observations and methods are fully documented, and that this report is complete and accurate to the best of my knowledge.

Laurie L. Hale	Laurie L. Hale	4/27/98
Reporter	Signature	Date
Darby C. Stapp	[signature]	4/27/98
Reviewer	Concurrence (Signature)	Date

5

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

WOODED ISLAND QUADRANGLE, WASHINGTON - 7.5 MINUTE SERIES (TOPOGRAPHIC) 1978
T12 N R 28E

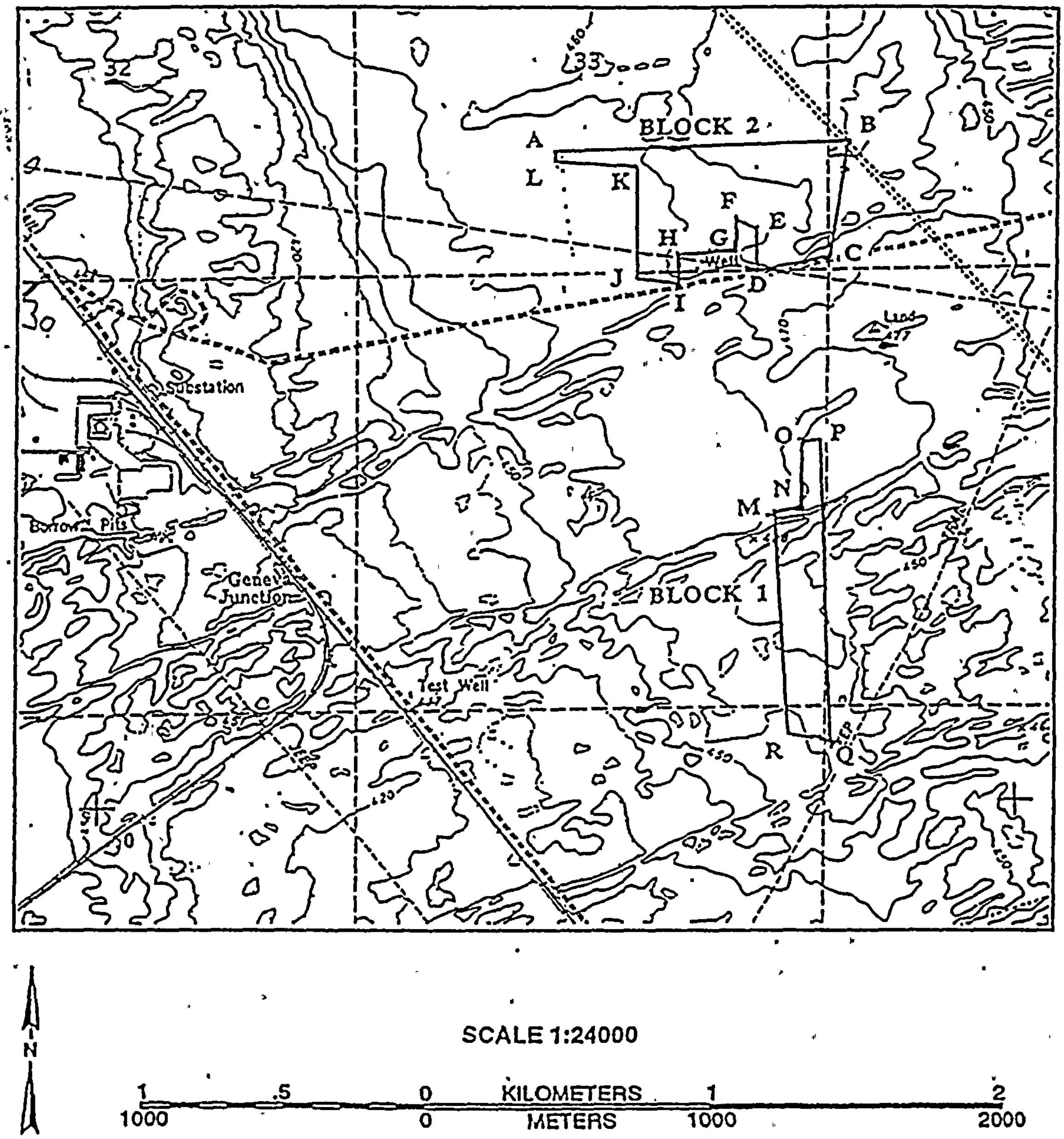


Figure 1. Location of area surveyed for the WPPSS Industrial Sites project, HCRC #98-0600-024.

6

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

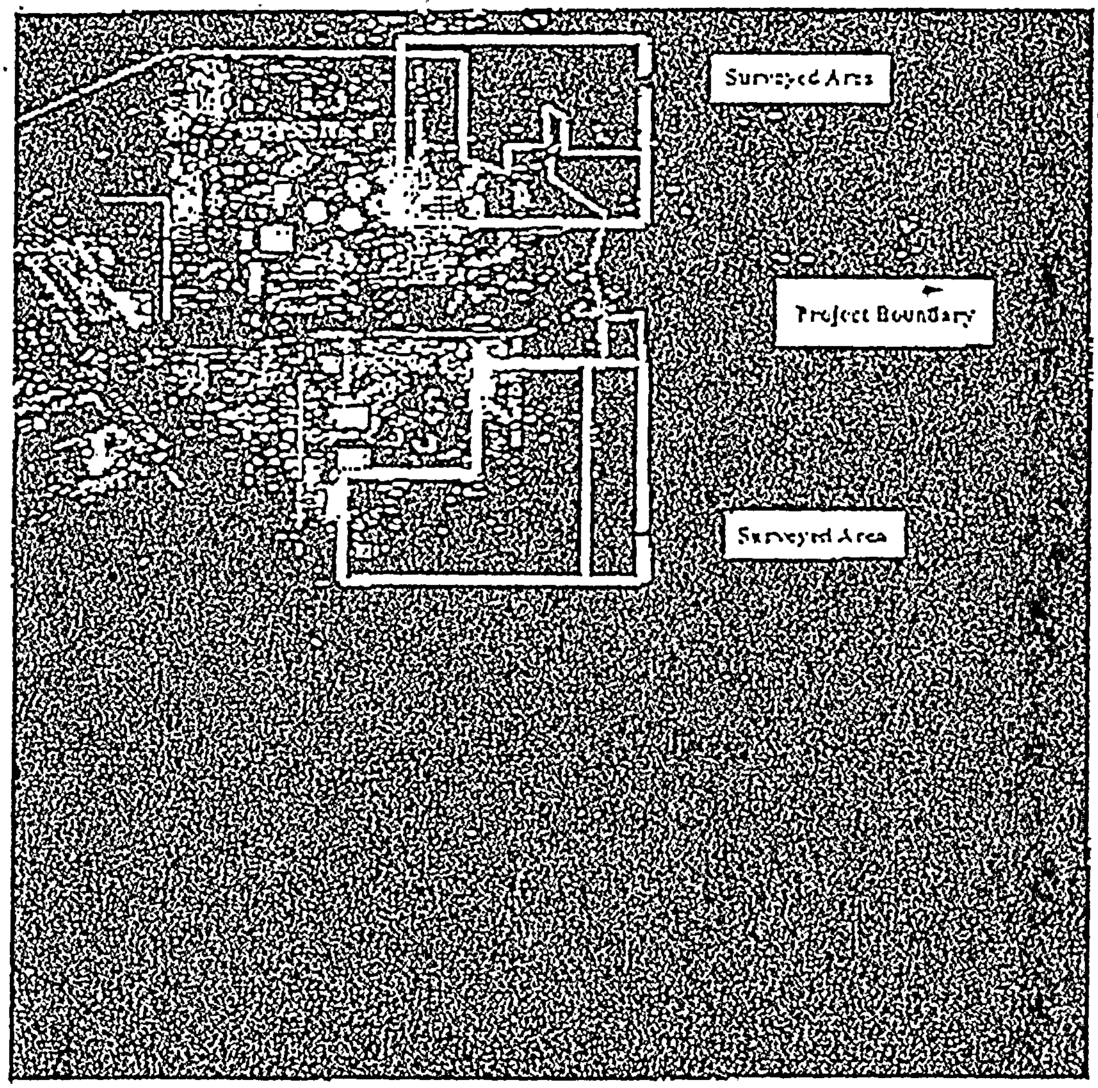


Figure 2. Portion of aerial photograph (EG&G 5675 # 125, 05-07-87, Scale 1:19900) showing the project boundaries and surveyed area of the WPPSS Industrial Sites project area (HCRC #98-0600-024).

7

CULTURAL RESOURCES REPORT NARRATIVE

Project Number: 98-0600-024
Project Name: WPPSS Industrial Sites

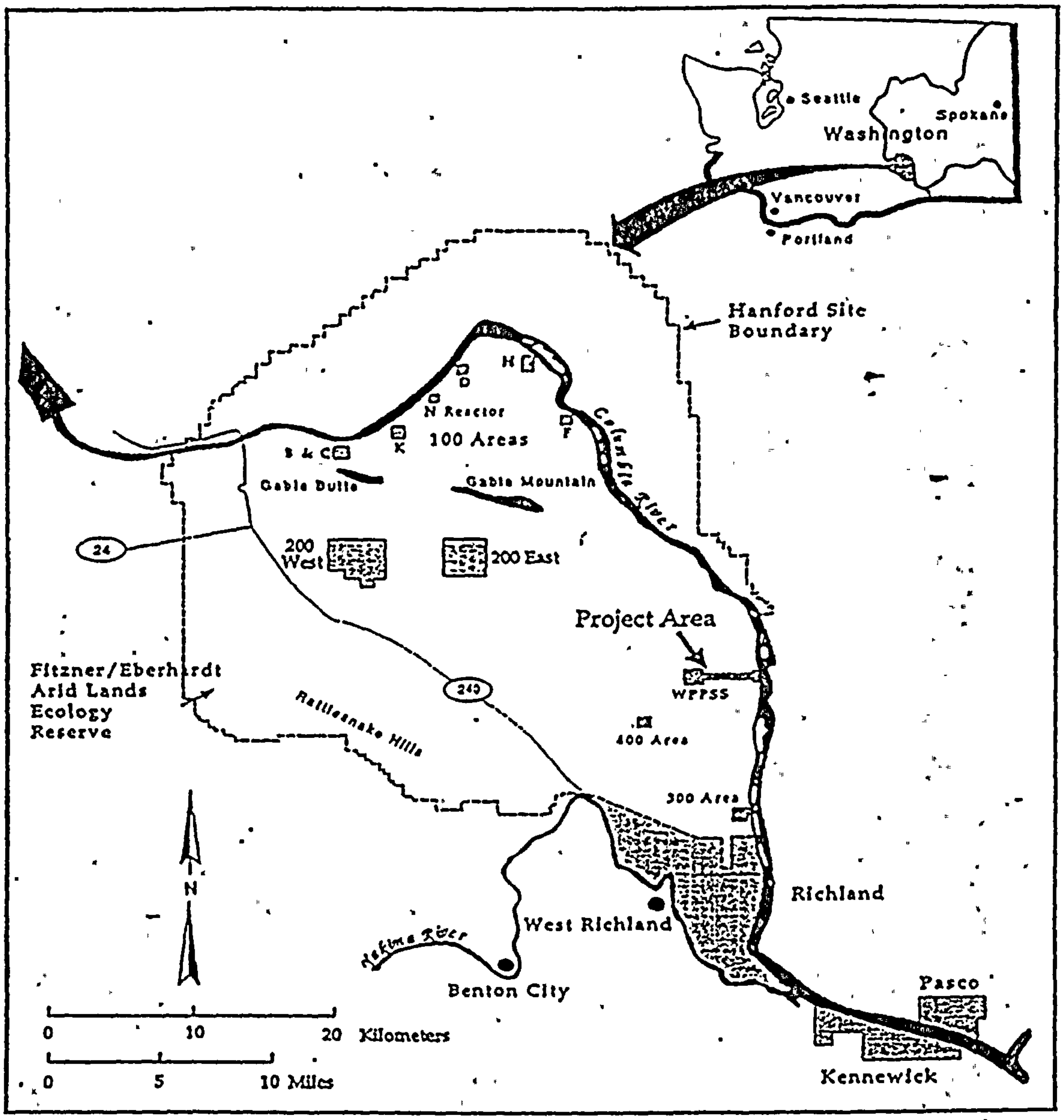


Figure 3. Overview map showing location of area surveyed for the WPPSS Industrial Sites project, HCRC #98-0600-024.

Pacific Northwest National Laboratory

Operated by Battelle for the U.S. Department of Energy

May 18, 1998

No Known Historic Properties

Mr. R. J. Staudacher
Fluor Daniel Hanford, Inc.
P. O. Box 1000/H8-64
Richland, WA 99352

Dear Mr. Staudacher:
CULTURAL RESOURCES REVIEW OF THE WPPSS INDUSTRIAL SITES AND PROPOSED GAS LINE. HCRC #98-600-024A.

In response to your request received May 8, 1998, staff of the Hanford Cultural Resources Laboratory (HCRL) conducted a cultural resources review of the subject project in the 600 Area of the Hanford Site. According to the information that you supplied, the project will involve the installation of a natural gas pipeline parallel to the existing DOE-owned railroad from a point opposite Cypress Street in the 300 Area to the proposed WPPSS industrial sites, a distance of approximately 10 miles. The pipeline would be installed within the railroad easement, within 25 feet from the track centerline. Construction of the pipeline would involve excavation of a trench approximately 5 feet deep. Spoils would be stockpiled adjacent to the trench and then backfilled once the pipe had been installed.

A review of our files showed that an archaeological survey was conducted prior to the installation of a fiber optic line (HCRC# 90-600-012) within the project area. The survey covered 30 m from the track centerline along one side of the tracks, on the west side of the tracks from between the 300 Area and the intersection of Stevens Drive and the railroad and on the east side of the tracks from the intersection north to WPPSS. One isolated artifact, a 1924 Oregon license plate, was recorded and collected from the project area. No sites were identified during the survey. Within the WPPSS site, the pipeline would be installed within ground that has been previously disturbed by the construction of the WPPSS facilities and/or within ground surveyed for this project (HCRC #98-600-024). No archaeological materials were identified during that survey within the project area. Therefore, if the pipeline is installed on the same side of the tracks as the fiber optic line and within 30 m of the tracks, it is unlikely that any archaeological materials will be affected. Additional survey of the project area and monitoring of the excavations by an archaeologist are not necessary. However, if construction activities, including vehicle access and spoil stockpiling, occurs outside the area reviewed (e.g., on the opposite side of the tracks or greater than 30 m from the tracks) additional review will be required.

It is the finding of the HCRL staff that there are no known historic properties within the proposed project area. The workers, however, should be directed to watch for cultural materials (e.g., bones, artifacts) during all work activities. If any are encountered, work in the vicinity of the discovery must stop until an HCRL archaeologist has been notified, assessed the significance of the find, and, if necessary, arranged for mitigation of the impacts to the find. The HCRL must be notified if any changes to project location or scope are anticipated. This is a Class V and III case, defined as a project which involves undisturbed ground, and new construction in a disturbed, low-sensitivity area.

902 Battelle Boulevard ■ P.O. Box 999 ■ Richland, WA 99352

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

[✓] Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[ ] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
April 25, 1972	S3-20141	S3-20141P	S3-20141C

NAME
WASHINGTON PUBLIC POWER SUPPLY SYSTEM

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
P.O. Box 968	Richland	Washington	99352

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Columbia River

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
90.0		41,200

QUANTITY, TYPE OF USE, PERIOD OF USE

56 cfs, 41,000 acre-feet per year for consumptive industrial supply;

32 cfs for nonconsumptive industrial supply;

2.0 cfs, 200 acre-feet per year for community domestic supply and beautification.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL

1320 feet north and 880 feet east of the center of Section 2

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
Government Lots 1 and 4	2	11	28 E.	40	Benton

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Beginning at the SW corner of Section 11, T. 11 N., R. 28 E.W.M., said corner having Washington State coordinates, S zone, of N 408,333.30 and E 2,307,653.50; thence N 0°41'08" E 8,055.20 feet to the true point of beginning; thence W 11,433.57 feet; thence S 01°01'23" E, 3000.48 feet; thence S 78°53'34" W 5,200.96 feet; thence N 0°31'41" W 3690.15 feet; thence S 1,630.00 feet; thence N 1,865.59 feet; thence N 87°46'08" E 3,703.83 feet; thence S 01°01'23" E 1,600.25 feet; thence E 11,189.29 feet; thence N 01°01'23" E 1,600.29 feet; thence N 89°07'55" E 3,300.38 feet to the line of navigation of the W bank of the Columbia River; thence southerly along said line of navigation to a point that bears N 89°15'21" E from the true point of beginning; thence S 89°15'21" W 3,850.32 feet, more or less, to the true point of beginning. Further; Beginning at the SW corner of Section 11, T. 11 N., R. 28 E.W.M., said corner having Washington State coordinates, S zone, of N 408,335.30 and E 2,307,653.50; thence N 0°41'08" E 8,065.28 feet; thence N 89°15'21" E, 3,850.32 feet to a point on the line of navigation of the W bank of the Columbia River and the true point of beginning of the description; thence continuing N 89°15'21" E, 600.00 feet; thence N 10°07'14" W 2865.36 feet; thence S 89°07'55" W 600.00 feet to a point on said line of navigation; thence southerly along said line of navigation to the true point of beginning of this description.

It is the intent that this certificate issue pursuant to and consistent with the Site Certification Agreement between the State of Washington and the Washington Public Power Supply System for Hanford No. 2 Nuclear Electric Generating Facility, Benton County, Washington of May 17, 1972.

Nothing in this certificate shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Yakima, Washington, this 4th day of February, 1983.

Department of Ecology

by Russell K. Taylor

RUSSELL K. TAYLOR, REGIONAL MANAGER

ENGINEERING DATA
OK M. Wil...
ake

FOR COUNTY USE ONLY

WNP-2 Site Certification Agreement

5. In carrying out the Monitoring Programs described in Attachment I, the Supply System will establish sampling locations on the Project site and within present or future regions of high population density located within a ten-mile radius of the Project's reactor building so as to provide a representative sampling of environmental effects in the surrounding area.

