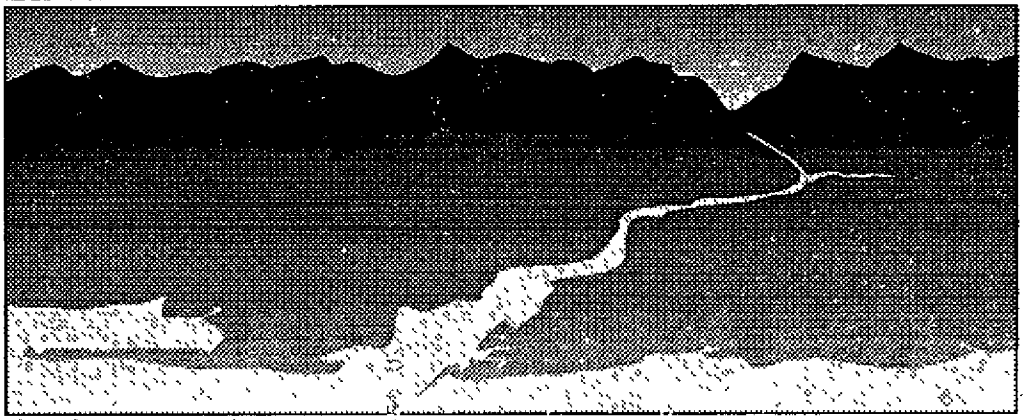
FINAL REPORT
8526-02

LOWER COLUMBIA RIVER



BI-STATE PROGRAM

RECONNAISSANCE SURVEY OF THE LOWER COLUMBIA RIVER

TASK 2 DATA ANALYSIS REPORT: INVENTORY AND CHARACTERIZATION OF POLLUTANTS

MAY 22, 1992

Prepared By:
TETRA TECH

In Association With:
DAVID EVANS & ASSOCIATES
EVS CONSULTANTS

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THE LOWER COLUMBIA RIVER BI-STATE PROGRAM

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ACKNOWLEDGMENTS

This document was prepared by Tetra Tech, Inc , with assistance from David Evans & Associates, for Columbia River Bi-State Committee Dr. Ted Turk of Tetra Tech served as the Project Manager for all work conducted on the lower Columbia River project. Dr Steven Ellis of Tetra Tech served as the Task Manager for all work conducted as part of Task 2: Inventory and Characterization of Pollutants.

Several individuals contributed to sections included in this document. Mr. Curtis DeGasperi of Tetra Tech was the principal author of sections discussing point source pollutant loading Mr DeGasperi, Mr. Tad Deshler, and Dr. Mahmood Shivji of Tetra Tech were responsible for non-point pollutant sections dealing with tributary pollutant loading. Ms. Diana Denham, Ms Lisa Hanf, Ms Laura Hudson, Ms. Marilu Koschak, Ms. Lisa Vogel, and Ms Ellen Wax of David Evans & Associates were responsible for non-point pollutant sections discussing land use Mr Glen St Amant was the principal author of all sections discussing in-place pollutants

Analysis and interpretation of data, identification of data gaps, and recommendations were provided by Dr. Ellis, Mr. DeGasperi, and Mr St Amant. Technical review was provided by Dr Ellis. Ms Eva Weaver performed technical editing Mr Scott Oswald of David Evans & Associates provided the Columbia River base maps All other illustrations were provided by Ms. Kim Shaty and Mr. Paul Ackerman of Tetra Tech. Word processing was performed by Ms Lisa Fosse and Ms Kelly Robinson

LIST OF ACRONYMS

ADT	Air Dried Ton
AOX	Adsorbable Organic Halides
BMP	Best Management Practices
BOD	Biological Oxygen Demand
BPA	Bonneville Power Administration
BTU	British Thermal Unit
CBOD	Carbonaceous BOD
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CM/SEC	Centimeters per second
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflows
DMRs	Discharge Monitoring Reports
DNR	Washington Department of Natural Resources
DO	Dissolved Oxygen
Hr	Hour
LB/D	Pounds Per Day
MGD	Million Gallons per Day
mL	Milliliter
NASQUAN	National Stream Quality Accounting Network
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife

ODOF	Oregon Department of Forestry
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statute
PAH	Polycyclic Aromatic Hydrocarbon
PCE	Tetrachloroethylene
PPM	Parts per million
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RPA	Resource Planning Act
TCDD	Tetrachlorodibenzodioxin
TCDF	Tetrachlorodibenzofuran
TCE	Trichlorethylene
TDS	Total Dissolved Solids
TFW	Timber, Fish, and Wildlife Agreement
TSS	Total Suspended Solids
U S COE	U S Army Corps of Engineers
U S EPA	U S Environmental Protection Agency
USDA	U S Department of Agriculture
USGS	U S. Geological Survey
WAC	Washington Administrative Code
WARM	Washington Ranking Method
WDOE	Washington Department of Ecology
WDOT	Washington Department of Transportation
WWTP	Wastewater Treatment Plant

1.0 INVENTORY AND CHARACTERIZATION OF POLLUTANTS

The Lower Columbia River Bi-State Water Quality Program (Bi-State Program) has been established to assess the ecological health of the lower Columbia River system This four-year program is jointly sponsored by the Washington Department of Ecology (WDOE), the Oregon Department of Environmental Quality (ODEQ), the Washington and Oregon Public Port Associations, and the Northwest Pulp and Paper Association. Its goals are to characterize water quality, identify water quality problems, determine whether beneficial uses are impaired, and develop solutions to problems found in the river below Bonneville Dam (Bi-State Steering Committee 1991) To accomplish these goals, the Bi-State Steering Committee proposed that water quality be evaluated in the lower Columbia River in a series of steps. This report presents the findings of one step, Task 2, an inventory and characterization of pollutants and pollutant sources along the lower Columbia River. Task 2 information was considered in the design of the reconnaissance survey of the river, conducted in October 1991

The goal of Task 2 is to inventory and characterize pollutant sources on the lower Columbia River To accomplish this goal, pollutant sources have been divided into three categories point sources, non-point sources, and in-place pollutants. *Point* sources are discrete pollution sources that discharge directly, generally from an outfall, to the waters of the lower Columbia River. *Non-point* pollution sources represent pollution that enters the river from dispersed water-based or land-use activities. Non-point pollution sources are difficult to quantify because their mechanisms of transport (surface runoff, groundwater transport, atmospheric deposition) are difficult to characterize, and non-point pollutant loading may occur intermittently *In-place* pollutants in this report refers to land-based sources of pollutants These sources—which may contribute to non-point pollutant loading to the river—include hazardous waste sites and sanitary landfills located near the river

To facilitate data evaluation and synthesis in this report, the lower Columbia River has been subdivided into several major and minor segments (Table 1) Each segment represents a river section with similar physical characteristics and allows better identification of the physical processes responsible for contaminant transport Each designated segment consists of reaches with similar flow and morphologic features, with major segment designations based on the confluences with major tributaries or the break between riverine and estuarine portions of the river systems. Subsegments were generally based on major geographic features along the river

TABLE 1. LOWER COLUMBIA RIVER SEGMENTATION DEFINITIONS				
Segment	Description	River Start	Mile End	Total Mileage
1 A	Mouth of the Columbia to Youngs Bay	0	13	37
B	Youngs Bay to Tongue Point	13	18 5	
C	Tongue Point to Tenasillahe Island	18 5	38	
2 A	Tenasillahee Island to Cathlamet Channel	38	47	31
B	Cathlamet Channel to River Mile 54	47	53 5	
C	River Mile 54 to Cowlitz River	53 5	72	
3 A	Cowlitz River to Lewis River	72	87.5	34
B	Lewis River to Willamette River	87 5	102	
4 A	Willamette River to Sandy River	102	125 3	44
B	Sandy River to Bonneville Dam	123 5	146	

Source: Tetra Tech (1992)

and confluences with smaller tributaries An extensive discussion of the rationale and features of each segment can be found in the Task 3 report *Review of Hydraulic, Hydrologic, Sediment Transport, and Geomorphic Characteristics of the Lower Columbia River* (Tetra Tech 1992)

It is important to note some limitations of the data contained in this report Information on point source monitoring requirements and pollutant discharges were obtained from National Pollution Discharge Elimination System (NPDES) files maintained at either ODEQ or WDOE for the years 1989 and 1990 Information not present in these files were not evaluated NPDES permits stipulate permittees discharge and monitoring requirements for a period of 5 years from the date issued In the event that new permits are not issued prior to the applicants expiration date, the requirements stipulated in the old permit remain in effect In some cases, summaries of permit requirements may reflect permits that are no longer in effect because the permittee has received a new permit since 1991

Other limitations concern descriptions of legislation Changes in environmental regulations that have occurred since 1991 are not reflected in this report. This limitation mainly effects discussions concerning stormwater monitoring requirements. Regulations for stormwater discharges in the State of Washington which may go in effect in 1992 may invalidate descriptions included in this document

To facilitate the readibility of this document, acronyms and abbreviations are used for regulatory agencies, pollutants, and other commonly used phrases A complete list of acronyms is provided on Page xi

2.0 POINT SOURCES OF POLLUTION TO THE LOWER COLUMBIA RIVER

Fifty-four point sources of pollution to the lower Columbia River were evaluated for this report (Table 2) These sources represent facilities that have National Pollutant Discharge Elimination System (NPDES) permits to discharge wastewater directly to the lower Columbia River via pipes or channels Locations of these facilities are shown on Figures 1a through 1d The U S Environmental Protection Agency (U S EPA) has delegated the authority to issue NPDES permits to ODEQ and WDOE These state permits specify the discharge limits that must be met during operation of a facility and the frequency and types of monitoring that must be carried out to ensure that limits are met

The following discussion of point sources along the lower Columbia River presents information on three topics

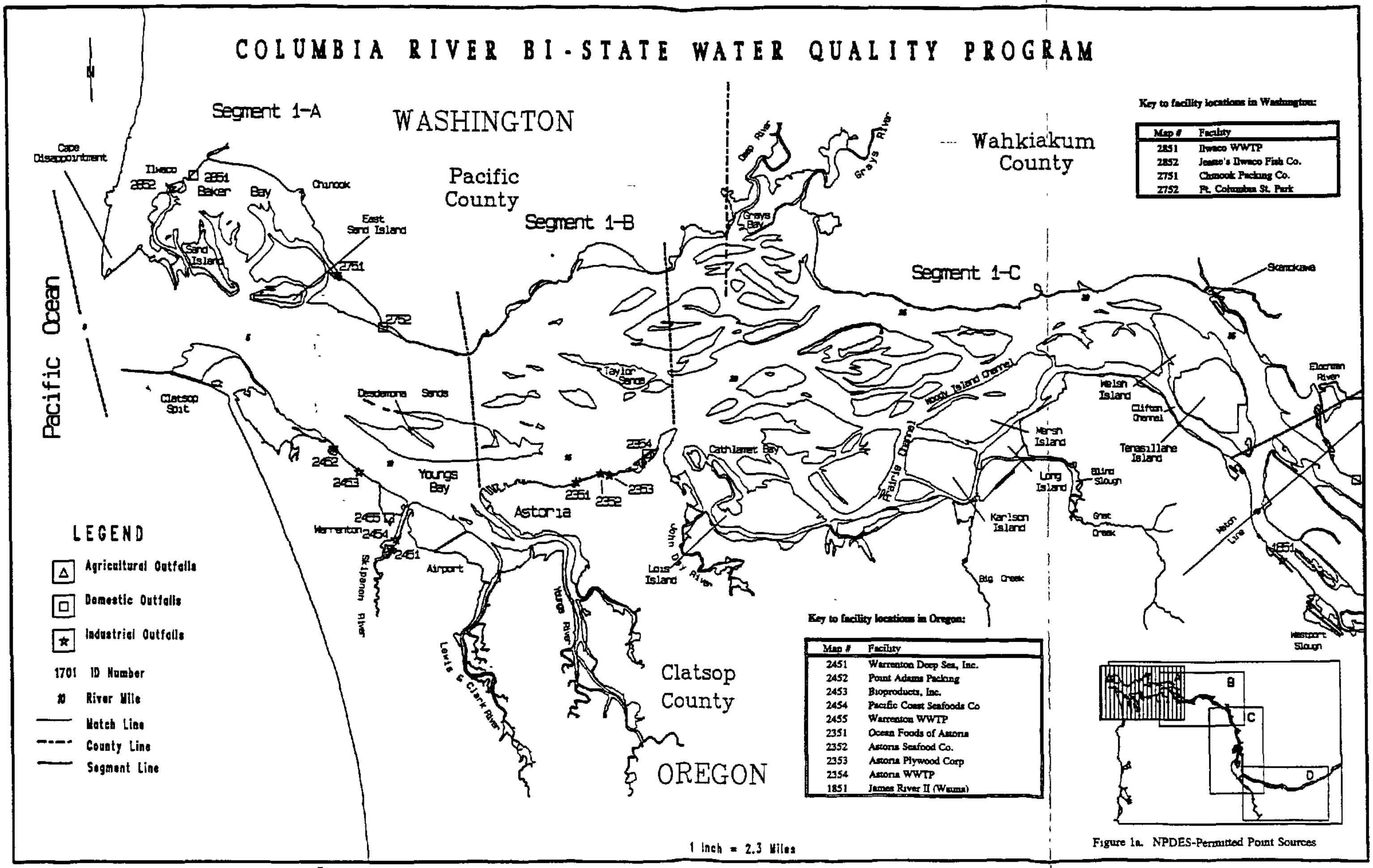
- Effluent limits specified in NPDES permits for pollutants
- NPDES permit monitoring requirements for pollutants
- Estimated loading rates of pollutants of concern.