6. Should any element of the Supply System's Monitoring Program which is being performed by, or in conjunction with, any federal, state or local governmental body or any other nuclear operator in the Hanford Operations Area be terminated, the Supply System agrees to re-activate so much of any such program as is appropriate and necessary.

7. The Supply System agrees to submit to the Council a copy or copies of reports and data from the Environmental Monitoring Programs required to be filed by the Atomic Energy Commission's construction permit, operating license or other regulations to the Council at the same time as when submitted to the Atomic Energy Commission.

VI. MISCELLANEOUS PROVISIONS

A. Project Visitation and Recreation

1. The Supply System agrees to provide visitor information facilities at the Project site subject to security regulations, and such limitations as the Supply System deems reasonably necessary for the health, safety and welfare of the public and for protection of the facility.

2. The Supply System agrees to provide replacement of recreational opportunities which are shown to be adversely affected as a direct consequence of Project activity when such adverse effects are substantiated by the Council.

B. Multi-Purpose Use of Coolant Water

1. In the event that a state agency of the State of Washington develops, implements or sponsors plans for the multi-use of the coolant water from the Project, the Supply System agrees to supply at no cost to the State warm water to the maximum practical extent, but not less than 4,000 gallons per minute at its source of diversion at an agreed-upon source; provided, that it is understood that at times plant operation may preclude delivery of such effluent water either in a warmed state or in the quantity mentioned above. In the event of that circumstance and to enable the early commencement or continuance of the multi-use project with unwarmed water, the Supply System agrees to provide a valved outlet on the cooling water supply system capable of deliverying such water at a rate of at least 4,000 gallons per minute.

C. Modification of Agreement

1. This Certification Agreement may be amended by initiation of either the Council or the applicant. Such amendatory activity shall be accomplished pursuant to Council rules and procedures then in effect in a like manner upon formal Council

ENERGY FACILITY SITE EVALUATION COUNCIL

820 EAST FIFTH AVENUE, OLYMPIA, WASHINGTON 98504 PHONE: 753-7384

Governor Dixy Lee Ray

June 28, 1977

Mr. R. K. Woodruff
Senior Environmental Engineer -
State Liaison
Washington Public Power Supply System
P. O. Box 968
Richland, WA 99352

Subject: WPPSS Nuclear Project No. 2
Multipurpose Use of
Coolant Water

Dear Mr. Woodruff:

Please refer to your letter of May 18, 1977, subject as above, which requested review and concurrence of a proposed agreement concerning the multipurpose use of the coolant water for a state sponsored project.

Be advised that the Washington State Energy Facility Site Evaluation Council at its regular meeting of June 27, 1977 did adopt by Resolution No. 122, copy enclosed, a five point statement regarding this matter.

Sincerely,

Roger Polzin
Executive Secretary

RP:els

Enclosure (1)
Resolution No. 122

Resolution No. 122

WHEREAS, Section VI.B. of the Site Certification Agreement for the Washington Public Power Supply System's Nuclear Project No. 2 provides that the certificate holder conditionally agrees to supply 4000 gallons per minute of warm water for a state sponsored project; and

WHEREAS, the certificate holder and the state recognize the desireability of formulating further definition of this agreement; and

WHEREAS, the certificate holder by its letter of May 18, 1977 subject: WPPSS Nuclear Project No. 2 Multipurpose Use of Coolant Water did request the Council to agree upon a statement of the certificate holder's commitment; and

WHEREAS, a Technical Committee was appointed with representatives from the Departments of Agriculture, Ecology, and Social and Health Services; and the State Energy Office, and Office of Program Planning and Fiscal Management who met with representatives of the certificate holder and who did provide recommendations to the Council;

NOW, THEREFORE, BE IT RESOLVED that the Energy Facility Site Evaluation Council agrees that:

1. The agreed upon source of diversion of heated water is a flange on the circulating water (CW) system between the condenser and the cooling towers as shown on Attachment 1. The specific source point is the flange located immediately downstream from the diversion tee.

2. The agreed upon source for unwarmed water is the tower makeup (TMU) water line east of the spray ponds, also shown on Attachment 1. The Supply System will supply and install the diversion tee and a valve for this part of the system. The specific source point for this water is immediately downstream from the valve.

3. The Supply System will design, construct and finance these tie-in's but will not be required to construct these items until such time as an appropriate state agency is ready to construct piping for use of the cold and/or hot water. When a program is developed and assured, the Council will provide written notice to proceed.

4. The Supply System will design and construct upon receipt of this written notice, the length of pipe that runs from the warm water source point to just outside the WPPSS security fence, however, the state agency utilizing the water will be responsible financially for both design and construction costs.

5. If the construction of the diversions for the Warm Water Utilization Program is desired during construction of WNP-2 it will be scheduled so that it does not impact the project startup date. If the construction of the

diversions is desired after startup it will be scheduled for the first possible outage so that plant operation will not be impacted. The Council will supply information on desired installation schedules as far in advance as possible in order to assist in minimizing impact upon construction/operation schedules of WNP-2 as well as the warm water utilization project.

Dated this 27th day of June 1977.

WASHINGTON STATE ENERGY FACILITY
SITE EVALUATION COUNCIL

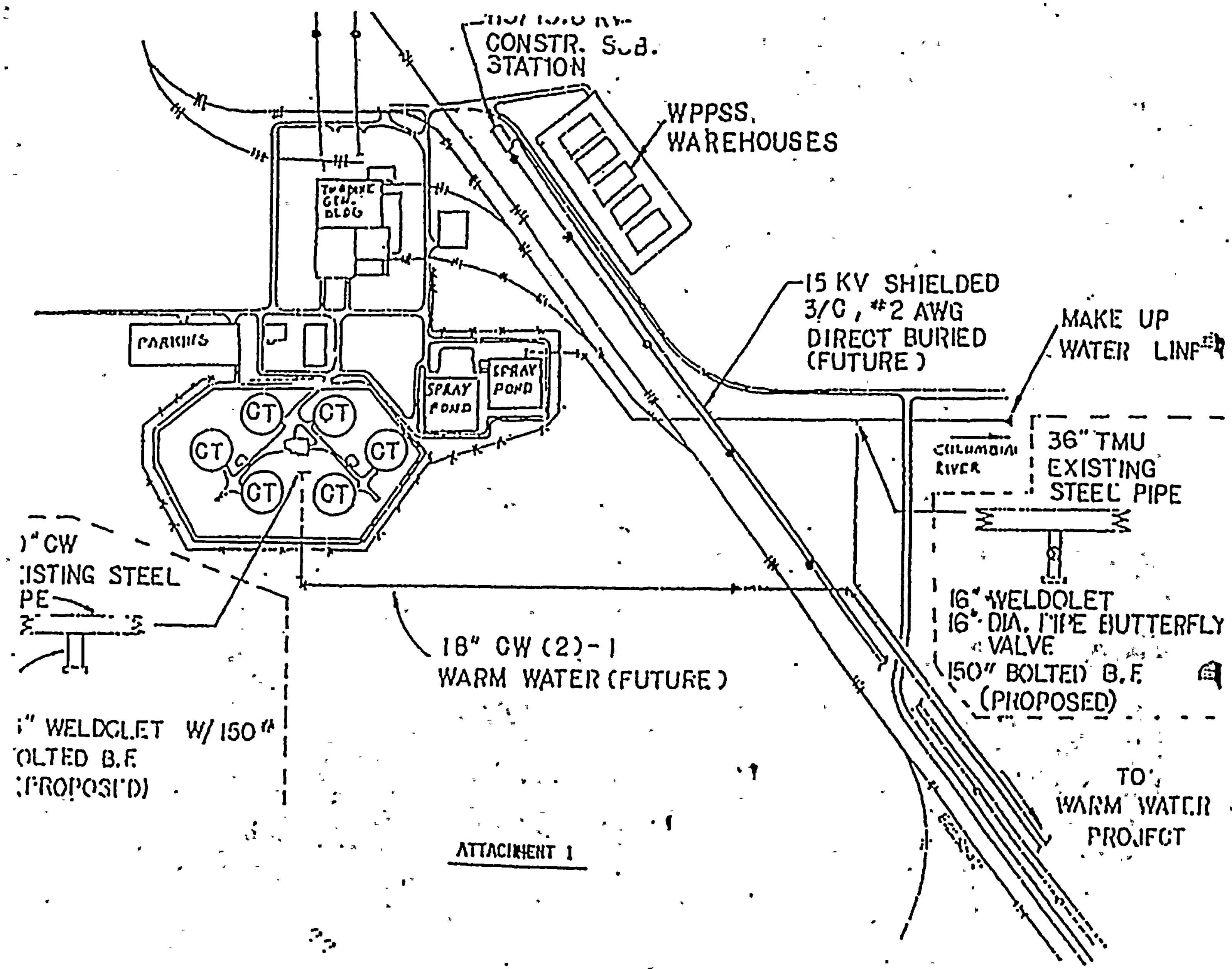
BY Lawrence B. Bradley
Lawrence B. Bradley
Chairman

ATTEST:

BY Roger Polzin
Roger Polzin
Executive Secretary

APPROVED AS TO FORM:

BY Thomas F. Carr
Thomas F. Carr
Assistant Attorney General



ATTACHMENT 1

Washington Public Power Supply System
A JOINT OPERATING AGENCY

P. O. Box 968 3000 George Washington Way Richland, Washington 99352 Phone (509) 946-8

Docket No. 50-460
50-513

January 20, 1975
G01-75-8

RECEIVED JAN 23 1975

Mr. Angelo Giambusso
Deputy Director for Reactor Projects
Directorate of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: WPPSS NUCLEAR PROJECTS NOS. 1 AND 4 COMMENTS ON THE "DRAFT ENVIRONMENTAL STATEMENT BY THE DIRECTORATE OF LICENSING ATOMIC ENERGY COMMISSION RELATED TO THE PROPOSED WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECTS NOS. 1 AND 4"

Dear Mr. Giambusso:

We have received a copy of the above subject document and are sending to your office the following comments on the Draft Environmental Statement.

Discharge Design Change (See DES Sections 3.1 and 5.2.3.2 and Figure 3.7)

It was determined earlier that the intake and outfall structures for WNP-1 and WNP-4 would be of the same design as that for WNP-2. The WNP-2 discharge was recently changed to reflect the comments of Federal and State agencies. This new jet diffuser design has now been accepted for WNP-2. A diagram of that system is included. The WNP-1 and WNP-4 discharge system will now be redesigned accordingly.

Well Use for Construction Water (See DES Sections 3.3, 3.4.2, 4.4, and 10.2.3.2)

While the Environmental Report discussed the need for water during construction, it did not state what the source of that water would be. At the present time WPPSS is planning to use two wells for its construction water. These wells are expected to be approximately 350 feet deep and produce a minimum of 250 gpm each. The water from these wells will be tested for mineral, chemical, bacteriological, and hydrogen sulphide content. The quality shall be in accordance with U. S. Public Health and Welfare Service Standards for drinking water.

The wells are located between the plants, approximately 900 feet north of WNP-1 reactor and 12,000 feet from the Columbia River. The cone of ground water influence is expected to have an approximate radius of 1,800 - 2,000 feet. The exact extent will be established by actual draw-down test. This draw will not affect the prevailing ground water conditions. Constant usage of the wells will not be required during construction, but will provide the necessary water through a storage tank to the Batch Plant, Fire Loop (WNP-1/4), etc. After construction, the wells will be capped and not used for permanent facilities.

Visitor Center (See DES Section 5.1)

A visitor and information center is planned for WNP-2 and will also serve WNP-1 and WNP-4. At this time (January 1975), the site of the center is expected to be in the City of Richland and not on the Hanford Reservation.

Intake Design (See DES Section 3.4.3)

The DES indicates that the 3/8 inch diameter holes of the outer sleeve cover one third of the surface area. The present design shows that these perforations cover 40 percent of the outer sleeve.

Seeding of Disturbed Areas (See DES Sections 4.4.1 and 4.4.2)

Study of the site area over the past year as well as experience with the WNP-2 construction area shows that reseeding disturbed areas with any commercially available seed is both unnecessary and would prove to be futile. Disturbed areas are quickly revegetated naturally with tumble mustard, Russian thistles, and cheat grass. Cheat grass quickly becomes the dominant species and serves the purpose of soil stabilization very well. The climate at this site is too dry and the soil too sandy for commercially available seeds to thrive.

It is the intent of the Supply System to restore all disturbed areas, as nearly as possible to the regional topography and top soil conditions in order to promote the revegetation of natural species as quickly as possible.

Socioeconomic Impact of Construction and Operation (See DES Section 4.6.1)

The Supply System has contracted Woodward-Clyde Consultants of San Francisco, California, to do an in-depth study and evaluation of the probable socioeconomic effects of the project. The report, which is to be completed in April 1975, will assess project impact on housing, schools, traffic, transportation, and community health and social services. The study area will include the Tri-City area and other communities within commuting proximity to the project. The final report will be available to community planners and governmental agencies.

Mr. Angelo Giambusso
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<u>Work Force Changes</u> (See DES Page 1 and Sections 4.1, 10.1.1.4 and 10.4.1.17)

Since the Environmental Report was issued, a new manpower forecast for WNP-1 and WNP-4 has been made. The change in the magnitude of manhours forecast in the Environmental Report and this recent forecast reflects new construction estimates. This forecast indicated that construction of WNP-1 will begin in April 1975 and will be completed in July 1980 with a peak force of 1500 workers in early 1978. Construction of WNP-4 would begin in August 1975 and be completed in January 1982 with a peak force of 1500 workers in 1979. The combined peak construction force of both plants is expected to be approximately 3300 workers and would occur in 1978 for a period of several months. The combined work force would number more than 2000 workers for a period of more than 30 months from March 1977 to December 1979.

<u>Environmental Monitoring Program</u> (See DES Sections 6.1.5.1, 6.1.5.2, and 6.2.3)

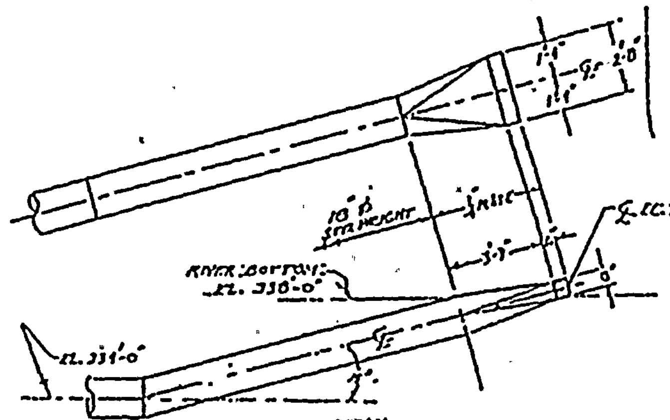
Revisions have been made by the applicant in the areas of environmental monitoring. The changes which we intend to include in the Environmental Report are included herein as Sections 6.1.1.2, 6.1.4.3, 6.3, and Table 6.2-1.

Very truly yours,

J. J. Stein
Managing Director

JJS:SLE:vlm

Enclosures



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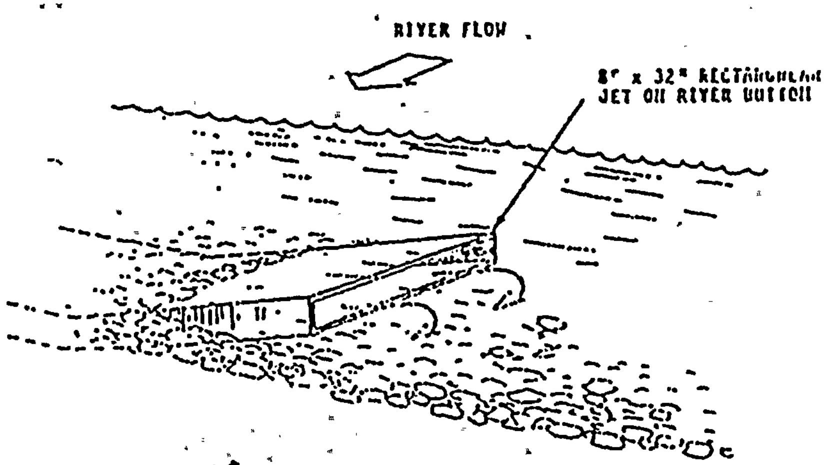

SCHEMATIC FOR
WPPSS NUCLEAR PROJECT NO. 2

(Dimensions will be adjusted for WNP-1 and WNP-4 discharge.)

INDUSTRIALLY-POLLUTED SEDIMENTS OF THE COLUMBIA RIVER NEAR WENATCHEE, WASHINGTON

by
David M. Damkaer
and
Douglas B. Dey

Preliminary Report to
Environmental Protection Agency
(Interagency Agreement DW13931749-01-0)

Coastal Zone and Estuarine Studies Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112

October 1986

CONTENTS

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1

BACKGROUND

Ramifications of this investigation impact three regional fisheries and habitat priority issues: (1) dams and hydroelectric power generation; (2) point and non-point source industrial waste discharge; and (3) waterway development (including dredging, filling, and dredge disposal). The National Marine Fisheries Service (NMFS) has long been involved in research on these particular issues. In the Columbia River Basin, information is needed on industrially-discharged materials, particularly organic compounds, heavy metals, fluoride, and cyanide. This information will contribute directly toward improved salmonid and habitat management in the Basin by NMFS, Environmental Protection Agency, U.S. Army Corps of Engineers (COE), Department of Interior, Bonneville Power Administration, Northwest Power Planning Council, state fishery agencies, and interagency groups such as the Columbia River Inter-tribal Fish Commission.

In a fish-passage-delay study funded by the COE, recent observations by NMFS related the fluctuations in fluoride concentrations at John Day Dam (Columbia River Mile 216) to fluoride discharges from a primary aluminum-production plant (Fig. 1) (Damkaer 1983; Damkaer and Dey 1984, 1985, 1986). Further observations, including bioassay experiments on adult salmon behavior, attributed significant increased passage times and decreased survival of salmon to these fluoride concentrations. Fluoride seems to have a critical role during the migration of adult salmonids, especially in their willingness to negotiate fishways at dams. In addition, the researchers determined the concentrations of a large number of inorganic and organic compounds in the water and sediments of the John Day Dam region.