Effluent limits specified in NPDES permits are the maximum concentrations or loading of specific constituents to the Columbia River allowed by Oregon and Washington regulatory agencies The amounts of pollutants discharged (pollutant loading) by NPDES-permitted facilities were estimated from measurements of the rate at which effluent is discharged into the river and the concentration of specific constituents present in the effluent These data were obtained from NPDES monitoring reports in ODEQ and WDOE permit files for 1989 and 1990 Because facilities rarely report effluent concentrations of any constituents not specified in their NPDES permit, estimates of pollutant loading are available only for the constituents that the states specify must be monitored

NPDES-permitted facilities that discharge wastewater to the lower Columbia River include a diverse assortment of private and publicly owned facilities. To better summarize and characterize discharges, these facilities have been classified into three main discharge categories. *domestic, industrial,* and *agricultural.* These discharge categories are utilized by the U S. EPA

TABLE 2 KEY TO PERMITTED POINT SOURCE MAP NUMBERS IN FIGURE 1A - 1D

Map Number	Facility	Map Number	Facility
	River Segment 1-A		**River Segment 3-A**
2851	Town of Ilwaco WWTP	1355	Trojan Nuclear Power Plant
2852	Jessie's Ilwaco Fish Co	1357	Prescott Ponds Fish Hatchery
2751	Chinook Packing Co	1251	Kalama Chemical
2752	Ft Columbia State Park	1252	Town of Kalama WWTP
2451	Warrenton Deep Sea, Inc	1151	Virginia Chemicals (Hoecht-Celanese)
2452	Point Adams Packing	1152	Chevron Chemical Co
2453	Bioproducts, Inc		
2454	Pacific Coast Seafoods Co	1051	City of St Helens WWTP
2455	City of Warrenton WWTP	1052	St. Helens veneer mill
	River Segment 1-B		**River Segment 3-B**
2351	Ocean Foods of Astoria	951	Salmon Creek WWTP
2352	Astoria Seafood Co.		
2353	Astoria Plywood Corp		**River Segment 4-A**
2354	City of Astoria WWTP		
		3151	Aluminum Company of America (ALCOA)
	River Segment 2-A		
		3152	GATX Terminals Corp.
1851	James River II, Inc. (Wauna)	3153	Fort Vancouver Plywood
		3154	Northwest Packing
1750	Cathlamet WWTP	3155	City of Vancouver (Westside) WWTP
		3156	Great Western Malting
	River Segment 2-B		
		851	City of Portland WWTP
1651	Beaver Generating Plant	852	Boise Cascade (Vancouver)
		853	Ideal Basic Industries
	River Segment 2-C		
		751	Vancouver Trout Hatchery
1451	Weyerhaeuser Paper Co.	752	City of Vancouver (Eastside) WWTP
1551	Reynolds Metals Co (Longview)	651	Reynolds Metals Co (Troutdale)
1552	Stella WWTP	652	City of Gresham WWTP
1351	Longview Fibre Co.	653	James River II, Inc Sundial Chip Reloading Facility
1352	Cowlitz Co Regional		
1353	International Paper Co.	654	James River II, Inc. (Camas)
1354	City of Rainier WWTP	656	Columbia Vista Corp
1356	Riverwood Mobil Home Park		
			River Segment 4-B
		451	Wahkeena Fish Hatchery
		551	Pendleton Woolen Mills
		655	City of Camas WWTP
		152	U.S. Army Corps of Engineers WWTP
		153	City of North Bonneville WWTP



Key to facility locations in Washington:

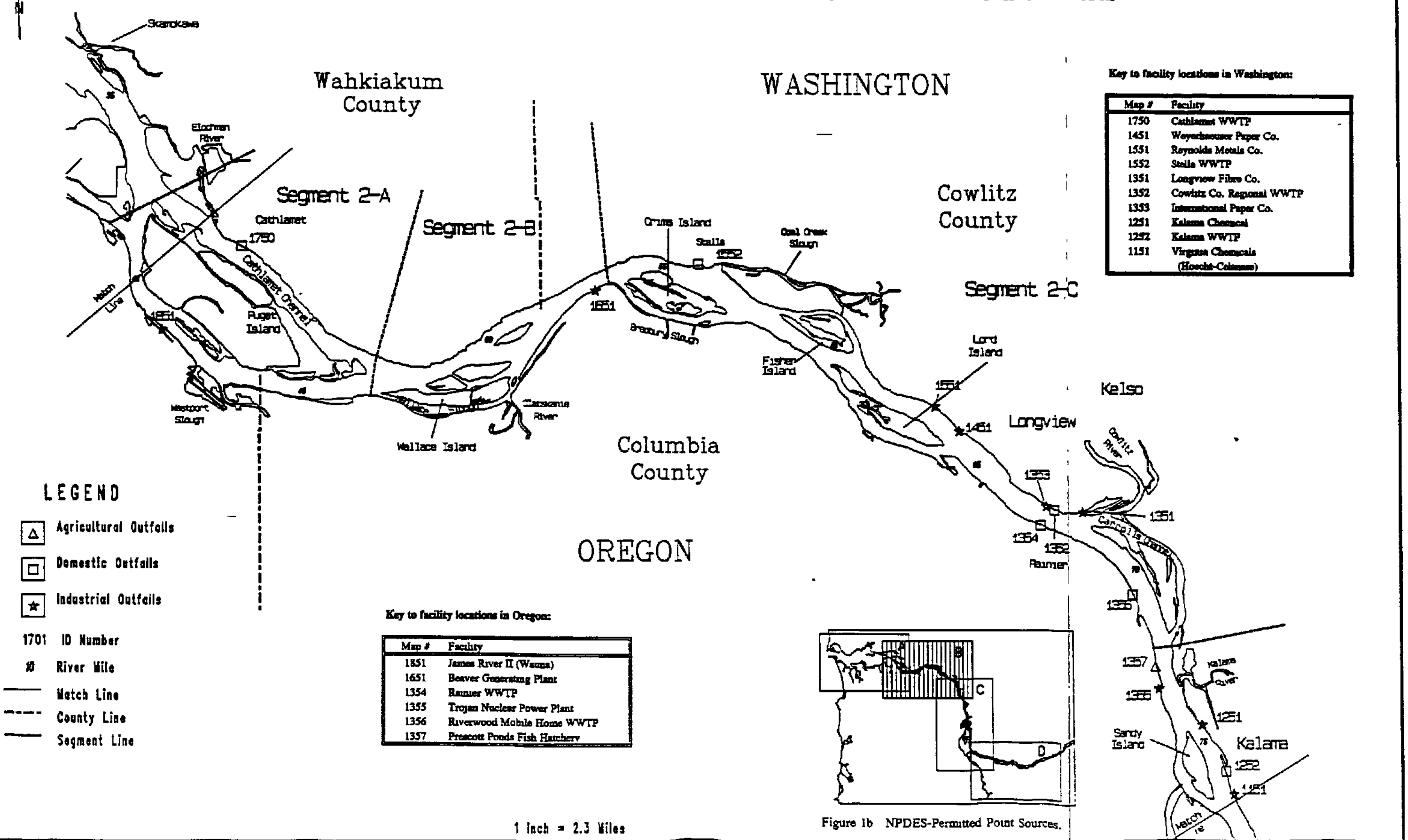
Map #	Facility
2851	Ilwaco WWTP
2852	Jessie's Ilwaco Fish Co.
2751	Chinook Packing Co.
2752	Ft. Columbia St. Park

Key to facility locations in Oregon:

Map #	Facility
2451	Warrenton Deep Sea, Inc.
2452	Point Adams Packing
2453	Bioproducts, Inc.
2454	Pacific Coast Seafoods Co
2455	Warrenton WWTP
2351	Ocean Foods of Astoria
2352	Astoria Seafood Co.
2353	Astoria Plywood Corp
2354	Astoria WWTP
1851	James River II (Wauna)

Figure 1a. NPDES-Permitted Point Sources

COLUMBIA RIVER BI-STATE WATER QUALITY PROGRAM



Key to facility locations in Washington:

Map #	Facility
1750	Cathlamet WWTP
1451	Weyerhaeuser Paper Co.
1551	Reynolds Metals Co.
1552	Stella WWTP
1351	Longview Fibre Co.
1352	Cowlitz Co. Regional WWTP
1353	International Paper Co.
1251	Kalama Chemical
1252	Kalama WWTP
1151	Virginia Chemicals (Hoechst-Celanese)

Key to facility locations in Oregon:

Map #	Facility
1851	James River II (Wauna)
1651	Beaver Generating Plant
1354	Rainier WWTP
1355	Trojan Nuclear Power Plant
1356	Riverwood Mobile Home WWTP
1357	Prescott Ponds Fish Hatchery

LEGEND

- △ Agricultural Outfalls
- □ Domestic Outfalls
- ★ Industrial Outfalls
- 1701 ID Number
- 10 River Mile
- Match Line
- County Line
- Segment Line

Figure 1b NPDES-Permitted Point Sources.