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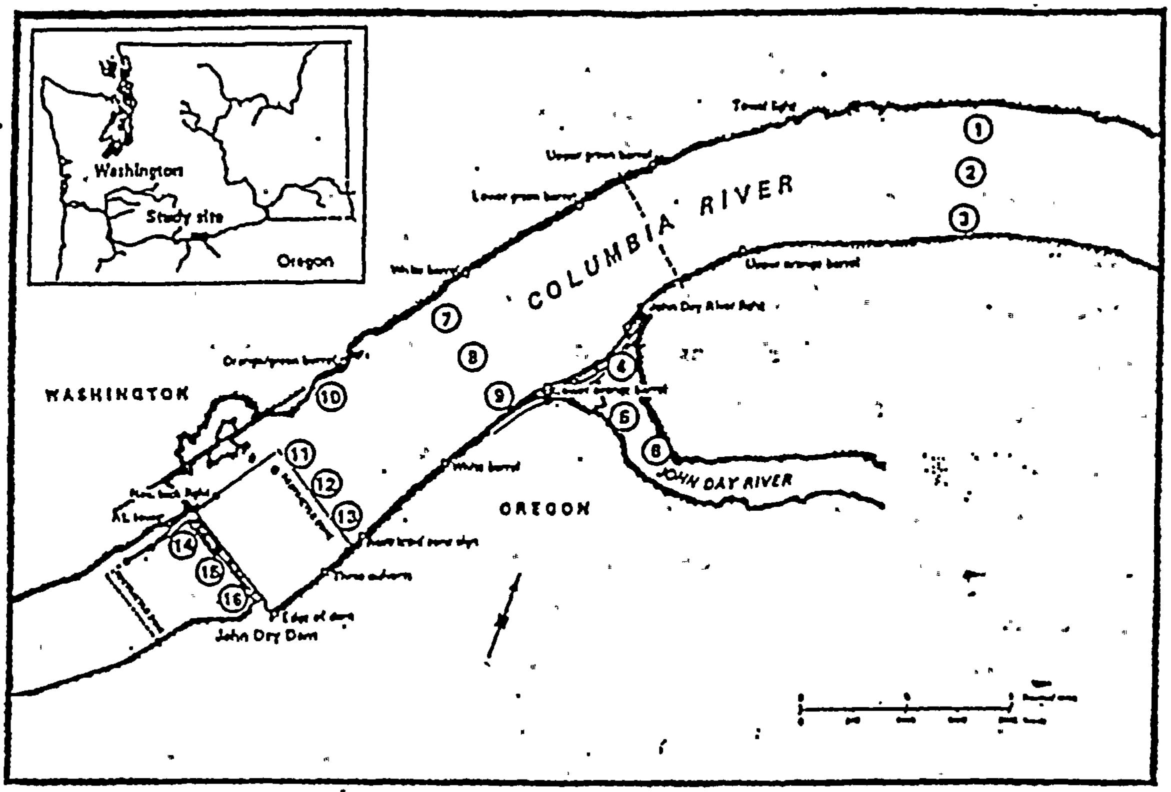

Figure 1.--Study area for adult salmonid passage-delay program, John Day Dam region, Columbia River. Circled numbers indicate sampling sites (sampling sites on downstream side of The Dalles and Bonneville Dams not shown).

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While the fish-passage-delays appeared to have a large and critical component related to fluoride concentrations upstream from the dam, it is possible that lesser effects were due to some heavy metals (cadmium, copper, lead, and zinc) and some aromatic and chlorinated hydrocarbons. The concentrations of aromatic hydrocarbons were much higher in the river sediment collected near the aluminum plant outfall and in the nearby lagoon (Stations L1 and L2) than from upriver stations, thereby implicating the aluminum plant as a source of aromatic hydrocarbons (Table 1).

It is interesting to compare the concentrations of the aromatic hydrocarbons in sediment samples from the John Day Dam region with those from other Pacific Northwest sites. The average and the range of concentration are comparable to concentrations in ~~sediments from~~ the Duwamish Waterway (Seattle), and they approach the concentrations found in Hylebos Waterway (Tacoma) (Table 2). These latter sites are deemed among the most-polluted aquatic areas in the U.S.

It is apparent that a number of toxic compounds related to an aluminum-production plant are accumulating in the sediments in the forebay and associated areas of John Day Dam. Even though the aluminum plant generally meets the Washington State Department of Ecology (DOE) standards for specific discharges, the presence of pollutants in the nearby river sediments is undoubtedly due to the rapid adsorption of pollutants onto suspended particulates and the high rate of sedimentation in the reservoir of the dam.

There are seven primary aluminum-production plants on or near the main Columbia River (Fig. 2). Some of these, like the complex recently studied at John Day Dam, are associated with hydroelectric dams. The plant at John Day Dam is just upstream from the dam. The aluminum plant at Wenatchee,

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Table 1.--Concentrations of aromatic compounds in sediment and water collected from the John Day Dam region, Columbia River.

Compound	Settling pond water (ng/ml) 6/11/82	Sediment (ng/g, dry weight)							
		Station 2 4/24/82	Station 4 4/24/82	Station 10 4/24/82-1	Station 10 4/24/82-2	Station 10+ 6/11/82	Station 10 6/11/82	L1 6/11/82	L2 6/11/82
isopropylbenzene	<.08	<.83	<.83	<.83	<.83	<.5	3.0	13	<1.0
n-propylbenzene	<.09	<.92	<.92	<.92	<.92	<.5	1.5	<1.1	<1.0
indan	<.09	<.87	<.87	<.87	<.87	<.5	1.2	3.7	1.4
tetramethylbenzene	<.08	<.83	<.83	<.83	<.83	<.5	<.5	<1.0	<1.0
naphthalene	<.07	<.76	<.76	13	12	<.5	<.5	42	29
benzothiophene	<.10	<1.1	<1.1	<1.1	<1.1	4.0	10	3.4	4.7
2-methylnaphthalene	<.08	<.85	<.85	5.7	6.1	18	13	20	9.7
1-methylnaphthalene	<.07	<.40	<.70	2.9	3.2	6.6	11	19	33
biphenyl	<.08	<.80	<.80	<.80	<.80	<.5	<.5	.8	6.3
2,6-dimethylnaphthalene	<.08	<.82	<.82	<.82	<.82	<.5	0.8	2.9	<.7
acenaphthene	<.07	<.73	<.73	16	13	8.0	5.6	110	55
trimethylnaphthalene	<.08	<.72	3.4	<.72	<.72	<.5	4.4	<.7	<.7
fluorene	<.07	<.82	<.82	23	20	13	8.2	78	44
dibenzothiophene	<.08	<.60	<.80	10	10	1.1	<.5	39	22
phenanthrene	<12	16	14	230	230	100	66	830	460
anthracene	<.07	<.85	<.85	140	140	37	16	200	88
1-methylphenanthrene	0.64	<.5	<.84	30	30	27	22	59	43
3,6-dimethylphenanthrene	0.23	<2.3	<2.3	25	25	11	11	53	26
fluoranthene	0.69	49	13	1100	1200	340	140	2000	1400
pyrene	0.31	49	14	1100	1200	360	150	2300	1500
benz[a]anthracene	0.32	20	4.3	1500	2000	280	100	1200	720
chrysene	1.5	39	12	4000	5800	780	310	2100	1500
benzo[e]pyrene	0.93	23	6.9	1800	2400	330	180	1300	770
benzo[a]pyrene	0.37	19	4.7	1700	2100	270	150	1200	720
perylene	<0.07	28	23	400	460	83	78	320	180
dibenzanthracene	0.10	7.4	<1.9	630	700	140	94	430	280

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Table 2.—The sums of concentrations of selected 1 through 5-ring aromatic compounds in sediment samples from the Columbia River (near John Day Dam) and Puget Sound (ng/g dry weight).

	Columbia R. stations			Puget Sound sites		
	2	4	10[a]	Duwamish Waterway[b]	Hylebos Waterway[c]	Port Madison[d]
Sums of concentrations of selected 1-5 ring aromatic compounds listed in Table 3.	250	86	8,300 [range 1,300-16,000]	11,000 [range 4,100-22,000]	18,000 [range 5,000 39,000]	480 [range 200-640]
Sums of concentrations of 3-, 4-, and 5-ring compounds listed in Table 3.	240	82	8,000 [range 2,600-16,000]	10,000 [range 3,700-20,000]	13,000 [range 3,800-33,000]	340 [range 160-510]

a/ Average for four samples (Damkaer 1983).

b/ Duwamish Waterway, Seattle, WA, average for four samples (Malins et al. 1980, 1982).

c/ Hylebos Waterway, Tacoma, WA, average for six samples (Malins et al. 1980, 1982).

d/ Port Madison, Puget Sound, WA, average for two samples (Malins et al. 1980, 1982).

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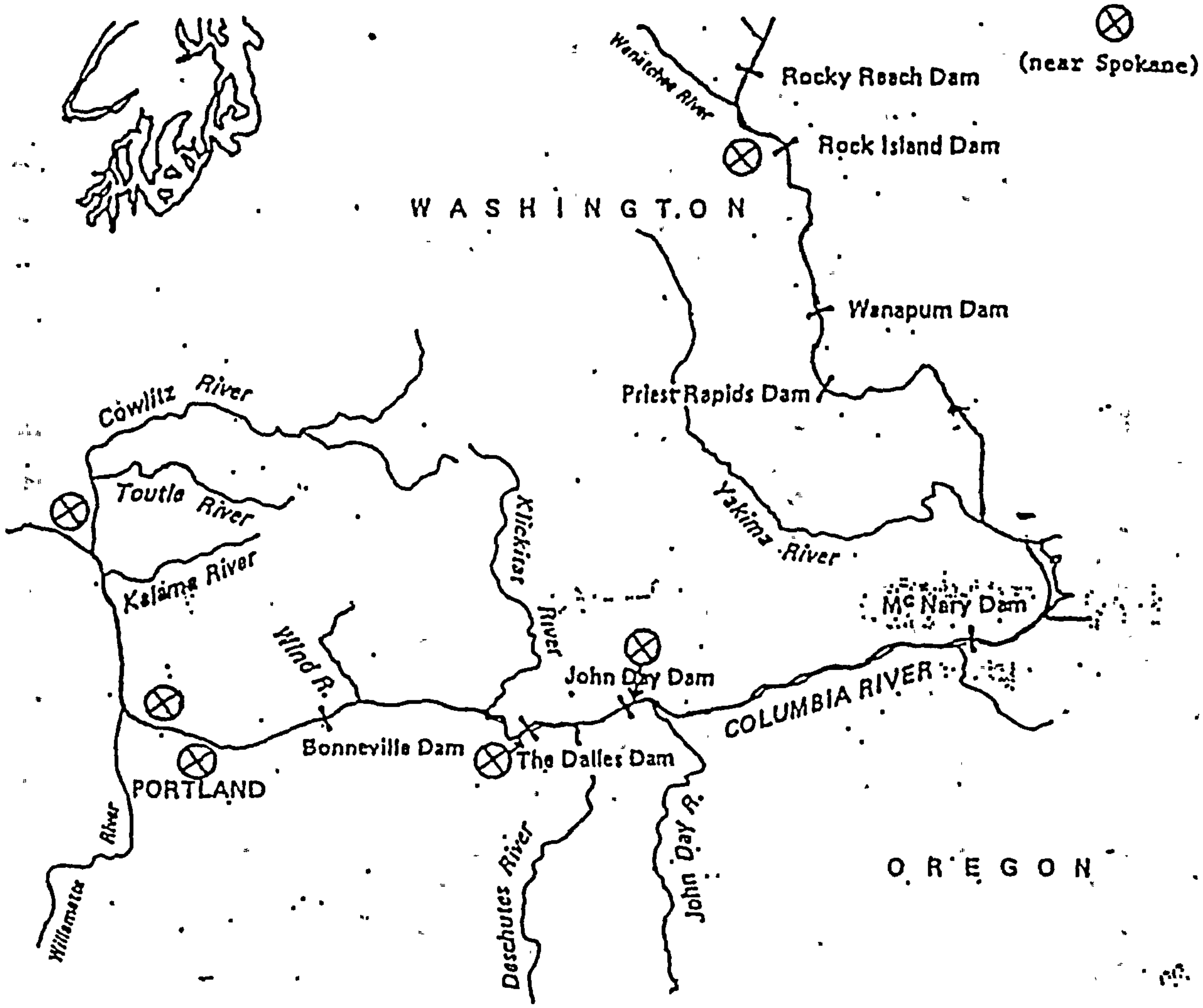

Figure 2.—Aluminum-production plants ⊗ on the Columbia River system.

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Washington, is between two nearby dams. The aluminum plant at The Dalles, Oregon, is just downstream from The Dalles Dam. Other aluminum plants, near Spokane, Vancouver, and Longview, Washington, and Troutdale, Oregon, are not adjacent to major dams. Undoubtedly the location of an aluminum plant's discharge, relative to an adjacent dam, would have important effects on the distribution of any pollutants in the water and in the sediments.

It is well known that sedimentation and siltation are occurring upstream from the major dams to such an extent that some dams in the Columbia River Basin will be non-functional in about 100 years unless the forebays (reservoirs) are dredged; obviously, these areas will be dredged. Because of the pollutant content, it is likely that this material would be resuspended on a large scale, and disposal on land would be required. The more that is known about the pollutants and their distributions in the Columbia River sediments, the more rationally will the problems be addressed.

In view of the likely critical situation of pollutant accumulation in the river sediments near aluminum plants, as described from the NMFS preliminary investigations at John Day Dam, it was proposed to examine other likely sites to document the nature and extent of these sedimented industrial pollutants. Our previous investigation centered on John Day Dam and particularly on fluorides. We related many organic pollutants to the aluminum-production process and have assumed that fluoride could be an index of this activity. Fluoride samples from the mouth of the Columbia River to Rocky Reach Dam (RM 474) (Fig. 2) showed relatively high fluoride concentrations adjacent to each aluminum plant. It is possible, therefore, that an assessment of river sediments would also show extraordinarily high concentrations of organic pollutants around these sites.

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A proposed sampling site was the main Columbia River near Wenatchee, Washington (RM 465). The Aluminum Company of America (ALCOA) primary aluminum smelter is located about 10 miles south of Wenatchee on the west bank of the Columbia River (Fig. 3). The plant is situated 1.8 miles upstream from Rock Island Dam and 19 miles below Rocky Reach Dam. Built in 1952 and capable of producing 625 tons of aluminum per day, the ALCOA plant has been in operation about 20 years longer than the Commonwealth Aluminum plant (production capacity: 500 tons per day) at John Day Dam. Over the past 33 years, the aluminum plant at Wenatchee has been discharging 10-15 million gallons of wastewater per day directly into the Columbia River (compared to 9 million gallons per day at the John Day facility). Because of the location of the ALCOA plant between the two dams, it was believed that organic pollutants, particularly aromatic hydrocarbons, would be in high concentrations in the river adjacent to the aluminum plant.

The specific objectives of this study were to: 1) collect sediments and general environmental data from the Columbia River near Wenatchee, John Day Dam, and other sites of active sedimentation or industry along the river and 2) document the nature and extent of sedimented industrial pollutants at these sites.

METHODS

The sampling plan for the Wenatchee area included collecting sediment samples at 11 stations within the Rock Island pool, as well as at 2 stations each above Rocky Reach Dam and below Rock Island Dam (Fig. 3). Even though there are two primary aluminum plants in the Columbia River Basin upstream from Wenatchee (one near Spokane, Washington, and one near Columbia Falls, Montana), by sampling above Rocky Reach Dam and above Rock Island Dam, we could separate the pollutant contribution of the Wenatchee plant. The samples

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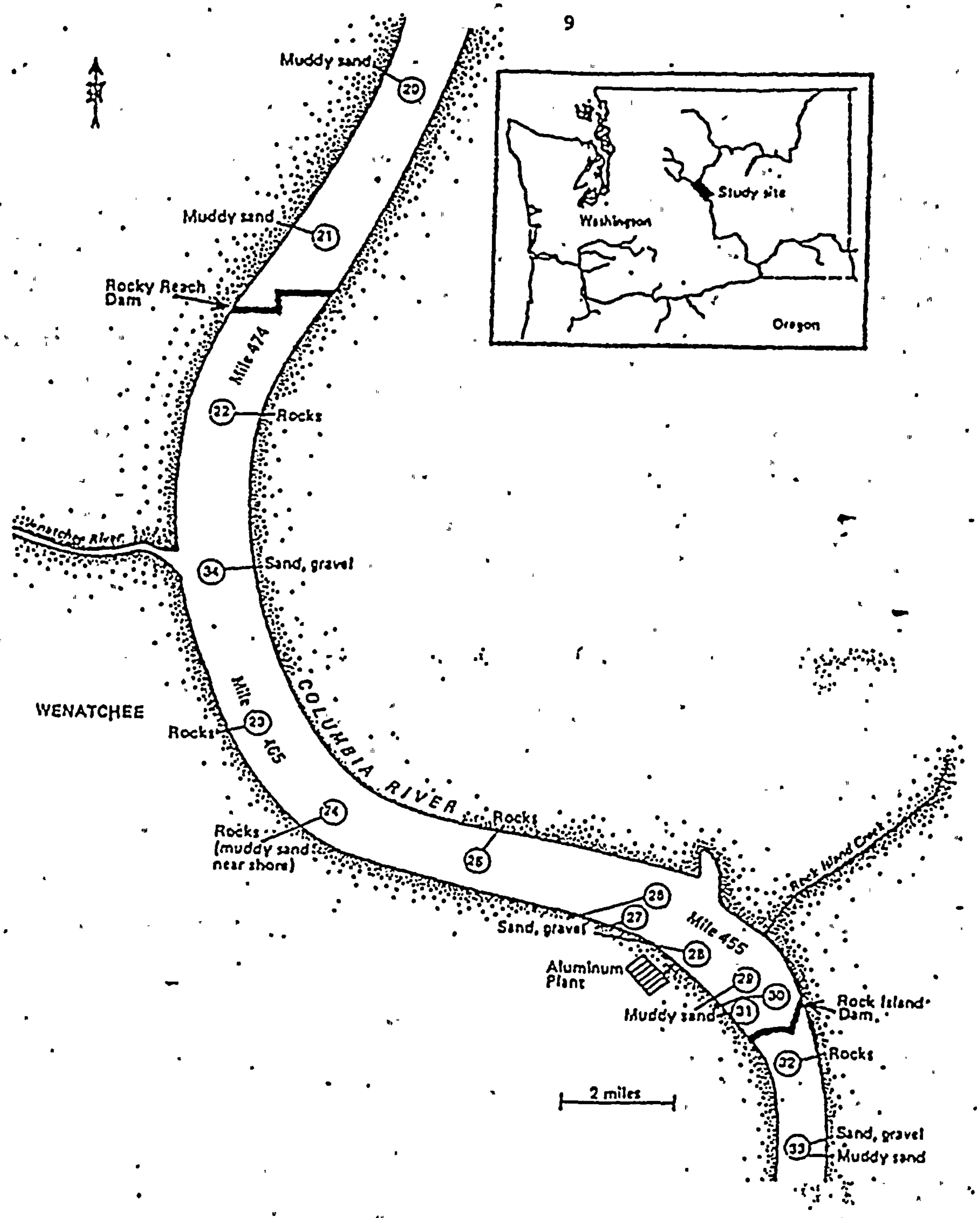

Figure 3.--Study area for industrially-polluted sediments near Wenatchee, Washington; Columbia River. Circled numbers indicate sampling sites.