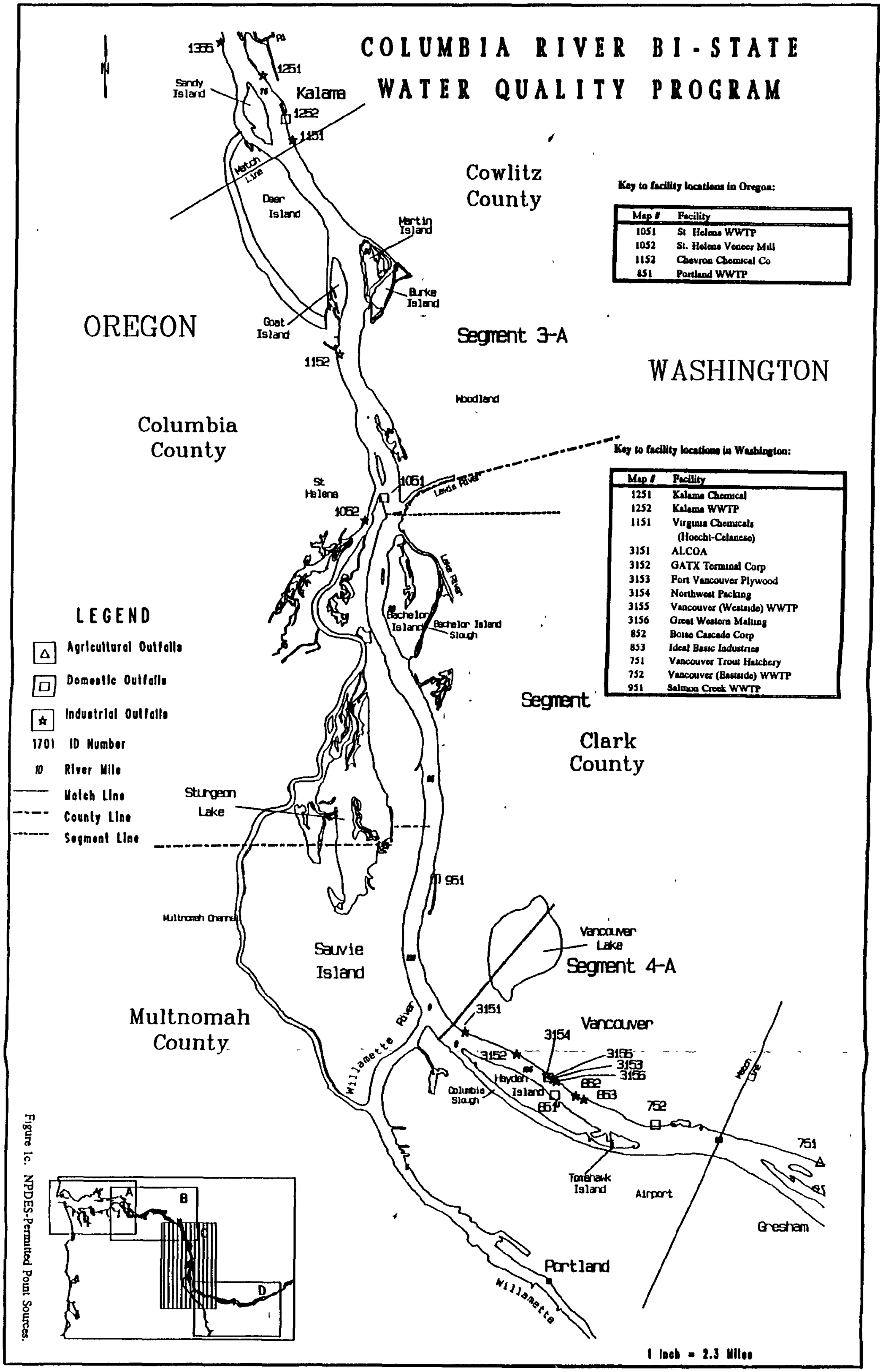
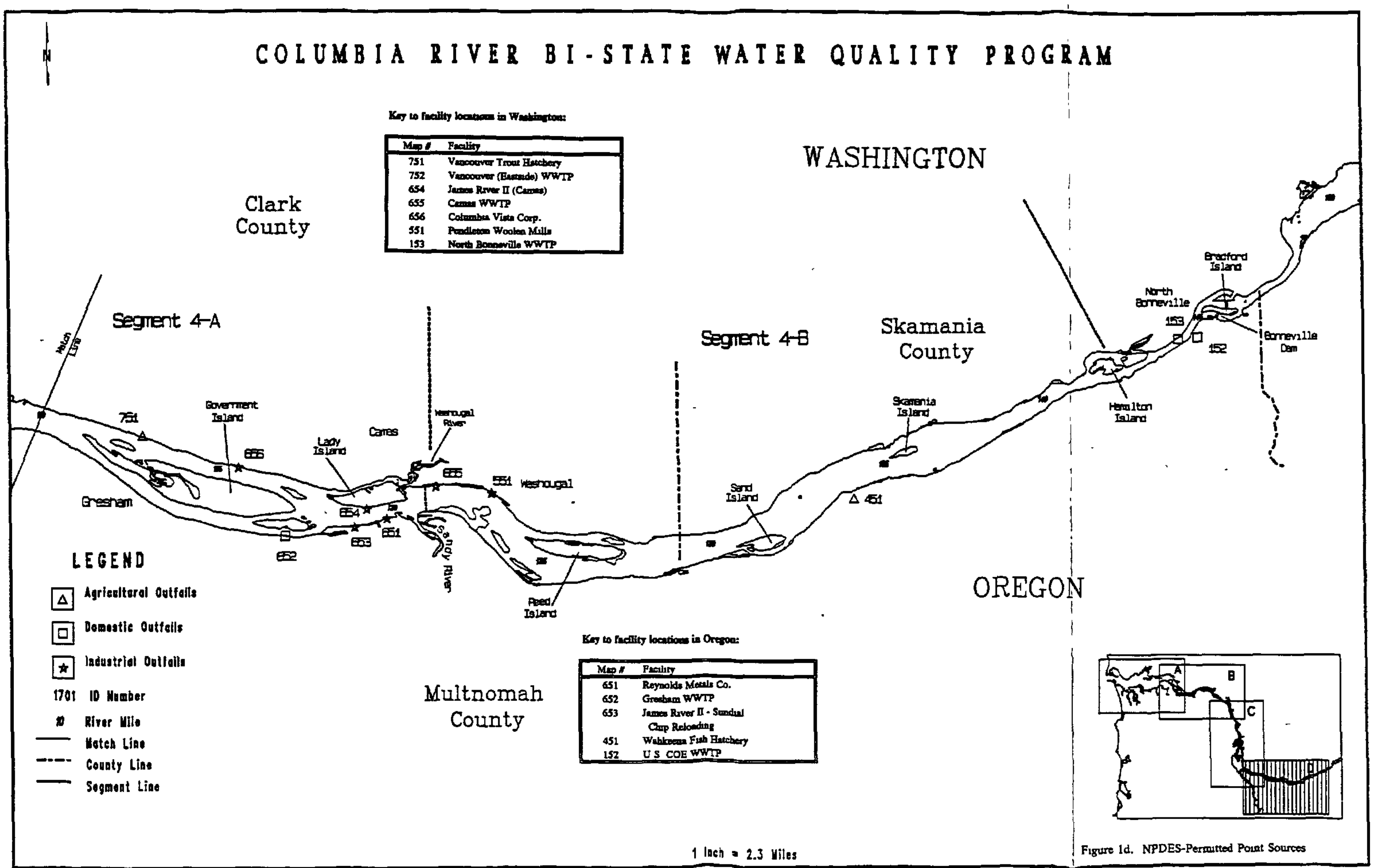


Figure 1c. NPDES-Permitted Point Sources.