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downstream from Rock Island Dam would give some indication of the distribution of these polluted sediments beyond the dam.

Hazardous currents, the generally rocky bottom found along this stretch of the Columbia River, and the necessity of sampling from a small vessel precluded the use of gravity-corers or heavy grab samplers. Sediment samples for organic analyses were collected using a 6-1/2-inch OD by 6-inch long cast-iron pipe dredge with a clean cloth bag clamped over one end. This sampler was dragged along the bottom of the river until sufficiently filled with sediment. Sediment was scooped from the dredge using a stainless steel spoon and placed in pre-rinsed (CH_2Cl_2) sample bottles. Samples were immediately frozen with dry ice, transported with dry ice, and stored at -18°C until analyzed. All organic chemical analyses were done by the National Analytical Facility, Northwest and Alaska Fisheries Center. Analytical methods and instrumentation for organic analyses are discussed in MacLeod et al. (1985).

Basic physical characteristics were measured at each station where conditions allowed using a Montedoro-Whitney Mark VA Water Quality Analyzer® 1/. This is a self-contained portable system for in situ measurements of depth and up to five factors as functions of depth [in this study: (1) temperature, (2) dissolved oxygen, (3) pH, and (4) conductivity]. Further information regarding specifications and capabilities of this instrument is in Damkaer (1983).

Water samples for fluoride and turbidity measurements were collected using Niskin® 1.2-liter closing water bottles constructed of teflon-lined PVC. Fluoride concentrations were determined with a HACH Company® fluoride

1/ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

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meter with an ion-selective electrode. Turbidity measurements were made immediately after sample collection with an HF Instruments portable turbidimeter (model DRT-15).

RESULTS AND CONCLUSIONS

Physical Characteristics

Dates, times, locations, depths of measurement, and corresponding physical characteristics of river water in the Wenatchee region for July 1986 are shown in Table 3. Because of the danger to the analytical probe posed by swift currents and the rocky bottom, environmental factors other than turbidity were not measured at some stations. Where measurements were made, however, only very small differences were detected vertically and horizontally in the well-mixed river water.

Fluoride

During a preliminary trip to the Wenatchee region in April, surface water samples were collected for fluoride analysis (Table 4). While the highest fluoride concentration was found near the aluminum plant outfall (Fig. 3, Station 28) the low, narrow range of concentrations measured throughout the study area did not suggest a particular problem with fluoride discharge to the river. Fluoride concentrations determined from July water samples were even lower and narrower in range (Table 5). In 1985, the Wenatchee aluminum plant converted air-emission control systems on three pot-rooms from wet to dry scrubbing; this eliminated a large water discharge from those systems. With this new equipment, the Wenatchee plant, while retaining a greater production capacity, is still able to comply with lower DOE discharge limitations than the aluminum plant near John Day Dam. Nevertheless, the fluoride

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Table 3.--General physical characteristics of river water near Wenatchee, Washington; Columbia River, July 23-24, 1986 (see Fig. 3 for station locations).

Columbia River near
Wenatchee, Washington
July 23-24, 1986
General Physical Characteristics

Station	Date 1985	Time (PST)	Total depth (m)	Sample depth (m)	Temperature °C	pH	Conductivity (mmhos)	Dissolved oxygen (ppm)	Turbidity (NTU)
20	23 Jul	0940	39.0	0	17.91	8.0	0.12	9.4	0.2
				5	17.71	7.9	0.12	9.3	–
				10	17.70	7.9	0.12	9.5	0.2
				15	17.70	7.9	0.12	9.4	–
				20	17.68	7.9	0.12	9.5	–
				25	17.71	8.0	0.12	9.8	0.2
21	23 Jul	1130	30.0	0	17.95	7.9	0.12	9.4	0.2
				5	17.91	7.8	0.12	9.5	–
				10	17.88	7.8	0.12	9.8	0.2
				15	17.74	7.8	0.12	9.7	–
				20	17.73	7.8	0.12	9.8	–
				25	17.91	7.9	0.12	9.8	0.2
22ᵃ	24 Jul	0740	6.0	0	–	–	–	–	0.2
23ᵃ	24 Jul	0820	15.0	0	–	–	–	–	0.2
24ᵃ	24 Jul	0700	13.0	0	–	–	–	–	0.1
25ᵃ	23 Jul	1803	8.0	0	–	–	–	–	0.3
26	23 Jul	1730	18.0	0	18.07	7.9	0.12	9.9	0.1
				5	18.10	8.0	0.12	9.8	–
				10	18.14	8.1	0.12	9.9	–
				15	18.27	8.1	0.12	9.9	0.1
27ᵃ	23 Jul	1700	18.0	0	–	–	–	–	0.1
				15	–	–	–	–	0.1
28	23 Jul	1315	12.0	0	18.06	8.0	0.12	9.8	0.15
				5	18.19	8.0	0.12	9.8	–
				10	18.38	8.0	0.12	10.0	0.15
29ᵃ	23 Jul	1630	22.0	0	–	–	–	–	0.2
				10	–	–	–	–	0.15
30ᵃ	23 Jul	1600	16.0	0	–	–	–	–	0.15
				14	–	–	–	–	0.15
31ᵃ	23 Jul	1550	9.5	0	–	–	–	–	0.2
				8	–	–	–	–	0.15
32ᵃ	24 Jul	1030	13.0	0	–	–	–	–	0.1
33	24 Jul	1100	15.0	10	18.01	7.9	0.12	9.6	0.3
				15	18.13	7.9	0.12	10.0	–
34	24 Jul	0800	3.0	0	–	–	–	–	0.2

ᵃ Extremely hazardous currents and/or rocky bottom.

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Table 4.—Fluoride concentrations of river water near Wenatchee, Washington; Columbia River, April 16, 1986 (see Fig. 3 for station locations).

Station	Columbia River near Wenatchee, Washington April 16, 1986 Fluoride (ppm) Surface (shore)
21	0.18
22	0.15
23	0.16
24	0.15
26	0.15
27	0.15
28	0.20
30	0.15
32	0.17
33	0.14
Columbia River upstream from confluence with Wenatchee River	0.18
Wenatchee River upstream from confluence with Columbia River	0.06

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Table 5.--Fluoride concentrations of river water near Wenatchee, Washington; Columbia River, July 23-24, 1986 (see Fig. 3 for station locations).

Station	Columbia River near Wenatchee, Washington July 23-24, 1986 Fluoride (ppm) Bottom	Mid-depth	Surface
20	0.10	0.10	0.10
21	0.09	0.10	0.10
22	–	–	0.10
23	–	–	0.09
24	–	–	0.10
25	–	–	0.10
26	0.10	–	0.10
27	0.10	–	0.10
28	0.10	–	0.10
29	0.10	–	0.10
30	0.10	–	0.08
31	0.10	–	0.10
32	–	–	0.10
33	–	–	0.10
34	–	–	0.03

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concentrations in the Columbia River near Wenatchee likely represent a measurable indication of the influence of industrial activity on river-water quality. For comparison, fluoride concentrations were considerably lower in the Wenatchee River in April (Table 4) and at the mouth of the Wenatchee River in July (Table 5, Station 34) than at the main Columbia River stations.

Organic Pollutants

Concentrations of aromatic and chlorinated compounds in the sediment samples collected in the Wenatchee area are shown in Tables 6 and 7. The sums of concentrations of aromatic analytes were noticeably elevated in sediments collected at Stations 29, 30, and 31 (just downriver from the aluminum-plant outfall; in the forebay of Rock Island Dam); and at Station 33 (below Rock Island Dam). Among the most concentrated compounds, fluoranthene, pyrene, benz[a]anthracene, chrysene, and benzo[e] and benzo[a]pyrene were lower in concentration here than in the highly polluted sediments collected near the aluminum-plant outfall above John Day Dam (Table 1, Station 10). However, phenanthrene and anthracene were found in comparable concentrations at the two study sites, and acenaphthene at Station 33 (Sediment #13) was considerably higher than at John Day Dam. As in the John Day Dam area, very few chlorinated hydrocarbons were present in measurable concentrations at the Wenatchee stations.

Despite the differences in concentrations of individual compounds at the two sites, the general similarity in the overall aromatic hydrocarbon profiles of the two areas implicates the aluminum plant at Wenatchee as an important source of these materials. The concentrations of aromatic hydrocarbons in sediments near Wenatchee appear to be somewhat lower than in sediments near the aluminum-plant at John Day Dam because of shallow water, strong currents,

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Table 6. ɔncentrations of aromatic compounds in sediment ‹ lected near Wenatchee, Washington; ꞏolumbia River, 23-24 July 1986 (see Figure 3 for ‥ation locations).

Concentrations of aromatic hydrocarbons in Columbia River sediment samples, ng/g (ppb) dry weight.[a,b,c]

station #		20		21		24		26		27		28		29
sediment #		1		2		11		8		7		3		6
sample #		61-1		61-2		61-10		61-8		61-7		61-3		61-6
naphthalene	<	7	<	14	<	7	<	8	<	9	<	8	<	13
2-methylnaphthalene	<	8	<	15	<	8	<	8	<	9	<	9	<	14
1-methylnaphthalene	<	8	<	14	<	8	<	8	<	9	<	9	<	13
biphenyl	<	7	<	13	<	7	<	7	<	9	<	8	<	12
2,6-dimethylnaphthalene	<	7	<	13	<	7	<	7	<	9		9		13
acenaphthene	<	8	<	14	<	8	<	8	<	10	<	9	<	13
fluorene	<	7	<	13	<	7	<	7	<	9	<	8		34
phenanthrene	<	7	<	13	<	7	<	7	<	8	<	8		150
anthracene	<	7	<	12	<	7	<	7	<	8	<	7		160
1-methylphenanthrene	<	7	<	12	<	7	<	7	<	8	<	7	<	11
fluoranthene	<	7		74		94	<	7	<	8	<	7		200
pyrene	<	7		49		22	<	7	<	9	<	8		160
benz[a]anthracene	<	9	<	16		9	<	8	<	9	<	10		110
chrysene	<	10	<	17		10	<	9	<	10	<	11		160
benzo[e]pyrene	<	11	<	19	<	10	<	10	<	12	<	12		72
benzo[a]pyrene	<	11	<	19	<	10	<	10	<	12	<	12		30
perylene	<	11	<	20	<	11	<	11	<	12	<	12		25
dibenz[a,h]anthracene	<	11	<	20	<	10	<	10	<	12	<	12	<	15
Sum of the concentrations of the above analytes		-		120		140		-		-		9		1200
% recovery of:														
naphthalene-d8		85		83		89		83		68		84		78
acenaphthene-d10		89		88		92		88		70		90		84
perylene-d12		73		76		89		89		75		75		93
sample weight, g		10.06		10.07		10.01		10.04		10.06		10.09		10.07
% dry weight		81.3		40.2		73.1		75.6		79.3		65.0		54.1

a The concentrations of analytes from napthalene through 1-methylnaphthalene were calculated using naphthalene-d8 as the internal standard; analytes from biphenyl through pyrene were calculated using acenaphthene-d10; analytes from benz[a]anthracene through dibenz[a,h]anthracene were calculated using perylene-d12.
b The "less than" symbol (<) indicates that the analyte was not detected in concentrations above the stated value.
c Concentrations and initial identifications were determined using flame ionization detection GC.

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Table 6.--cont.

Concentrations of aromatic hydrocarbons in Columbia River sediment samples, ng/g (ppb) dry weight.[a,b,c]

station #	30	31	33(sand)	33(mud)	34
sediment #	5	4	12	13	10
sample #	61-5	61-4	61-11	61-12	61-9
naphthalene	< 8	< 8	< 8	< 11	< 11
2-methylnaphthalene	< 8	< 8	< 8	22	< 12
1-methylnaphthalene	< 8	< 8	< 8	< 11	< 12
biphenyl	< 8	< 8	< 8	15	< 10
2,6-dimethylnaphthalene	< 8	< 8	< 8	< 10	< 10
acenaphthene	38	< 8	< 8	120	< 11
fluorene	< 8	< 7	< 7	< 10	< 10
phenanthrene	58	100	< 7	14	< 9
anthracene	9	13	< 7	< 9	< 9
1-methylphenanthrene	10	< 7	< 7	< 10	< 9
fluoranthene	120	180	< 7	350	< 9
pyrene	72	150	< 7	41	< 9
benz[a]anthracene	27	120	< 9	80	< 14
chrysene	61	260	< 10	37	< 15
benzo[e]pyrene	36	110	< 11	< 18	20
benzo[a]pyrene	45	130	< 11	< 18	97
perylene	29	30	< 12	< 19	60
dibenz[a,h]anthracene	< 11	19	< 11	< 17	< 17
Sum of the concentrations of the above analytes	510	1100	-	680	180
% recovery of:					
naphthalene-d8	96	81	84	82	57
acenaphthene-d10	95	86	90	90	67
perylene-d12	97	78	81	70	52
sample weight, g	10.03	10.05	10.08	10.02	10.05
% dry weight	65.5	72.5	69.8	55.5	78.7

a The concentrations of analytes from napthalene through 1-methylnaphthalene were calculated using naphthalene-d8 as the internal standard; analytes from biphenyl through pyrene were calculated using acenaphthene-d10; analytes from benz[a]anthracene through dibenz[a,h]anthracene were calculated using perylene-d12.

b The "less than" symbol (<) indicates that the analyte was not detected in concentrations above the stated value.

c Concentrations and initial identifications were determined using flame ionization detection GC.

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Table 6.-

Concentrations of aromatic hydrocarbons in blanks, ng/g (ppb) average dry weight, and percent recovery of analytes in spiked blank samples.[a,b,c]

sediment # / sample #	blank 61-14	spiked blank[d] 61-13
naphthalene	< 9	100
2-methylnaphthalene	< 9	100
1-methylnaphthalene	< 9	100
biphenyl	< 8	99
2,6-dimethylnaphthalene	< 8	100
acenaphthene	< 9	99
fluorene	< 8	100
phenanthrene	< 8	100
anthracene	< 8	100
1-methylphenanthrene	< 8	110
fluoranthene	< 8	110
pyrene	< 8	110
benz[a]anthracene	< 11	120
chrysene	< 12	120
benzo[e]pyrene	< 14	110
benzo[a]pyrene	< 14	110
perylene	< 15	100
dibenz[a,h]anthracene	< 13	110
Sum of the concentrations of the above analytes	-	-
% recovery of:	-	
naphthalene-d8	90	89
acenaphthene-d10	93	91
perylene-d12	76	82
sample weight, g	-	-
% dry weight	-	-

a The concentrations of analytes from napthalene through 1-methylnaphthalene were calculated using naphthalene-d8 as the internal standard; analytes from biphenyl through pyrene were calculated using acenaphthene-d10; analytes from benz[a]anthracene through dibenz[a,h]anthracene were calculated using perylene-d12.
b The "less than" symbol (<) indicates that the analyte was not detected in concentrations above the stated value.
c Concentrations and initial identifications were determined using flame ionization detection GC.
d Percent recovery of analyte standards added to a blank sample which was then prepared and analyzed as a sample.

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Table 7.—Concentrations of chlorinated compounds in sediment collected near Wenatchee, Washington; Columbia River, 23-24 July 1986 (see Figure 3 for station locations).

Concentrations of chlorinated analytes in Columbia River sediment samples, ng/g (ppb) dry weight. [a,b,c,d]

station #	29	30	31	33(mud)
sediment #	6	5	4	13
sample #	61-6	61-5	61-4	61-12
hexachlorobenzene	< 1	< 1	< 1	< 1
lindane (gamma-BHC)	< 1	< 1	< 1	< 1
heptachlor	< 1	< 1	< 1	< 1
aldrin	< 1	< 1	< 1	< 1
heptachlorepoxide	< 1	< 1	< 1	< 1
alpha-chlordane	< 1	< 1	< 1	< 1
trans-nonachlor	< 1	< 1	< 1	< 1
dieldrin	< 1	< 1	< 1	< 1
mirex	< 1	< 1	< 1	< 1
o,p'-DDE	< 1	< 1	< 1	< 1
p,p'-DDE	8	3	< 1	7
o,p'-DDD	4	< 1	< 1	2
p,p'-DDD	8	< 1	< 1	6
o,p'-DDT	< 1	< 1	< 1	< 1
p,p'-DDT	< 1	< 1	< 1	< 1
dichlorobiphenyls	< 1	< 1	< 1	< 1
trichlorobiphenyls	< 1	< 1	< 1	< 1
tetrachlorobiphenyls	< 1	< 1	< 1	< 1
pentachlorobiphenyls	< 1	< 1	< 1	< 1
hexachlorobiphenyls	< 1	< 1	< 1	< 1
heptachlorobiphenyls	< 1	< 1	< 1	< 1
octachlorobiphenyls	< 1	< 1	< 1	< 1
nonachlorobiphenyls	< 1	< 1	< 1	< 1
dichlorobutadienes	< 1	< 1	< 1	< 1
trichlorobutadienes	< 1	< 1	< 1	< 1
tetrachlorobutadienes	< 1	< 1	< 1	< 1
pentachlorobutadienes	< 1	< 1	< 1	< 1
hexachlorobutadienes	< 1	< 1	< 1	< 1
Sum of the concentrations of the above analytes	20	3		15
% recovery of: acenaphthene-d10	84	95	86	90
sample weight, g	10.07	10.03	10.05	10.02
% dry weight	54.1	65.5	72.5	55.5

a The concentrations of analytes were calculated using % recovery of acenaphthene-d10.
b The "less than" symbol (<) indicates that the analyte was not detected in concentrations above the stated value.
c Concentrations and initial identifications were determined using electron capture detection GC.
d These four samples were selected to calculate concentrations of chlorinated analytes because they had the highest concentrations of analytes of the twelve samples analyzed for aromatic hydrocarbons.

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Table 7.--cont.

Concentrations of chlorinated analytes in blank, ng/g (ppb) average dry weight.[a,b,c]

sediment # / sample #	blank 61-14
hexachlorobenzene	< 1
lindane (gamma-BHC)	< 1
heptachlor	< 1
aldrin	< 1
heptachlorepoxide	< 1
alpha-chlordane	< 1
trans-nonachlor	< 1
dieldrin	< 1
mirex	< 1
o,p'-DDE	< 1
p,p'-DDE	< 1
o,p'-DDD	< 1
p,p'-DDD	< 1
o,p'-DDT	< 1
p,p'-DDT	< 1
dichlorobiphenyls	< 1
trichlorobiphenyls	< 1
tetrachlorobiphenyls	< 1
pentachlorobiphenyls	< 1
hexachlorobiphenyls	< 1
heptachlorobiphenyls	< 1
octachlorobiphenyls	< 1
nonachlorobiphenyls	< 1
dichlorobutadienes	< 1
trichlorobutadienes	< 1
tetrachlorobutadienes	< 1
pentachlorobutadienes	< 1
hexachlorobutadienes	< 1
Sum of the concentrations of the above analytes	-
% recovery of:	
acenaphthene-d10	93
sample weight, g	-
% dry weight	-

a The concentrations of analytes were calculated using % recovery of acenaphthene-d10.
b The "less than" symbol (<) indicates that the analyte was not detected in concentrations above the stated value.
c Concentrations and initial identifications were determined using electron capture detection GC.

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and little sedimentation in the Wenatchee area. In contrast, the large reservoir of relatively slow-moving water behind John Day Dam encourages sedimentation. At the aluminum plant near John Day Dam, sediment collected right at the outfall contained high concentrations of organic material since the slower movement of water dispersed these materials much less effectively downriver. Of course, even though the river currents near Wenatchee are, apparently, reasonably effective in flushing discharged contaminants downriver, it is quite possible these materials have accumulated in significant concentrations at nearby locations. Elevated concentrations of organic compounds were found downriver from the outfall at Rock Island Dam where limited sedimentation is possible. However, the most likely sites of accumulation would include areas just upriver from the major dams. It is now believed that the bulk of pollutants from the upriver aluminum plants are probably sedimented in McNary Dam reservoir with lesser amounts in Wanapum and Priest Rapids reservoirs. Because these areas will inevitably be dredged, it is important that possible toxic organic "hot spots" within them be located.

Although analytical results are not yet available, we have recently completed the collection of sediments from the McNary Dam reservoir (RM 292) and at several other downstream sites adjacent to aluminum plants, including: (1) John Day Dam reservoir; (2) The Dalles, Oregon (RM 186); (3) Troutdale, Oregon (RM 120); (4) Vancouver, Washington (RM 102); and (5) Longview, Washington (RM 62). Analyses of these samples will increase our understanding of the nature, origin, and extent of industrial pollution in the Columbia River.

The motivation for continued and expanded investigations of industrial pollutants in the Columbia River system is the protection of the valuable salmonid resource and related habitat. The information from these studies

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could optimize the understanding of relationships between point-source pollution-discharge and dams, and contribute considerably to planned construction of new industrial/ hydroelectric complexes. State and federal Pacific Northwest fisheries and habitat management agencies would rapidly incorporate information from this research.

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FIGURES

Figure 1.—Study area for adult salmonid passage-delay program, John Day Dam region, Columbia River. Circled numbers indicate sampling sites (sampling sites on downstream side of The Dalles and Bonneville Dams not shown).

Figure 2.—Aluminum-production plants ⊗ on the Columbia River system.

Figure 3.—Study area for industrially-polluted sediments near Wenatchee, Washington; Columbia River. Circled numbers indicate sampling sites.

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TABLES

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BACT/MACT Protocol

Determination of BACT and MACT for the Proposed Aluminum Reduction Smelter Project Boardman, Oregon

Introduction

The purpose of this protocol is to provide EPA Prevention of Significant Deterioration (PSD) requirements for control technologies and emission limits for the proposed aluminum smelter in Boardman, Oregon. Based on preliminary emission estimates for carbon monoxide (CO), sulfur dioxide (SO_2), total fluorides (TF) and total suspended particulates (TSP), the company must determine Best Available Control Technology (BACT) for the proposed anode bake plant and potrooms. By the time the facility is in operation, the proposed Maximum Achievable Control Technology (MACT) requirements for primary aluminum reduction plants are expected to be finalized. Emissions from the proposed smelter must be evaluated against the MACT limits for TF and polycyclic organic matter (POM).

BACT Demonstration

BACT is demonstrated for each pollutant using EPA's top-down approach consisting of five major elements:

- Identification of all control strategies available for the pollutant and equipment under evaluation
- Elimination of those strategies determined to be technically infeasible
- Ranking of technically feasible options in descending order of control efficiency
- Evaluation of cost per ton of emissions controlled for each technically feasible option and identification of other impacts of each strategy (i.e., increases in other pollutants, increased energy consumption, other environmental impacts, etc.)
- Selection of BACT.

Once the list of technically feasible options is prepared, each option is evaluated for its range of impacts and cost -effectiveness. The control option providing the greatest control efficiency is selected unless eliminated on energy, environmental, or economic grounds.

At a minimum, BACT selection must meet the New Source Performance Standards (NSPS) for Primary Aluminum Reduction Plants in accordance with 40 CFR 60, Subpart S. This NSPS requires the following emission limits:

- Potroom TF emissions no greater than 1.9 pounds per ton (lb/ton) of aluminum produced

- Anode bake plant TF emissions no greater than 0.1 lb/ton of aluminum equivalent
- Opacity less than 10 percent for potrooms
- Opacity less than 20 percent for anode bake plants.

As stated in 40 CFR 60.192(2), "emissions between 1.9 and 2.5 lb/ton will be considered in compliance if the owner or operator demonstrates that exemplary operation and maintenance procedures were used with respect to the emission control system and that proper control equipment was operating during the performance test."

Primary aluminum production control strategies were identified based on a search of EPA's RACT/BACT/LAER clearinghouse (Clearinghouse), review of EPA's AP-42, Fifth Edition, Section 12.1 (AP-42), and discussions with Don Bradford, a consultant, regarding control technologies at similar plants. The BACT evaluation included identification of control strategies for prebake plants, such as the proposed aluminum smelter, and Soderberg plants that have similar emission sources.

BACT for CO

CO and carbon dioxide are formed from the reaction of aluminum oxide with carbon electrodes during electrolytic aluminum reduction. No CO control strategies for primary aluminum reduction plants were identified in EPA'' Clearinghouse or AP-42.

Primary aluminum reduction plants in The Dalles, Oregon (Northwest Aluminum), and Goldendale, Washington (Goldendale Aluminum) have afterburners that oxidize CO from the potrooms into carbon dioxide. The primary purpose of these afterburners is to burn hydrocarbons generated from the baking of the anodes. Both of these plants use the Soderberg process for aluminum reduction. The prebake process has a much higher exhaust flow rate than the Soderberg process (approximately one order of magnitude), and the concentration of CO is significantly less in prebake exhaust versus Soderberg exhaust. For these reasons, no existing prebake plants control CO from the potrooms. Thus, BACT for CO emissions from the potrooms is no control.

BACT for SO_2

The source of SO_2 in primary aluminum reduction operations is sulfur in the carbon materials making up the electrical anode. Almost all anodes in use are made from commercial grade calcined petroleum coke and distilled coal tar pitch. Both of these carbon materials contain sulfur. During the production of aluminum by electrolysis, any sulfur in the anode is burned and forms SO_2.

Most of the available anode cokes on the West Coast of the United States are derived from Alaskan North Slope crude, and the coke from these sources ranges from 2.5% to 3% sulfur content. The coal tar pitch, used as a binder with coke in anode manufacture, is distilled from the off-gases of steel industry metallurgical coke coking ovens. Because the coal tar pitch is a distilled product, it is generally low in sulfur at a nominal 1%. Available sources of coal tar pitch on the West Coast are primarily imports from Korea, Japan, and Germany or from the Great Lakes area of the U.S.

A review of the EPA Clearinghouse determinations for SO_2 from primary aluminum reduction plants identifies limits on coke and coal tar pitch sulfur content as control strategies for this pollutant. To comply with PSD BACT requirements, primary aluminum reduction plants in Warrick, Indiana (Aluminum Company of America), and Goose Creek, South Carolina (Alumax), limit the maximum sulfur content in anode pitch to 0.8% and 1.2%, respectively. The Alumax plant also limits the maximum sulfur content in anode coke to 2.95%.

EPA's AP-42 identifies sulfur content limits as well as wet scrubbing as control strategies for reducing sulfur dioxide emissions from primary aluminum reduction. A number of VSS-type Soderberg smelters, including the Northwest Aluminum smelter at The Dalles, Oregon, use wet scrubber systems to reduce SO_2 emissions. AP-42 states that concentrations of sulfur oxides from VSS-type Soderberg smelters range from 200 to 300 parts per million. Emissions from prebake plants usually have much lower SO_2 concentrations ranging from 20 50 30 parts per million. The primary gas collection system at The Dalles smelter is rated at approximately 165,000 SCFM. The company proposes a total extraction volume of 1,100,000 SCFM for the prebake smelter in Boardman, Oregon.

Due to the prohibitive size of SO_2 wet scrubbers that would be required to treat these waste gas volumes and the low SO_2 concentrations in the waste gas stream, SO_2 scrubbers are not economically feasible for the proposed smelter. In addition, a water treatment would be required to treat sulfates from a wet scrubber. The Dalles smelter has a large, complex water treatment facility to remove collected particulates, sulfates, and fluorides from the scrubber system. These collected materials require a large volume of water discharged via NPDES permit to the Columbia River. In the past five years, DEQ has not permitted waste water discharge to the Columbia River from new facilities such as the proposed aluminum smelter.

Based on a review of control strategies, BACT for SO_2 emissions from the proposed smelter are limits on maximum sulfur content in anode coke and pitch. Additional discussion regarding the technical and economic feasibility of SO_2 controls at prebake plants will be developed for the PSD application.

BACT for TF

The source of fluoride emissions during aluminum reduction is the fluoride electrolyte, which contains cryolite, aluminum fluoride, and fluorospar. TF emissions include both gaseous and particulate fluoride from the anode baking furnace and the prebake cells. The EPA Clearinghouse determinations for controlling TF emissions from primary aluminum reduction plants were reviewed to develop a list of control options. The EPA Clearinghouse lists three plants with TF control strategies for prebake potrooms: Aluminum Company of America in Warrick, Indiana, Alumax in Goose Creek, South Carolina, and Noranda Aluminum, Inc. in New Madrid, Missouri. All three plants use dry alumina scrubbers for TF control in compliance with PSD BACT requirements.

Additional TF control strategies were identified in AP-42 for anode baking furnaces and prebake cells. Strategies for anode baking furnaces are listed below in approximate descending order of control effectiveness with each option's approximate control efficiency indicated in parentheses:

1. Dry alumina scrubber (99 percent)
2. ESP (93 percent)
3. Spray tower (93 percent).

Strategies for prebake cells are listed below in approximate descending order of control effectiveness with each option's approximate control efficiency indicated in parenthesis:

1. Dry alumina scrubber (99 percent)
2. Dry plus secondary scrubber (98 percent)
3. Coated bag filter dry scrubber (91 percent)
4. Floating bed scrubber (90 percent)
5. Dry ESP plus spray tower (89 percent)
6. Spray tower (88 percent)
7. Crossflow packed bed (71 percent)
8. Multiple cyclones (35 percent).

Based on our review of TF control strategies, dry alumina scrubbers are BACT for TF emissions from anode baking furnaces and prebake cell potrooms. If necessary, additional discussion regarding the technical and economic feasibility of other TF control options will be developed for the PSD application.

BACT for TSP

For prebake aluminum reduction plants similar to the proposed smelter, TSP is emitted from paste production, anode baking furnaces, and aluminum reduction cell potrooms. Paste production emits TSP from crushing, grinding, and screening of coke, and blending with a pitch binder to make green anodes. During anode baking, TSP emits from the green anodes cracking. TSP emits from prebake cells into the potrooms during the electrolytic aluminum reduction process.

No TSP control strategies for primary aluminum reduction plants were identified in EPA's Clearinghouse. However, most of the TF control strategies listed in the Clearinghouse also reduce TSP emissions.

AP-42 was reviewed to develop a list of options for controlling TSP emissions from primary aluminum reduction plants. No control options were listed in AP-42 for TSP emissions from past production. The industry standard for TSP control from paste production is baghouse filters. Although cyclones are also in use at some prebake plants, cyclones are less effective for controlling TSP than baghouse filters.

TSP control strategies identified in AP-42 for anode baking furnaces are listed below in approximate descending order of control effectiveness with each option's approximate control efficiency indicated in parentheses:

1. Dry alumina scrubber (98 percent)
2. ESP (75 percent)
3. Spray tower (75 percent).

Strategies for prebake cells are listed below in approximate descending order of control effectiveness with each option's approximate control efficiency indicated in parentheses:

Strategies for prebake cells are listed below in approximate descending order of control effectiveness with each option's approximate control efficiency indicated in parentheses:

1. Dry plus secondary scrubber (99 percent)
2. Dry alumina scrubber (98 percent)
3. Coated bag filter dry scrubber (98 percent)
4. Dry ESP plus spray tower (95 percent)
5. Multiple cyclones (78 percent).
6. Crossflow packed bed (70 percent).

Based on our review of control strategies, baghouse filters are BACT for TSP emissions from paste production. Dry alumina scrubbers are BACT for TSP emissions from anode baking furnaces. Dry alumina scrubbers are also BACT for prebake potroom cells based on economic feasibility. Additional discussion regarding the economic feasibility of TSP control options will be developed for the PSD application.

MACT Standard

EPA has proposed national emissions standards (40 CFR 63, Subpart LL) for each new or existing potline, paste production operation, and anode bake furnace associated with a primary aluminum reduction plant. Under the proposed MACT standard, the following limits would apply to the proposed aluminum smelter:

- TF emissions from potlines not to exceed 1.2 lb/ton of aluminum produced
- POM emissions from potlines not to exceed 0.63 lb/ton of aluminum produced
- TF emissions from anode bake furnaces not to exceed 0.02 lb/ton of green anode
- POM emissions from anode bake furnaces not to exceed 0.05 lb/ton of green anode.

In addition to emission limits, the proposed MACT standard will require that the company install, operate, and maintain equipment for the capture and control of

POM emission from the paste production plant. Captured emissions must be rerouted through a closed system to a dry coke scrubber, or the company must submit a written request for use of an alternative control device with a POM reduction efficiency of at least 95 percent for continuous mixing or 90 percent for batch mixing.

Oregon Industrial Standards for Aluminum Plants

In accordance with OAR 340-25-265, the following aluminum plant emission standards for TF and TSP are required for the proposed smelter:

- Monthly average TF emissions not to exceed 1.3 lb/ton of aluminum produced
- Annual average TF emissions not to exceed 1.0 lb/ton of aluminum produced
- No greater than 12.5 tons of TF per month with prior written approval by the Oregon Department of Environmental Quality
- Monthly average TSP not to exceed 7.0 lb/ton of aluminum produced
- Annual average TSP not to exceed 5.0 lb/ton of aluminum produced
- Visible emissions not to exceed 10 percent opacity.

These emission standards are applicable 180 days after completing potroom startup.

Modeling Protocol

Modeling Analysis of the Proposed Aluminum Reduction Smelter Project Boardman, Oregon

Introduction

A private commercial aluminum company making a proposal to build an aluminum reduction smelter in Boardman, Oregon is a venture capitol firm specializing in the development of facilities involved with the aluminum industry. They operate an aluminum recycling company in Portland and have other facilities in the U.S. involved with downstream processing of aluminum products. They are currently building a new aluminum smelter in Iceland and are proposing to build a similar facility in the U.S.

Project Description

The commercial aluminum company has identified a location in Boardman, Oregon as a potential location for this new facility. The proposed facility will be a modem mini-mill utilizing efficiencies that should allow for aluminum production in a more cost effective manner than older, existing smelters. Permitting will be for 165,000 short tons per year of aluminum production, constructed in two phases. The initial phase will include the first 82,500 tons. The second phase to be included in the initial permit will add another 82,500 tons and an anode baking plant. Facility design and layout has not yet been completed and will be preliminary for the permitting phase of the project.

Table D2-1 shows the proposed annual emission rates for carbon monoxide (CO), sulfur dioxide (SO_2), total suspended particulate (TSP), and Hydrogen Fluoride (HF). All TSP will conservatively be assumed to be particulate matter less than 10 microns (PM_{10}). Emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are insignificant and not presented. Because the proposed facility has the potential to emit several criteria pollutants in amounts greater then the major source threshold as defined in federal Prevention of Significant Deterioration (PSD) regulations, it is defined as "major".

Also shown in Table D2-1 are the applicable significant emission rates (SERs). Potential emissions of CO, SO_2, particulate and fluoride are expected to be above state and federal significant emission rates. As such, a PSD review of these pollutants will be required.

Table D2-1. Estimated Annual Emission Rates (tons per year).