Key to facility locations in Washington:

Map #	Facility
751	Vancouver Trout Hatchery
752	Vancouver (Eastside) WWTP
654	James River II (Camas)
655	Camas WWTP
656	Columbia Vista Corp.
551	Pendleton Woolen Mills
153	North Bonneville WWTP

Key to facility locations in Oregon:

Map #	Facility
651	Reynolds Metals Co.
652	Gresham WWTP
653	James River II - Sundial Chip Reloading
451	Wahkeena Fish Hatchery
152	U S COE WWTP

Figure 1d. NPDES-Permitted Point Sources

U S EPA, ODEQ, and WDOE General definitions of the types of discharge that fall within these categories are provided below

Domestic Facilities - These facilities are municipal wastewater treatment plants (WWTP) that discharge treated domestic wastewater. In addition to domestic wastewaters, some portion of the wastewater may come from industrial sources that discharge pre-treated and/or untreated wastewaters to the municipal wastewater collection system

Industrial Facilities - Industrial facilities are private industrial plants that may discharge treated process wastewater, treated sanitary wastewater, stormwater runoff, cooling tower and boiler blowdown water, contact and/or non-contact cooling water, water supply filter-backwash water, and/or water used for other industrial needs A facility classified as industrial does not necessarily discharge contact industrial wastewater

Agricultural Facilities - These facilities discharge wastewater and materials resulting from plant or animal husbandry. All permitted agricultural facilities on the lower Columbia River are fish hatcheries These facilities periodically discharge fish culture wastewater, and culture pond cleaning water

Each of the discharge categories have been further designated facilities as *major* or *minor*, a classification scheme currently used by U.S. EPA, ODEQ, and WDOE. The following are the general definitions of these labels:

Major Domestic Facilities - Municipal WWTPs are considered a major domestic facility if they serve a population greater than 10,000 and/or discharge more than 1 million gallons per day (MGD), and/or receive a large portion of industrial wastewater.

Minor Domestic Facilities - These municipal wastewater facilities serve less than 10,000 people and do not receive significant amounts of industrial wastewater.

Major Industrial Facilities - Major industrial facilities are those plants that discharge process wastewater or are water power generating facilities that discharge large volumes of heated effluent. Major facilities may discharge large biological oxygen demand (BOD) or metal loads; have significant toxic discharges, or have a treatment system which, if not operated properly, would have a significant adverse impact on the receiving water.

Minor Industrial Facilities - Minor industrial facilities are those that do not discharge process wastewater. They include plants that discharge small volumes of non-contact cooling water.

Major Agricultural Facilities - Major agricultural facilities discharge large quantities of wastewater. No permitted major agricultural facilities were identified on the lower Columbia River

Minor Agricultural Facilities - These agricultural facilities discharge low levels of BOD, total suspended solids (TSS), and potentially toxic substances.

The following text summarizes the permitted facilities within each of these categories, their permit effluent limits, monitoring requirements, and the pollutants of concern discharged by each After this summary of permit requirements, the effluent discharge by river segment is discussed

2.1 DATA COLLECTION AND METHODOLOGY

The goals of the point source pollutant data collection and characterization were to 1) provide guidance and input into the design of the reconnaissance survey sampling plan, 2) estimate pollutant loading from direct NPDES-permitted discharges to the river, and 3) identify river segments and pollutants of concern in the lower Columbia River.

2.1.1 Data Collection Methods

The evaluation of point sources in this report is limited to NPDES-permitted facilities that discharge directly to the lower Columbia River Searches performed by ODEQ and WDOE identified NPDES-permitted facilities that currently discharge wastewater directly to the Columbia River. Copies of NPDES permits, discharge monitoring reports (DMRs), fact sheets, and additional data on each of the identified facilities were obtained from ODEQ and WDOE permit files

2.1.2 Description of Available Data

The available information on permit effluent limits and discharge monitoring requirements was reviewed and summarized (Appendices A through T). Only DMRs and additional data for

1989 and 1990 were used to estimate the total discharge of point source pollutants to each river segment An attempt was made to obtain and summarize effluent limits and monitoring requirements from the most recently issued NPDES permits. Permit monitoring requirements changed for some facilities after 1990 (e g , City of Portland WWTP) and, therefore, the data available may not reflect present monitoring requirements.

Because the NPDES-permitted effluent limits for industrial discharges are based partly on the type of industry and its production output, some industry effluent standards are set based on production quantity Other factors such as the assimilation capacity of the receiving water are also are considered by the permitting agencies. For several pulp and paper mills along the lower Columbia River, effluent limits have been recently established for adsorbable organic halides (AOX) These AOX effluent limits are based on the production of bleached kraft pulp in the units "air dried ton" (ADT) Thus, to establish a mill's compliance with the NPDES limit, the production of bleached kraft pulp must be known.

2.1.3 Method for Estimating Loading

Monthly loading of a particular constituent to the river was estimated by one of two methods depending on the type of data available.

- Method 1 - The monthly average daily loading estimate for the effluent constituent reported in the DMR was multiplied by the number of days in that month

- Method 2 - This method was used if monthly average daily loading data was not available, but monthly average constituent concentration and monthly average effluent discharge flow were available Monthly loading was calculated by multiplying average discharge flow by the average constituent concentration in the effluent.

Seasonal loading was determined by summing the estimated monthly discharges for each of two seasons. dry and wet. The dry season was defined as the months of April through September and the wet season as the months of October through March. Loading estimates for each season were then calculated for each day by dividing the seasonal mass loading by the number of days in each season (183 days for the dry season and 182 days for the wet season) If data for one month were unavailable, monthly loading was interpolated for that month. When data were unavailable for two or more consecutive months, a mean monthly loading was estimated and seasonal loading estimated by multiplying the monthly average estimated loadings by six (the number of months in each season).

Because temperature and pH do not lend themselves to calculation of loading, loading estimates of these parameters were not attempted Instead, mean seasonal monthly average temperature and pH were calculated when data were available Because effluent limits for temperature were often set at a maximum level, DMRs often only reported the maximum temperature Similar problems arose with pH data Because limits for pH are generally set as minimum and maximum values, often only the monthly minimum and maximum pH values were reported on the DMRs When monthly mean pH data were available, seasonal monthly mean pH was calculated Fecal coliform data were also difficult to summarize given the variety in sampling frequency and reporting requirements

Fecal coliform bacteria indicate the presence of human pathogens of fecal origin, making bacteria concentration data more meaningful than bacteria loading data When available, the reported 30-day average was used to calculate seasonal average fecal coliform levels

Calculations of loading estimates were further complicated by the large number of constituents reported as not detected in permit files Several techniques exist for handling non-detect values in data sets However, many of these censored data techniques require larger amounts of data, or larger proportions of detected values, than were available for analysis In this report, the most conservative option was adopted for dealing with non-detect values—the method or laboratory detection limit was used in the calculations for constituents reported as non-detected The detection limit was used to estimate loadings for either a month, quarter, or season depending on the frequency of sampling If only one detection limit value was available for a seasonal loading estimate, then this value was multiplied by the estimated wastewater discharge for that season When any of these seasonal estimates contained loading estimates based on detection limit values, the estimate is shown in parentheses. These loading estimates based on detection limit values may overestimate actual loading, although the amount of overestimation cannot be determined Thus, loading estimates in parentheses should be considered as worst-case estimates of loading The pollutants most often containing non-detect values were metals, boron, cyanide, and organic compounds