Pollutant	Emission Rate	Significant Emission Rate
Co	10,445	100
SO_2	4,058	40
TSP/PM_{10}	518	15
Fluorides	105	3
VOC	40+	

This modeling protocol summarizes the modeling methodology that will be used to evaluate the facility's air quality impacts for the proposed project. It has been prepared based on the Oregon Department of Environmental Quality ~EQ) requirements defined in "Requirements for Air Quality Modeling Submittals" (as revised January 1996), and the U.S. Environmental Protection Agency (EPA) *Guideline on Air Quality Modeling* (GAQM).

Source Description

Stack Parameters and Emissions

Subject Source

The major pollutant sources at the proposed facility include four potrooms, a paste plant, and an anode baking plant.

In the potrooms, the commercial aluminum company proposes to install two primary dry alumina scrubber systems for collection of gaseous and particulate emissions. Potroom emissions that escape the scrubber systems are emitted through roof vents.

For modeling, a series of point sources will be used to represent the roof vents. Two sources will be located along the roof line at the end of each potroom for a total of sixteen sources. Roof vent parameters were estimated using.

Sources of pollutants in the anode baking plant include the carbon bake furnaces and the fume treatment stack on the carbon bake furnaces.

Parameters have not yet been developed for the carbon bake furnace and paste plant. Available stack parameters are given in Table D2-2.

Table D2-2. Modeling Parameters.

Source	Modeling ID	Stack height (meters)	Diameter (meters)	Velocity (meters per second)	Temperature °K
Potline Scrubber 1	SSTACK	30.48	4.72	19.4	383
Potline Scrubber 2	NSTACK	30.48	4.72	19.4	383
Carbon Bake Scrubber	BAKE	30.48	2.16	20.5	358
Roof Vent 1	PL3	16.94	2.50	2.0	308
Roof Vent 2	PL4	16.94	2.50	2.0	308
Roof Vent 3	PL5	16.94	2.50	2.0	308
Roof Vent 4	PL6	16.94	2.50	2.0	308
Roof Vent 5	PL7	16.94	2.50	2.0	308
Roof Vent 6	PL8	16.94	2.50	2.0	308
Roof Vent 7	PL9	16.94	2.50	2.0	308
Roof Vent8	PL10	16.94	2.50	2.0	308
Roof Vent 9	PL11	16.94	2.50	2.0	308
Roof Vent 10	PL12	16.94	2.50	2.0	308
Roof Vent 11	PL13	16.94	2.50	2.0	308
Roof Vent 12	PL14	16.94	2.50	2.0	308
Roof Vent 13	PL15	16.94	2.50	2.0	308
Roof Vent 14	PL16	16.94	2.50	2.0	308
Roof Vent 15	PL17	16.94	2.50	2.0	308
Roof Vent 16	PL18	16.94	2.50	2.0	308

Emissions

Inherent in the activated alumina dry scrubber system are high efficiency bag filters for particulate collection. In this type of scrubber, collected fluorides and particulate are returned to the reduction cells and re-absorbed in the salt bath or in the metal product. Gases that are not reabsorbed are primarily water vapor, carbon dioxide, CO and 802. Trace combustible hydrocarbon gases are collected by the alumina and returned to the cell, where they are oxidized at the high cell temperatures and destroyed.

Emission rates of regulated pollutants are presented in Table D2-3.

Table D2-3. Per Emission Unit g/s emission rate (Number of units in parenthesis).

Compound	Potroom stack (2)	Roof Vents (16)	Paste plant (1)	Baking (1)	Furnaces (1)
CO	143.32	0.46	0.00	6.18	0.57
SO_2	55.28	0.18	0.00	3.47	0.00
TSP/PM_{10}	2.61	0.56	0.38	0.38	0.01
HF	0.23	0.15	0.00	0.19	0.00

The final modeling analysis report will provide a map of the project vicinity, a scaled plot plan showing the Universal Transverse Mercator (UTM) coordinates, emission release locations, nearby buildings (including dimensions), property lines, fence lines, and roads. Cross-section diagrams showing the heights of each stack and nearby buildings will be attached to the final report.

U.S. Geological Survey (USGS) 7.5-minute topographic maps will be provided with the final modeling analysis report. This map will show the proposed site and all maximum impact locations predicted as a result of the modeling analysis.

Nearby Sources

If the pollutant-specific Significant Impact Level (SIL) is exceeded; additional modeling will be done to include nearby sources for comparison with the Ambient Air Quality Standards (AAQS) and PSD increments. The modeling analysis will include nearby sources whose area of significant impact overlap with the proposed smelter's area of significant impact. Requests were made to Oregon DEQ and Washington Department of Ecology for all nearby sources by county. Data has not yet been received from Ecology. Preliminary data from DEQ is included as Attachment A at the end of this protocol. This data has not been compiled into a modeling format, nor has its contents been reviewed. Some of these sources will be excluded because of their distance from the facility, their low emission rates, or both. Specific criteria for inclusion are as follows:

- All permitted sources within five kilometers (km) with permitted emissions of at least one ton per year (tpy)
- All permitted sources between five and fifteen km with permitted emissions greater than the DEQ pollutant-specific significant emission rate
- All permitted sources located between fifteen and fifty km with permitted emissions greater than 100 tpy.

Short-term emission rates for sources for which operating hours are available will be factored accordingly.

The final modeling report will summarize emission rates and stack parameters for the nearby sources.

Building Wake Down wash Parameters

Buildings influence the downwind concentrations by lowering the plume heights in the building wake region and enhancing the turbulent dispersion in both the wake and the reattachment regions of the buildings.

To calculate the effects and compute direction-specific building-downwash parameters, the most recent version of the EPA BPIP program will be used. All buildings have either flat roofs or roofs with a low pitch; therefore, the buildings will be modeled as simple blocks, not as multiple tiers. Buildings with low-pitched roofs will be modeled using the highest point of the roof as the building height. The final report will include a floppy diskette containing the BPIP program input and output files.

The potline buildings and two ore silos will be evaluated to determine their downwash influence. The potline structure consists of four separate potlines. Because of their proximity, they were conservatively combined in the downwash evaluation into one large building. Tables D2-4 and D2-5 summarize the dimensions of these structures. The commercial aluminum company provided the building dimensions to be used in the analysis.

Table D2-4. Dimensions of Nearby Buildings.

ID	Structure description	Length (m)	Width (m)	Height (m)
Potline	Combined potline	521	175	16.9
Baking	Carbon bake furnace	119	63	16.9

Table D2-5. Dimensions of Ore Silos.

ID	Structure description	Diameter (m)	Height (m)
Stank	South Ore Silo	36.3	5.5
Ntank	North Ore Silo	36.3	5.5

Model Selection

The short-term model, ISCST3, of the Industrial Source Complex (ISC) Dispersion Models, will be used in the air quality modeling analysis to evaluate pollutant concentrations. ISCST3 incorporates the COMPLEX1 model algorithms for use in evaluating concentrations in complex and intermediate terrain. ISCS13 has been approved and successfully used for similar modeling applications.

ISCST3, Version 97.33 is a Gaussian dispersion model that models dispersion over simple terrain (terrain elevations less than the lowest stack height), and complex terrain (terrain elevations above the lowest stack height). ISCST3 also calculates concentrations over intermediate terrain (terrain elevations lower than the final plume rise height but higher than the stack height).

Although it was specifically developed to simulate the transport and diffusion of emissions from aluminum reduction plants, the Buoyant Line and Point Source (13I1P) model was not selected for several reasons. BLP has not been updated since 1990 and may not be up-to-date. ISCST3 is better able to take into account the downwash requirements. It is a simpler model to execute, and many of the nearby sources have already been modeled in the ISCST3 format. Unlike ISCST3, BLP cannot be used for complex terrain, so an additional model would be needed to evaluate impacts in complex terrain. Use of ISCST3 will yield more conservative results, because unlike BLP it does not take into account the effects of plume merging.

Modeling Options and Assumptions

ISCST3 will be run with the following options, as recommended in the GAQM:

- Regulatory default options
- 10-meter anemometer height
- Calm processing routine
- Direction-specific building downwash
- Actual receptor elevations
- Complex/intermediate terrain algorithms.

ISCST3 will be run using 1 year of actual meteorological data described in the section titled "Meteorology."

ISCST3 allows the selection of either rural or urban dispersion coefficients. Rural dispersion coefficients will be selected based on the methodology described in the section titled "Urban vs. Rural Dispersion."

Nearby sources that have similar stack parameters will be modeled as a single stack following the guidelines described in Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA, 1992a). All sources will be simulated as point or area sources.

Receptors

The air quality impacts from the sources at the proposed aluminum smelter facility will be evaluated using both boundary and grid receptors. The boundary receptors will be placed at 50-meter intervals along the entire property boundary and public access areas (such as roads) that intersect the boundary. The grid receptors will be placed on a 10-kilometer by 10-kilometer Cartesian coordinate receptor grid centered on the facility.

The modeling analysis will be performed in two stages: (1) a coarse grid analysis, which will include the boundary receptors and the grid receptors spaced at 500-meter intervals (to locate areas of concern), and (2) a refined grid analysis, which will include grid receptors spaced at 100-meter intervals on a 1-kilometer by 1-kilometer region encompassing the coarse-grid maximum impact receptor (to find the point of maximum ground-level impact).

For the AAQS and PSD analyses, only receptors identified as "significant" in the aluminum smelter- only coarse-grid analyses will be included in the modeling. ("Significant" receptors are those with maximum modeled impacts exceeding the SIL for the given pollutant.)

One-degree Digital Elevation Modeling (DEM) maps for the area will be used to estimate the terrain elevation for each receptor for the coarse grid modeling. If available, 7.5 minute DEM data will be used to estimate terrain elevations for the fine grid modeling. Otherwise, receptor elevations will be manually obtained from 7.5 minute U.S.G.S. maps.

Concentrations from all sources will be evaluated at ground level (that is, no "flagpole" receptors).

Urban vs. Rural Dispersion

Auer's land-use classification (1978) was used to determine the dispersion mode for this analysis. Because more than 50 percent of the land use within the modeling area around the facility is rural, the model will be run using the rural dispersion coefficients for both flat and intermediate terrain.

Meteorology

The air quality dispersion modeling will be conducted using actual meteorological data collected near the proposed aluminum smelter facility location. Portland General Electric (PGE) collected these data from August 6, 1994, through August 5, 1995. Along with meteorological monitoring, ambient air quality monitoring was also performed; including particulate (TSP and PM_{10}), CO, and SO_2. A monitoring plan defining the procedures used in operating the monitoring program was submitted to DEQ on June 23, 1994, and approved on March 16, 1995.

Meteorological measurements were taken on a 64-meter tower (210 feet), approximately 2 miles west-northwest of the proposed aluminum smelter facility. The monitoring site is located approximately 900 feet south of the Columbia River at an elevation of approximately 270 feet. The area is in relatively flat terrain, sloping gently upward to the south. An examination of the area and terrain indicates that the data collected for Coyote Springs would be representative of conditions at the proposed aluminum smelter.

Table D2-6 identifies the meteorological parameters monitored, the critical parameters to be used in the modeling analysis, and the annual data recovery for the critical parameters. The solar radiation/delta temperature (SRDT) method was used to determine the stability class in this analysis.

Table D2-6. Monitored Meteorological Values.

Instrument Level	Meteorological Monitoring Parameter
2-meter	Temperature, 2- to 10-meter delta temperature (99.5)*
10-meter	Temperature (99.5),* wind direction, wind speed, * sigma theta
64-meter	Temperature, wind direction (99.4), wind speed (99.4) sigma theta
Trailer roof	Solar radiation (99.8)*

*Critical parameters to be used in modeling analysis.
Symbol: ()= annual data recovery in percent

An annual summary of the monitoring program was submitted by the monitoring contractor (Dames & Moore) to DEQ on January 16, 1996. This report identified the data recovery that is shown above for the critical parameters. The majority of missing data were related to maintenance and calibration activities or power failures. These missing periods typically involved all parameters; therefore, substitution of other monitoring parameters for data fill was not possible.

A modeling analysis completed in 1996 for POE used data collected at the 64-meter level from this site. Because of the low level sources at the proposed aluminum smelter facility, this analysis will use the data collected at the 10-meter level. For both data sets, forty-eight hours of data were missing for the critical parameters needed for analysis. This corresponds to a capture rate of 99.5 percent Table D2-7 shows the missing data periods. Five hours of data were interpolated from valid data by the methods described in Procedures for Substituting Missing NWS Meteorological Data for Use in Regulatory Air Quality Models, by Dennis Atkinson and Russell F. Lee (July 1992). Shaded hours in Table D2-7 are hours filled by linear interpolation.

TABLE 7

Missing Meteorological Data

Year	Month	Day	Hour	Solar Radiation	2-10 meter Delta Temp	2 meter Temp	10 meter Temp	64 meter Temp	10 meter wind speed	64 meter wind speed	10 meter wind dir	64 meter wind dir	10 meter Sigma Theta	64 meter Sigma Theta
94	8	29	13	1.17	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	8	29	14	1.08	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	8	29	15	0.93	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	8	29	16	0.71	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	8	29	17	0.42	-0.37	27.3	26.9	26.2	999.7	999.7	9997	9997	999.7	999.7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
94	11	17	11	0.11	-0.01	2.7	2.7	2.2	999.7	999.7	9997	9997	999.7	999.7
94	11	17	12	0.23	-0.18	3.4	3.2	2.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	13	0.41	-0.29	4.5	4.2	3.6	999.7	999.7	9997	9997	999.7	999.7
94	11	17	14	0.33	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	15	0.24	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	16	0.05	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	17	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	18	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
94	11	17	19	0.04	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
95	2	9	10	0.25	-0.2	-0.5	-0.7	-0.7	999.7	999.7	9997	9997	999.7	999.7
95	2	9	11	0.47	-0.35	0.8	0.5	0.4	999.7	999.7	9997	9997	999.7	999.7
95	2	9	12	0.66	-0.48	2.2	1.7	1.6	999.7	999.7	9997	9997	999.7	999.7
95	2	9	13	0.69	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	9	14	0.61	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	9	15	0.48	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	9	16	0.29	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	9	17	0.09	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	22	14	0.64	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7

TABLE 7

Missing Meteorological Data

Year	Month	Day	Hour	Solar Radiation	2-10 meter Delta Temp	2 meter Temp	10 meter Temp	64 meter Temp	10 meter wind speed	64 meter wind speed	10 meter wind dir	64 meter wind dir	10 meter Sigma Theta	64 meter Sigma Theta
95	2	22	15	0.55	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	22	16	0.36	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	22	17	0.13	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	22	18	0.02	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	2	22	19	0	-2.59	8.4	11	13.1	999.7	999.7	9997	9997	999.7	999.7
95	2	22	20	0	2.34	6.7	9	12.4	999.7	999.7	9997	9997	999.7	999.7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
95	5	12	21	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	5	12	22	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	5	12	23	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	5	12	24	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	5	13	1	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	5	13	2	99.99	99.99	999.9	999.9	999.9	999.9	999.9	9999	9999	999.9	999.9
95	6	15	10	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	6	15	11	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	6	15	12	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	6	15	13	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	6	15	14	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7
95	6	15	15	99.97	99.97	999.7	999.7	999.7	999.7	999.7	9997	9997	999.7	999.7

For the PGE analysis, a series of data fill operations was performed to fill the remaining 43 hours of missing data, in response to a request by DEQ. Thirty-four of these hours required a substitution of stability class data. The substitution involved the Turner 1964 method described in On-site Meteorological Program Guidance for Regulatory Modeling Applications, Section 4.4.1 (EPA-450/4-87-013, June 1987, revised August 1995). Pendleton, Oregon, airport surface observation data (including cloud cover and ceiling height) were used in this stability calculation method, and provided and approved by DEQ staff. The Pendleton data were also used to fill other missing data.

Missing mixing heights were filled by use of Spokane, Washington, seasonal average mixing heights from Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, by George Holzworth (January 1972). The missing hours and the fill values are identified in Table D2-8.

Table D2-8. Filled Mixing Height Values.

Day	Morning Height (m)*	Afternoon Height (m)*
January 1	NA	523
April 23	401	1943
June 21	40	1943
June 22	401	1943
December 9	266	NA
December 13	266	1362
December 23	266	1362
December 28	NA	1362

* "NA" indicates no fill was necessary.

Table D2-9 identifies the final data values used to fill the 43 hours of missing data.

Table D2-9. Final Filled Meteorological Data.

Year	Month	Day	Hour	Ambient temp (°F)	Wind direction (degrees)	Wind flow vector (degrees)	Wind speed (mph)	Stability class (number)
94	8	29	13	75	270	90	10.4	3
94	8	29	14	77	280	100	10.4	3
94	8	29	15	77	280	100	11.5	3
94	8	29	16	78	270	90	11.5	4
94	8	29	17	77	290	110	11.5	NA
94	11	17	11	33	320	140	5.8	NA
94	11	17	12	34	310	130	4.6	NA
94	11	17	13	34	330	150	8.1	NA
94	11	17	14	33	317	137	7.6	4
94	11	17	15	33	304	124	7.2	4
94	11	17	16	32	290	110	6.9	5
94	11	17	17	32	300	120	5.8	5
94	11	17	18	33	310	130	5.9	5
94	11	17	19	33	310	130	5.9	4
95	2	9	10	40	140	320	6.9	NA
95	2	9	11	45	150	330	6.9	NA
95	2	9	12	49	140	320	5.8	NA
95	2	9	13	53	360	180	4.0	3
95	2	9	14	44	260	80	8.1	3
95	2	9	15	55	260	80	92	3
95	2	9	16	53	310	130	5.6	4
95	2	9	17	49	350	150	3.5	5
95	2	22	14	57	350	170	5.8	3
95	2	22	15	59	300	120	4.6	3
95	2	22	16	58	330	150	4.6	3

Year	Month	Day	Hour	Ambient temp (°F)	Wind direction (degrees)	Wind flow vector (degrees)	Wind speed (mph)	Stability class (number)
95	2	22	17	56	0	180	0	4
95	2	22	18	53	350	170	3.5	5
95	2	22	19	51	350	180	0	NA
95	2	22	20	49	180	320	6.9	NA
95	3	4	11	48	250	70	16.1	3
95	3	4	12	49	260	80	18.4	4
95	5	12	21	48	170	350	5.8	5
95	5	12	22	45	100	280	5.8	5
95	5	12	23	44	90	270	5.4	5
95	5	12	24	45	80	260	5.0	5
95	5	13	1	45	70	250	4.6	5
95	5	13	2	46	143	323	5.8	4
95	6	15	10	62	310	130	9.2	4
95	6	15	11	65	290	110	9.2	3
95	6	15	12	64	260	80	11.5	3
95	6	15	13	64	290	110	6.9	3
95	6	15	14	62	270	90	15.0	4
95	6	15	15	63	290	110	10.4	4

Total data fill hours = 43 (with 34 hours of stability class data fill).
NA=stability class parameters were available for those hours and data fill was not necessary.