2.1.4 Limitations of Analysis

Calculation of pollutant loading was complicated by a number of factors. The primary difficulty arose when NPDES permit files contained only DMRs The data in DMRs are intended for determining compliance with effluent permit limits and, therefore, contain monitoring information that allows a determination of whether a permit violation has occurred The types of data in these reports, with the possible exception of flow, BOD, and TSS, are generally not well suited for estimating pollutant loading to the river Unless the permit limits were established in terms of loadings (e g , lb/day), this data was not typically present in the

DMR. The alternative method (Method 2, pg. 17) of calculating loading requires data on average pollutant concentration and discharge flow. Because several facilities did not have flow limits in their NPDES permits, they were not required to report flow data on their DMR Thus, loadings could not be calculated for these facilities In other cases, the flow and/or effluent constituent permit limit was based on a maximum value. On occasion, only one sampler per month was required and was reported as the maximum value. Use of these data would overestimate average monthly loading

An additional problem arose from the difficulty in locating complete monitoring files. When only one month of data was missing, values for that month were interpolated When two or more consecutive months were unavailable, a seasonal average was calculated using the available data, and a seasonal total then extrapolated from the monthly mean loading. A final difficulty involved recent changes in some permit requirements. While several permits for pollutant loading to the lower Columbia River have been recently renewed to require extensive monitoring of metals and organic compounds, these data are as yet incomplete.

Precisely locating the point source discharges to the river was also difficult. Location of most point sources was only approximate. For the minor facilities, the location information included the name of the town or city in which the facility was located, and occasionally, the river mile (within 0 5 mile) location of the discharge. While the latitude and longitude of some of the major facilities discharges were specified, many of these were actually measurements of the latitude and longitude of the facility rather than the outfall, or were incorrect For example, the latitude and longitude given for Kalama Chemical, Inc. in their NPDES permit places the discharge near Lake Umatilla in eastern Washington.

2.2 DOMESTIC POINT SOURCES

Nineteen municipal wastewater treatment plants discharge secondary treated wastewater directly to the waters of the lower Columbia River below Bonneville Dam. Pollutants of concern discharged by these facilities include BOD, TSS, nutrients, and pathogens Metals and organic compounds may also be discharged from these facilities, particularly those that receive wastewater from industrial facilities and stormwater runoff.

2.2.1 Major Domestic Point Sources of Pollution

Eight major point sources of secondary treated domestic wastewater are located on the lower Columbia River (Table 3). Four of these municipal facilities are in Oregon (Astoria, St. Helens, Portland, and Gresham) and four facilities are in Washington (one in Longview and three

TABLE 3 SUMMARY OF PERMITTED MAJOR DOMESTIC DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Treatment Plant Type	Type of Discharge
OREGON										
City of Astoria	OR002756-1	6-30-91	Astoria	Clatsop	18 0	1B	46°12'14"	123°46'21"	3 cell lagoon with mechanical aeration	Secondary treated municipal wastewater
City of St Helens	OR002083-4	11-30-95	St Helens	Columbia	86	3A	45°51'16"	122°47'14"	Primary treatment and combined secondary aeration lagoon	Combined municipal and bleach kraft mill secondary effluent
City of Portland	OR002690-5	3-31-96	Portland	Multnomah	105 5	4A	45°37'26"	122°41'32"	Activated sludge	Secondary treated municipal wastewater
City of Gresham[c]	OR002613-1	3-31-92	Gresham	Multnomah	117 5	4A	45°33'30"	122°27'55"	NA[a]	Secondary treated municipal wastewater
WASHINGTON										
Cowlitz County STP[b]	WA003778-8	7-3-91 (rev 3-8-90)	Longview	Cowlitz	67 0	2C	46°05'52"	122°05'52"	Activated sludge	Secondary treated municipal wastewater
Salmon Creek Wastewater Treatment Plant	WA002363-9	12-22-85	Vancouver	Clark	97 2	3B	45°42'39"	122°45'30"	Activated sludge	Secondary treated municipal wastewater
City of Vancouver Westside STP	WA002435-0	9-16-90	Vancouver	Clark	105	4A	45°38'10"	122°41'45"	Activated sludge	Secondary treated municipal wastewater
City of Vancouver Eastside STP	WA002436-8	10-6-92	Vancouver	Clark	110	4A	45°36'45"	122°37'00"	Activated sludge	Secondary treated municipal wastewater

[a] NA = Not available

[b] STP = Sewage treatment plant

[c] Latitude and Longintude were not present in NPDES files Values shown are estimates

in Vancouver) Major domestic dischargers are distributed along the river from river segment 1B to river segment 4A (Figure 1a–1d) The City of Astoria's WWTP discharges to the Columbia River Estuary in river segment 1B (Figure 1a) The Cowlitz County regional facility in Longview, WA discharges to river segment 2C (Figure 1b). The City of St Helens' WWTP discharges to river segment 3A, into the main channel just upstream from the confluence with the Multnomah Channel (Figure 1c) The Salmon Creek WWTP is the only direct permitted point source discharge to river segment 3B (Figure 1c) Four of the major domestic WWTP facilities discharge to river segment 4A (Figures 1c and 1d)

All of these WWTPs, except the City of St Helens's facility, serve a population greater than 10,000 and discharge more than 1 MGD of wastewater The City of St Helens WWTP serves a population less than 10,000, but given the input of primary treated process wastewater and landfill leachate from the St Helens Boise Cascade Corporation pulp and paper mill, the U S EPA and ODEQ classify this facility as major

2.2.1 1 ***Pollutants of Concern.*** Pollutants of concern discharged by large municipal WWTPs include BOD, TSS, nutrients, and pathogens. Because these facilities may receive wastewater from industrial facilities as well as stormwater runoff, metals and organic compounds are also of concern Pollutants of concern at the City of St. Helens WWTP—which treats a blend of municipal and pulp and paper mill process wastewater—include halogenated organic compounds, which are created during the pulp bleaching process Large municipal WWTPs may also be a source of halogenated organic compounds if they use chlorine for wastewater disinfection before discharge or if they receive and treat industrial wastewater

2 2 1.2 ***NPDES Permit Effluent Limits.*** NPDES permit limits for the discharge of specific effluent constituents by major domestic WWTPs were summarized from ODEQ and WDOE files (Appendix A) Effluent limits for all facilities include limits for flow, BOD, TSS, fecal coliform bacteria, and pH. Effective November 1993 and 1995, the St Helens facility will also have effluent limits for 2,3,7,8 tetrachlorodibenzodioxin (TCDD) and AOX, respectively These additional requirements are being imposed because the city's WWTP receives industrial effluent consisting of treated pulp and paper mill wastewater and landfill leachate

All major domestic WWTP facilities, except for the St Helens WWTP, have average dry season flow limits These limits range from 2 0 MGD for the Salmon Creek facility in Vancouver, WA to 100 MGD for Portland.