Figure 1 is an annual wind rose for the meteorological data to be used in the modeling analysis. This wind rose identifies the general flow patterns in the project area. The percentage of calms is 4.8 percent (417 hours), based on all wind data recorded below 1 meter per second.

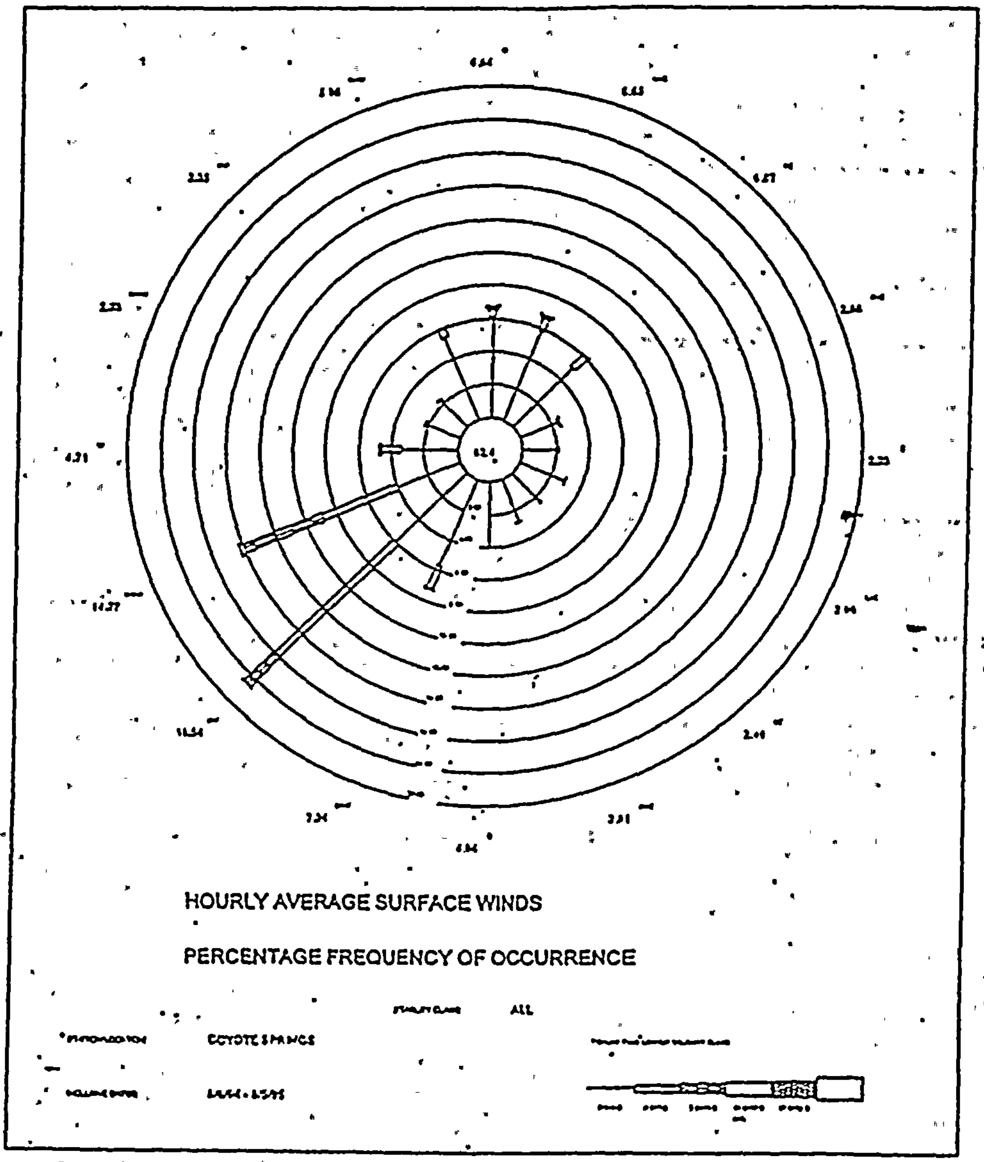
HOURLY AVERAGE SURFACE WINDS
PERCENTAGE FREQUENCY OF OCCURRENCE
ALL
COYOTE SPRINGS

Figure 1

Background Pollutant Concentrations

The PSD regulations require the use of background ambient air quality data for comparison against AAQS. Ambient air quality was monitored near Coyote Springs by PGE from August 6, 1994, to August 5, 1995. This monitoring included the collection of 24-hour average particulate data (TSP and PM_{10}), CO, and SO_2. These data will be used as background values in the AAQS modeling. A comprehensive monitoring plan that included operations of the meteorological station and the particulate monitoring station was submitted to DEQ on June 23, 1994, and approved on March 16, 1995.

Particulate

The particulate monitoring was performed with a continuous PM_{10} monitor (Beta Gauge) and a manual high-volume sampler for TSP. For both parameters, collocated manual samplers were included in the monitoring program. At the conclusion of the program, the annual data recoveries were 97 percent for TSP and 100 percent for PM_{10}. In total, 11 days of TSP background data were missing, as shown Table D2-10, and no PM_{10} background data were missing. No adjustments or replacements were made for the missing TSP data.

Table D2-10. Dates of Missing TSP Data.

September 6, 1994	May 26, 1995
September 7, 1994	June 3, 1995
March 4, 1995	June 7, 1995
May 12, 1995	August 2, 1995
May 13, 1995	August 5, 1995
May 22, 1995	

During the particulate monitoring, two exceedances of the Oregon TSP AAQS of 150 $\mu g/m^3$ were identified. These exceedances were 195 $\mu g/m^3$, measured on September 21, 1994, and 169 $\mu g/m^3$, measured on October 11, 1994. After further investigation, it was noted that one of these exceedances and two other 24-hour particulate measurements in October might have been affected by temporary truck hauling and agricultural operations near the monitor. Therefore, PGE asked for and received approval from DEQ on December 21, 1995, to discount three measurements, which are shown in Table D2-11.

Table D2-11. Discounted Monitoring Values.

Date	Actual measurement ($\mu g/m^3$)	Resultant discounted value ($\mu g/m^3$)
October 5, 1994	133	103
October 6, 1994	140	88
October 11, 1994	169	114

Sulfur Dioxide

Ambient concentrations of SO_2 were recorded on a continuous basis at the PGE monitoring site. This data had a data recovery rate of 93.2 percent.

Carbon Monoxide

No onsite ambient monitoring data is available to serve as a background for the CO AAQS modeling. Ambient CO concentrations in rural areas away from large man-made sources are generally very low (< 1.0 parts per million [ppm]). Studies have placed typical clean CO backgrounds at 70 to 80 parts per billion (ppb) (Seifer, et al., as referenced by Parish et al., 1991). The proposed aluminum smelter facility is well away from any large city, and over a mile from Interstate 84. Given these factors, for the NAAQS analysis, a conservative CO background of 2.0 ppm (2,240 $\mu g/m^3$) will be used as background for both the 1-hour and 8-hour averaging times. (Ashgrove Cement PSD Application, 1996).

PSD regulations allow an exemption from pre-construction monitoring if CO concentrations in the area that the source would impact are less than the significant monitoring concentrations. Based on modeling completed for PGE Coyote Springs in 1993 (Air Contaminant Discharge Permit Application for the Coyote Springs Cogeneration Project, Chester Environmental, September 12, 1993), the highest 8-hour modeled concentrations from Coyote Springs, the largest nearby source, were predicted to be 32 $\mu g/m^3$. (As mentioned above, the proposed aluminum smelter facility is well away from any large city, and over a mile from Interstate 84.) Because the modeled Coyote Springs impact is significantly less than the CO 8-hour significant monitoring concentration of 575 $\mu g/m^3$, it is anticipated that impacts from all existing sources will be less than the significant monitoring concentration and therefore pre-construction monitoring will not be required.

Hydrogen Fluoride

No other sources of HF exist in the area, therefore the HF background value is expected to be zero. As such, it is anticipated that impacts from all existing sources will be less than the HF 24-hour significant monitoring concentration of 0.25 $\mu g/m^3$ and therefore preconstruction monitoring will not be required.

Background values are summarized in Table D2-12.

Table D2-12. Background Pollutant Concentrations.

Pollutant	Averaging period	Background concentration ($\mu g/m^3$)	Source
TSP	Annual 24-hour*	25 131	Dames & Moore "Ambient Air quality and Meteorology Annual Data Summary Report 8/6/94-8/5/95 for PGE
PM_{10}	Annual 24-hour*	20 81	(same)
SO_2	Annual 24-hour 3-hour	3 26 55	(same)
CO	8-hour 1-hour	2 ppm 3 ppm	DEQ

* Highest second high.

Ambient Air Quality Standard Evaluation

Concentrations of CO, SO_2, and TSP/PM_{10} will be compared with the appropriate SH.z (evaluation of HF is discussed below). The Oregon SILs will be used for receptors in Oregon, and the Washington SILs will be used for receptors in Washington. For those pollutants with modeled concentrations greater than the SILs, an additional analysis identified maximum concentrations, which include contributions from nearby sources and background pollutant concentrations, for comparison with the AAQS.

Because HF is emitted in a quantity greater than the federal SER, modeling of HF emissions will be completed. Oregon has no specific program for evaluation of hazardous air pollutants (HAPs). Dispersion modeling results will be presented in the application.

PSD Increment Analysis

For the modeled impacts greater than the SIL, an additional analysis will be performed to determine the PSD increment consumption. The Oregon SILs will be used for receptors in Oregon, and the Washington SILs will be used for receptors in Washington. The analysis will include contributions from other major increment-consuming sources for comparison with the available PSD increment. These sources will be determined by consulting with DEQ and DOE and its local agency representatives.

From the PGE Coyote Springs analysis the following are known to be baseline sources and will not be modeled in the increment consumption analysis:

- Pendleton Grain Growers, Umatilla and Hermiston, Oregon
- J.R. Simplot Feedlot, Wallula, Washington

- Lamb Weston, Hermiston, Oregon.

Additional baseline sources will likely be identified in the final modeling analysis.

Air Quality Related Values

The EPA's PSD guidelines require an analysis of impacts on air-quality-related values (AQRVs) in Class I areas and an analysis of vegetation, soil, and visibility impacts in Class II areas (18 AAC 50.310 [d][4]). This section presents the proposed approach for analyzing additional Class I area and Class II area impacts resulting from the proposed aluminum smelter near Boardman, Oregon.

Class I Area Analysis

Under the current PSD guidelines, applicants for a permit must demonstrate that the PSD source will not cause or contribute to adverse impacts on AORVs in any Class I area. The following sections describe the pollutants, Class I areas, and AORVs to be evaluated, as well as the specific analysis procedures, inputs, and assumptions that will be employed.

Pollutants to be Evaluated

The proposed aluminum smelter is expected to emit approximately 105 tons of fluorides per year (primarily as HF), 518 tons of particulate matter per year (primarily as PM_{10}), 4,058 tons of SO_2 per year, 10,445 tons of CO per year, and 149 tons of carbon dioxide (CO_2) per year. The proposed smelter will produce zero emissions of NO_x.

The AQRV impact assessment will include an evaluation of HF, PM_{10}, and SO_2 impacts only. CO_2 will not be evaluated because it is currently not a PSD-regulated pollutant. CO will also not be evaluated because it is chemically inert and has no direct visibility' impairing effects. Moreover, CO is not toxic to vegetation at the concentrations typically encountered in even highly polluted atmospheres. The human health standards for CO are expected to provide ample protection of AQRVs from CO concentrations in nearby Class I areas.

Ozone--a secondary pollutant formed from photochemical oxidation of NOx and nonmethane hydrocarbon in the atmosphere--will not be evaluated because the proposed aluminum smelter is expected to produce negligible quantities of ozone precursors.

Class I Areas to be Evaluated

The PSD guidelines do not specify a maximum source-receptor distance for which the requirement to demonstrate that the proposed sources will "...not cause or contribute to adverse impact..." applies. In the absence of more definitive guidance, many states have adopted a default distance criterion of 100 kilometers.

Because of the expected magnitude of the proposed aluminum smelter source (i.e., more than 4,000 tons per year of SO2), the AQRV impact assessment will be extended to include all Class I areas located within 200 kilometers (km) of the proposed source. This is consistent with the rationale described in the EPA's "20D Rule", which is used to evaluate the significance of sources for inclusion in an air quality analysis [Federal ,Register, Vol. 56, No. 186, September 25, 1991, pg. 48473 By the "20D Rule", a 4,000-ton-per-year source would be considered "significant" at a distance of 200 km between the source and the affected Class I area.

Seven Class I areas and one high-priority Class II area are located within a 200-km radius of the proposed source:

- Columbia River Gorge National Scenic Area (CRGNSA; Oregon): 95 km west of the source (although not a Class I area, the CRGNSA has been given a high priority for visibility protection by the States of Oregon and Washington)
- Mt. Hood Wilderness (Oregon): 153 krn west of the source
- Eagle Cap Wilderness (Oregon): 165 km east-southeast of the source
- Strawberry Mountain Wilderness (Oregon): 177 km south-southeast of the source
- Mt. Adams Wilderness (Washington): 136 km west-northwest of the source
- Goat Rocks Wilderness (Washington): 145 km northwest of the source
- Mt. Rainier National Park (Washington): 171 km northwest of the source
- Alpine Lakes Wilderness (Washington): 193 km north-northwest of the source.

Two other Class I areas are located just outside the 200-km limit: Hells Canyon Wilderness, located 242 km east-southeast of the source; and Mt. Jefferson Wilderness, located 205 km southwest of the source.

Air Quality Related Values to be Evaluated

The USDA Forest Service and National Park Service has identified the following standard AQRVs, which will be evaluated in all of the affected areas listed above:

- Visibility: measures the direct impacts of air pollutants on plume visibility and regional haze
- Vegetation: measures the direct impacts of air pollutants on sensitive vegetation
- Soil: measures the indirect effects of air pollutants on sensitive vegetation via the soil pathway.

In addition, water quality has been identified as a sensitive receptor in all of the affected areas except the Strawberry Mountain Wilderness and the CRGNSA. The water quality assessment is designed to measure the indirect impacts of air pollutants through chemical transformation and deposition of secondary aerosols onto sensitive lakes and streams.

The Forest Service and National Park Service have identified several other AQRVs in each of the affected areas, such as fauna, archaeological resources, and odor. However, these AQRVs will not be directly assessed because the four AQRVs that were selected are expected to provide a very conservative measure of the potential air quality impacts resulting from the proposed project. SO_2 injury to sensitive lichen species, for example, may occur at air concentrations as low as 5 ppb (13 $\mu g/m_3$, 3-hour averaging period). It is unlikely that any other AQRVs will be affected at air concentrations less than 5 ppb.

Assessment Procedures

The approach used to assess each AQRV is described in the following sections. The model and modeling assumptions used to predict the project-related incremental air concentrations and deposition rates have not been decided at the time of this writing. A supplementation modeling protocol will be submitted later following agreement on the modeling approach by the Oregon DEQ and USDA Forest Service.

Vegetation

The vegetation component is designed to account for direct air pollution impacts on both vascular and nonvascular plants. The vegetation impact section will present an analysis of direct effects of gaseous SO_2 and HF impacts on vegetation, and will include the following discussion elements:

- Species sensitivity, including a short listing of species found in the affected Class I areas
- Mechanisms of effect

- Pollutant injury thresholds
- Expected acute and chronic impacts.

The descriptions of species sensitivity to SO_2 and HF, and their respective mechanisms of effect, will be summarized from the scientific literature. The USDA Forest Service's *Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in the Pacific Northwest* will provide the pollutant injury threshold for SO_2. The HF injury threshold will be taken from the published scientific literature. Finally, the expected impacts on vegetation will be evaluated by adding the background air concentration in each Class I area to the model-predicted incremental air concentration. The background air concentration of HF will be assumed to be zero in all affected areas. The background SO_2 concentration will be deduced by back-calculating the air concentration from the sulfur deposition rates measured at the nearest National Acid Deposition Program (NADP) monitoring site. NADP monitoring sites are located in the Bull Run Watershed east of Portland; at the Starkey Experimental Forest south of Pendleton; and on Snoqualmie Pass north of Vancouver. The calculation will assume a wet-to-dry partitioning coefficient of 0.50, and a dry deposition velocity for SO_2 of 0.05 meters per second (5 centimeters per second).

Soil

The soil component is designed to account for indirect air pollution impacts on sensitive vegetation via the soil pathway. The pollutant of concern is sulfur. The soil section will include the following discussion elements:

- Species sensitivity to deposited sulfur, including a short listing of species found in the affected Class I areas
- Mechanisms of effect
- Pollutant injury thresholds
- Expected impacts.

The descriptions of species sensitivity to deposited sulfur, and their respective mechanisms of effect, will be summarized from the scientific literature. The USDA Forest Service's *Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in the Pacific Northwest* will provide the pollutant injury threshold for sulfur. Finally, the expected impacts on vegetation will be evaluated by adding the background sulfur deposition rate in each Class I area to the model-predicted incremental sulfur deposition rate.

The background sulfur deposition rates will be obtained from data collected at nearby NADP monitoring sites. NADP monitoring sites are located in the Bull Run Watershed east of Portland; at the Starkey Experimental Forest south of Pendleton; and on Snoqualmie Pass north of Vancouver.

The project-related incremental sulfur deposition rates in the affected Class I areas will be estimated by applying a dry deposition velocity to the computed annual-average SO_2 concentration in each area. The equation that will be used is:

$$D_{total} = \left[\frac{\chi\, v\, t\, M\, x}{p}\right]_{Project} + D_{Background}$$

where D_{total} is the total deposition rate (in units of kilograms/hectare-year), ? is the project-related annual-average SO_2 concentration (in units of grams/meter^3), ? is the dry deposition velocity (in units of meter/second), t represents the number of seconds per year, M is the mole fraction of elemental nitrogen (N) in NO_{2} (dimensionless), x is a constant to ensure unit balance (10 kilograms-meter^2/grams-hectare), p is the dry-to-wet deposition partitioning coefficient (dimensionless), and $D_{background}$ represents the total background sulfur deposition rate in each area (in kilograms/hectare-year).' The dry deposition-to-wet deposition partitioning coefficient is needed to estimate total sulfur deposition from both wet an dry deposition when only one is measured.

The model-predicted annual-average SO_2 concentrations in the affected Class I areas will be obtained from the modeling analysis. According to Taylor et al. (1987), the dry deposition velocities for SO_2 range from 0.002 meters/second to 0.03 meters/second. For the purposes of this analysis, a median deposition velocity of 0.016 meters/second for SO_2 will be used. The analysis will also assume a wet-to-dry deposition partitioning coefficient of 0.50 for sulfur (Scruggs, 1995) that is, 50% of the total deposition of sulfur compounds is via dry deposition and 50% is via wet deposition.

Visibility

Plume Visual Impairment

For visibility, a level 1. (and if needed, a level 2) plume visibility analysis will be performed in accordance with the EPA's *Workbook for Plume Visual Impacts Screening and Analysis*. Following the workbook, the VISCREEN model will be used. The following assumptions will be used:

- SO_2 will be converted to primary sulfate using an S02-to-sulfate oxidation rate of 6 percent per hour. This amount will be entered into the model as primary sulfate.
- The peak hourly particulate matter and S02 emission rates will be used in the model.
- A single observer Will be located in each affected area along the boundary closest to the proposed source.

- Only views oriented "inside" the Class I areas will be used. Outside views will be ignored; i.e., views whose paths crosses the plume centerline at downwind distances that are less than the minimum distance to the Class I area.

- Default values for background ozone concentrations and particle distributions will be used

- Background visual ranges (BVR) will be obtained from the federal land managers. For all Class I areas, the 90th percentile BVR will be used in the model. In situations where the BVR is estimated from camera data, the 80th percentile values will be used instead of the 90th percentile in order to compensate for the "clean bias" associated with the use of slide densitometric measurements of visual range.

- The sequential hourly meteorological data required for the level 2 analysis will be taken from an historical data set collected at the 64-meter height on a tower operated by PGE near the Coyote Springs power generation facility in Boardman, Oregon.

- The EPA's Class I screening criteria will be used to evaluate the VISCREEN results: contrast parameter (%) of 0.05, and a color difference parameter (DE) of 2. The VISCREEN model does compensate for plume perceptibility differences that occur when the plume angle subtended by the viewer is less than 0.1 degree or more than 5 degrees.

Regional Haze

A regional haze analysis will be performed following the methods outlined in the Interagency Workgroup on Air Quality Modeling (IWAQM)'s *Phase I Report: Interim Recommendation for Modeling Long Range Transport and Impacts on Regional Visibility* [EPA-454/R-93-015]. Although IWAQM is expected to publish its Phase II recommendations soon, they have not yet done so and the Phase I document is still the most current in terms of describing the recommended methods for addressing regional haze impacts.

The regional haze modeling analysis will be based on the following inputs and assumptions:

- Concentrations based on the maximum 24-hour average particulate matter and SO_2 emission rates.

- SO_2-to-sulfate oxidation rate of 6 percent per hour.

- Molar conversion ratio of SO_2 to ammonium sulfate of 2.0625.

- Relative humidity obtained from nearby monitoring station. If not available, RH of 95 percent will be used per IWAQM Phase I report, page B-3.

- Average daily windspeed computed for the day producing the highest 24-hour average concentration in each of the affected Class I areas.
- 90th percentile BVR obtained from the federal land managers (80th percentile is obtained from camera sites)
- Haziness (i.e., deciview) index' computed for each Class I area, with the results compared to a threshold deciview change of 0.5 for a 24-hour period.

Water Quality

- A quality analysis will be performed in each of the affected Class I areas where the predicted sulfur deposition rate exceeds a threshold deposition rate of 5 kilograms per hectare per year. The water quality impact analysis, if performed, would include the following steps:
- Calculation of annual average SO_2 air concentration in each of the affected areas.
- Conversion of SO_2 to ammonium sulfate (aerosol) using an oxidation rate of 6 percent per hour and a conversion ratio of 2.0625 moles of ammonium sulfate generated per mole of SO_2.
- Background cloudwater chemistry obtained from Dean Hegge, University of Washington, Seattle.
- Scavenging of ammonium sulfate aerosols by cloudwater using the conventional scavenging equations, and subsequent deposition of rainwater with pH determined by dissociating the ammonium sulfate in an aqueous solution.
- Listing of sensitive lakes in each affected Class I area. Sensitive lakes are defined' as those with an acid-neutralizing capacity (ANC) of less than 50 microequivalents per liter.
- Evaluation of the underlying bedrock geology in each Class I area, and potential for adverse impacts on water quality caused by either a pulse input of rainwater or snowmelt runoff at the specified pH.

Class 11 Analysis

To date, no standards or guidelines have been established for addressing vegetation, soil, and visibility impacts in Class II areas. The Class I criteria were developed to provide maximum protection of sensitive Class I receptors, and are therefore too stringent for use in Class II areas. For these reasons, the air quality impacts in Class II areas will be assessed on the basis of the secondary (welfare-based) NAAQS for PM_{10} and SO_2.

Presentation of Results

The Air Quality Modeling Analysis section of the PSD application will document all aspects of the air quality' impact analyses, including all elements requested in the *Requirements for Air Quality Modeling Submittals*. These include the following:

- A table summarizing emission rates used in the modeling analysis for all pertinent averaging periods.
- A table summarizing source parameters (such as stack height, stack exit diameter, stack exit velocity, and stack exit temperature).
- A plot plan (provided by the commercial aluminum company) that includes UTMs showing emission release locations, nearby buildings (including dimensions), directions of cross Sections, property lines, fence lines, and roads. The plot plan will include cross-section diagrams to verify the heights of stacks and buildings.
- Topographic maps showing contour lines, source and receptor locations, and maximum impact locations: The topographic map showing the maximum impact location will be the same scale as a 7.5-minute quadrangle map (1:24,000).
- A table summarizing the latest modeling results, including receptor number, receptor coordinates, pollutant concentration, and ambient air quality standards and the modeling results for these pollutants of interest.
- A floppy diskette containing the ISCST3 input and output files.
- DEQ's Checklist for Air Quality Modeling Submittals.

References

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U.S. EPA, 1992a. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (Revised)*. EPA-454/R-92-019. Office of Air and Radiation and Office of Air Quality Planning and Standards.

APPENDIX D3

PNNL'S ESTIMATION OF AIR QUALITY IMPACTS USING INDUSTRIAL COMPLEX MODEL

JUNE 1998

PNNL'S ESTIMATING AIR QUALITY IMPACTS USING THE INDUSTRIAL SOURCE COMPLEX MODEL

JUNE 1998

Atmospheric dispersion modeling was conducted for the proposed Aluminum Smelter site using the U.S. EPA's Industrial Source Complex (ISC) model. The ISC model is a Gaussian plume model that offers a wide vary of options for configuring release characteristics and computing pollutant concentration and deposition values for a wide range of averaging periods (US EPA 1995).

In our assessment, the ISC model is run for a generic pollutant with a unit release rate. Because of the lack of site specific data on the design of the proposed facility and emission characteristics, a number of simplifying assumptions were made about the facility and associated dispersion conditions. These assumption include:

- A single stack release represents all facility emissions
- Effective release height of 40 m for all pollutant emissions -- assumes a 40-m tall stack with no momentum or buoyant plume rise, no stack-tip downwash, and no building wake effects.
- No dry deposition (includes no gravitation settling of particulates)
- No wet deposition/depletion
- Rural conditions assumed in modeling dispersion
- Flat terrain.

Using hourly meteorological data for 1995, 1996, and 1997, estimates are obtained for annual average impacts and the maximum impacts for short-duration periods (e.g., 1 hour, 3 hours, 24 hours) over the course of each year. The greatest air quality impacts occurred using meteorology from 1997. Meteorological data were obtained from the monitoring station operated by the Hanford Meteorology Monitoring Network near the Supply System's WNP-2 facility. The-monitoring station measures wind direction and speed at 10 m above ground level. Atmospheric temperature, pressure, and other parameters are also monitored at this station. Other meteorological parameters (such as atmospheric stability and winds aloft) are available from the nearby 60 m monitoring tower at the Fast Flux Test Facility and the 120-m tower at the Hanford Meteorology Station. Monitoring is also conducted at 27 other monitoring locations within and near the Hanford Site (PNNL-11754).

Meteorological data from 1997 indicate that winds at the proposed smelter location have a strong eastward component (blowing towards the Columbia River) about 15% of the time. Winds have a strong component towards the south (blowing in the direction of the Tri-Cities) about 25% of the time. Winds blow towards the north about 30% of the time (at a distance of about 10-km, the Columbia River passes directly north of the proposed smelter site).

Additional information about the meteorological conditions in the vicinity of the Supply System (including a joint frequency distribution of the wind direction and wind speed) are presented in PNNL-11794.

Results from the ISC model runs are presented in Table D3-1. Results represent ground-level pollutant concentrations in units of $\mu g/m^3$ for a pollutant release rate of 1 g/s. To estimate air quality impacts (in units of $\mu g/m^3$) for actual projections of pollutant releases, the data presented in Table D3-1 should be multiplied by the pollutant release rate (in units of g/s).

Table D3-1. Preliminary Projection of Ground-Level Pollutant Concentrations Downwind of the Proposed Smelter Location for a Generic Pollutant Released at a Rate of 1 g/s.

Annual Concentrations
Distance Downwind in meters (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	0.08142	0.46489	0.49602	0.44216	0.34537	0.27114	0.22015	0.10572	0.04807
NE	0.05317	0.2846	0.21526	0.11298	0.0668	0.0441	0.03148	0.01051	0.00351
E	0.04574	0.25625	0.27093	0.22287	0.16754	0.12896	0.10336	0.04817	0.0215
SE	0.04397	0.40657	0.38674	0.20427	0.12041	0.07952	0.05684	0.01928	0.00666
S	0.09566	0.60194	0.57515	0.47124	0.36266	0.28339	0.22964	0.11063	0.05097
SW	0.07422	0.429	0.29305	0.14076	0.08117	0.05313	0.0378	0.01274	0.00443
W	0.05916	0.22169	0.15073	0.11407	0.08619	0.06677	0.05379	0.02548	0.0115
NW	0.06895	0.31748	0.19732	0.09519	0.05535	0.03639	0.02595	0.00876	0.003

Maximum 24-Hour Concentrations
Distance Downwind (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	1.47125	3.98775	3.31494	3.04069	2.33524	2.01451	1.73463	0.93631	0.45318
NE	1.08049	2.64194	2.45317	1.18676	0.68627	0.45261	0.32106	0.12175	0.05213
E	1.27019	2.73152	4.09616	3.81583	3.38818	2.82206	2.37191	1.21813	0.57201
SE	1.16364	11.04333	6.09079	2.94709	1.66215	1.07701	0.76271	0.34546	0.16715
S	1.12843	5.01945	4.83205	3.82388	3.23643	2.63244	2.18292	1.15563	0.55956
SW	1.29043	5.09829	3.31505	1.6029	0.90448	0.58828	0.4199	0.15791	0.06571
W	1.71587	3.70376	3.01876	2.60467	2.00169	1.69825	1.44838	0.77393	0.37494
NW	1.91062	3.52534	2.67477	1.29435	0.72979	0.47162	0.3313	0.10414	0.04287

Maximum 12-Hour Concentrations
Distance Downwind (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	2.5774	7.29506	6.39891	5.30641	4.67049	3.87084	3.24665	1.66518	0.78324
NE	2.15603	5.12808	3.04169	1.62892	0.95438	0.62593	0.44371	0.14436	0.05705
E	1.65649	4.77646	7.85098	7.31368	5.23613	3.92412	3.388	1.83521	0.88862
SE	2.58521	16.38237	8.6158	4.16867	2.35051	1.52089	1.07372	0.48482	0.23795
SE	1.86212	8.60639	8.74429	6.23645	5.91534	5.16668	4.4608	2.41632	1.16999
SW	2.15918	10.19217	5.79614	2.80405	1.58252	1.02937	0.73476	0.27634	0.11499
W	2.67308	6.7967	6.0369	4.45009	3.89446	3.39955	2.93425	1.58867	0.76905
NW	3.51347	6.83429	5.8845	2.84757	1.60554	1.03756	0.72886	0.22911	0.08964

Maximum 8-Hour Concentrations
Distance Downwind (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	2.62152	10.19506	8.79153	6.98871	5.8517	5.1109	4.4128	2.39032	1.1574
NE	1.72211	7.68879	4.50193	2.41854	1.41523	0.92379	0.65598	0.21197	0.08382
E	2.70702	6.92674	11.77646	10.97052	7.8542	5.88618	5.082	2.75281	1.33292
SE	2.90836	25.68489	12.04651	4.12049	2.5533	1.91103	1.53011	0.76184	0.37392
S	3.38528	10.50318	12.77263	8.0183	8.13359	7.10418	6.13359	3.32244	1.60874
SW	3.57885	14.0972	8.69421	4.20608	2.37379	1.54405	1.10214	0.41451	0.17249
W	4.52964	11.01156	7.78507	6.99298	6.11204	5.33692	4.60718	2.49519	1.20813
NW	5.24987	9.54522	7.35563	3.55946	2.00692	1.29695	0.91108	0.28638	0.13482

Maximum 3-Hour Concentrations
Distance Downwind (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	8.00831	27.1868	22.52552	16.23562	14.2523	12.44848	10.74775	5.82183	2.81895
NE	8.59776	20.50343	11.64705	6.41906	3.75288	2.45518	1.73599	0.55812	0.22352
E	4.03848	18.47126	22.31889	16.22269	14.25229	12.44848	10.74774	5.82183	2.81895
SE	7.75563	40.13631	18.81971	6.46809	3.81737	2.85154	2.28302	1.13672	0.55792
S	7.44847	27.91911	25.46697	21.19891	21.68958	18.94449	16.35625	8.85984	4.28997
SW	7.20814	27.67521	17.82141	8.62397	4.86347	3.14967	2.22847	0.80172	0.3331
W	6.99072	27.18682	24.13986	16.01634	14.2523	12.44848	10.74775	5.82183	2.81895
NW	10.05239	19.80123	10.735	5.71673	3.31234	2.16049	1.52502	0.64092	0.31457

Maximum 1-Hour Concentrations
Distance Downwind (m)

Transport sector	100	500	1000	2000	3000	4000	5000	10000	20000
N	13.91132	81.56041	66.95666	48.66806	42.75689	37.34545	32.24324	17.46549	8.45686
NE	12.89664	59.3981	29.42247	14.23803	8.03825	5.23686	3.75212	1.46093	0.67045
E	10.22997	55.41378	66.95666	48.66806	42.75687	37.34544	32.24323	17.46549	8.45686
SE	12.89664	60.99804	29.42261	14.23811	8.0383	5.2369	3.75212	1.97455	0.96914
S	13.91132	83.75734	66.95666	41.7896	42.75689	37.34545	32.24324	17.46549	8.45686
SW	12.89665	60.99812	29.42254	14.23807	8.03828	5.23688	3.75213	1.46093	0.6225
W	13.91132	81.56041	60.83412	41.7896	42.75689	37.34545	32.24324	17.46549	8.45686
NW	12.89665	59.39801	29.42266	14.23814	8.03831	5.23691	3.86173	1.92276	0.94372

Another set of ISC model runs was conducted to focus at 100-m increments between 100 m and 1 km from the release location. The largest impacts generally occur at about 200 m from the release location. These impacts may be several times those at 500m, but for purposes of this assessment, the fenceline of the proposed facility is assumed to be 500 m from the release location.

To determine the maximum pollutant emission rate that would not produce a ground-level pollutant concentration that would exceed ambient air quality standards or prevention of significant deterioration limits, we divide the regulatory limit by the maximum value reported for the appropriate time period in Table D3-1. These results are presented in Table D3-2. Assuming the proposed facility operates around-the-clock throughout the year at this maximum permissible emission rate, we also estimate the maximum permissible annual emissions for each pollutant. Depending on where the facility fenceline is finally positioned and actual emissions pollutant emission parameters (e.g., the number and height of emission stacks and roof vents, building dimensions, effluent temperature and exhaust velocity, timing of pollutant emissions), these estimates can change substantially. Table D3-3 uses results from Table D3-2 to estimate maximum pollutant emission rates per metric ton of Aluminum produced. These values change as a function of the rate of annual production of Aluminum at the proposed facility.

It should be noted that the assessments presented here focus only on the ground-level pollutant concentrations that would result from smelter emissions. Other man-made or natural pollutant sources, including average background pollutant concentrations, are not considered. In practice, background concentrations of pollutants are important in evaluating compliance with air quality standards. It is the sum of a facility's proposed emissions and projected background concentration of pollutants that determine whether ambient air quality standards would be violated. When background air concentrations of pollutants are exceptionally high (such as during inversions or when air mass stagnation conditions exist), levels of pollutant emissions below those provided in Tables D3-1 and D3-2 could result in pollutant concentrations above air quality standards. Information on stagnation conditions in the Columbia Basin are presented in PNL-4622.

Table D3-2. Projected Maximum Pollutant Emission Rates and Annual Emission Totals. Values in excess of these rates and totals are likely to exceed AAQS and PSD Limits. These preliminary values are based on a set of very simple (and incomplete) characterizations of the proposed facility.

Pollutant	Time period	Regulatory limit ($\mu g/m^3$)	Governing standard	Maximum pollutant emission rate (g/s)	Maximum annual pollutant emissions (mt)
Particulates	Annual	17	PSD	28	900
	24 h	150	PSD	14	440
SO_2	Annual	20	PSD	33	1,000
	24 h	91	PSD	8	250
	3 h	512	PSD	13	400
	1 h	1,040	AAQS	12	400
CO	8 h	10,000	AAQS	390	12,000
	1 h	40,000	AAQS	480	15,000