Effluent limits for BOD and TSS are based on both effluent concentration and mass loading Monthly average effluent limits for BOD and TSS range from 20 to 30 mg/L and 500 to

25,000 lb/day, respectively. The weekly average limits range from 30 to 45 mg/L and 750 to 37,500 lb/day Oregon facilities have an additional daily maximum effluent loading limit that ranges from 2,100 to 50,057 lb/day Effluent limits for the City of Gresham vary seasonally because stormwater and domestic wastewater are not separated in the city's collection system During the rainy season, the Gresham facility processes large volumes of wastewater, making the city's effluent limits for BOD and TSS higher during November through April Lower limits for BOD and TSS are set for the dry season

Effluent limits for all major facilities in Washington and the cities of Portland and Gresham, Oregon require that a minimum of 85 percent of BOD and TSS be removed before wastewater discharge Portland has variable, flow-dependent limits for the percent removal of BOD and TSS When flow to the Portland facility exceeds 100 MGD, the percent removal of BOD and TSS may be less than 85 percent; monthly average discharge of BOD and TSS limits may increase to 50,000 lb/day, and the daily maximum discharge limit may increase to 100,000 lb/day As with the City of Gresham, seasonal variation in wastewater flow is the result of Portland's combined stormwater and municipal wastewater collection system

For all facilities except the City of St Helens WWTP, final effluent limits for fecal coliform are set at a monthly average of 200 colonies/100 mL and a weekly average of 400 colonies/100 mL The fecal coliform limit for the St Helens WWTP is set at the point where the primary treated municipal wastewater discharges to the secondary treatment system The fecal coliform bacteria limits are the same as for the other facilities.

The effluent limits for TCDD and AOX at the St Helens facility are set at an annual average of 8.8×10^{-7} lb/day and 3.0 lb ADT of bleached pulp, respectively. The short-term limits (a three-day maximum) are 1.4×10^{-6} lb/day and 3.8 lb/ADT for TCDD and AOX, respectively

2.2.1.3 NPDES Permit Monitoring Requirements. Monitoring requirements for major domestic WWTP facilities were summarized from permits available in ODEQ and WDOE files (Appendix B) Only influent and effluent monitoring requirements were summarized The WDOE permits require additional monitoring of treatment plant operations (e g , sludge volume index, dissolved oxygen (DO), and volatile suspended solids concentration in aeration basins) Because these parameters are not relevant to the estimation of pollutant loading, these requirements were not summarized. Monitoring requirements for all major facilities include measurements of the rate of discharge (flow), BOD, TSS, residual chlorine, and fecal coliform bacteria Monitoring of the final effluent temperature is required at all facilities except for the City of Astoria, City of Portland, City of Gresham, and Cowlitz County WWTPs WWTP facilities in Washington are also required to monitor DO

Only the City of St Helens, City of Portland, and the City of Gresham WWTP have additional monitoring requirements for metals and organic compounds Formerly, both the City of Portland and the City of Gresham had identical effluent monitoring requirements which included copper, lead, zinc, arsenic, chromium, cyanide, barium, boron, fluoride, iron, manganese, and total phenols However, under a recently re-issued NPDES permit for Portland, some of these requirements have been deleted and others added Portland is now required to monitor copper, cadmium, nickel, lead, zinc, silver, arsenic, chromium, mercury, cyanide, and total phenols on a monthly basis and dioxins, EPA priority pollutants, and Thorium 232 on a quarterly basis Other new requirements include weekly dry season monitoring of nutrients, effluent toxicity tests, and dilution studies New permit monitoring requirements for St Helens, OR include TCDD, 2,3,7,8-tetrachlorodibenzofuran (TCDF), AOX, color, chloroform, copper, cadmium, nickel, lead, zinc, silver, arsenic, chromium, mercury, cyanide, effluent toxicity tests, dilution studies, sediment, and biota investigations

Under NPDES permit requirements, flow is generally required to be monitored continuously Grab samples for temperature, pH, residual chlorine, and DO must be collected daily, except for the Astoria WWTP, which requires less frequent monitoring. The frequency of sampling for BOD and TSS varies from weekly to daily, but all samples must be composites Monthly monitoring of carbonaceous BOD (CBOD) using composite sampling is also required at the St Helens facility Fecal coliform sampling requirements vary from weekly to daily but are required to be grab samples.

Monitoring frequency for metals varies at the City of Portland, Gresham, and St Helens WWTPs The monitoring frequency required at the City of Portland, St Helens, and Gresham WWTPs is monthly, quarterly, and twice per year, respectively Both the City of St Helens and City of Portland are required to collect 24-hour composite samples, while the Gresham facility is only required to analyze grab samples.

The Portland and Gresham WWTPs must also monitor total phenols. Monthly 24-hour composite samples are required for Portland, and grab samples collected twice per year are required for Gresham The St Helens and Portland WWTPs have additional monitoring requirements for organic constituents that include TCDD, TCDF, AOX, chloroform, and priority pollutants

The Portland WWTP is required to measure dioxins quarterly using 24-hour composite samples, while the St Helens WWTP is required to measure TCDD, TCDF, and AOX, quarterly using 3-day composites Quarterly monitoring of U S EPA priority pollutants using composite samples is required at the Portland facility and quarterly monitoring of chloroform using grab samples is required at the St Helens facility

2.2.2 Minor Domestic Point Sources of Pollution

Eleven minor point sources discharge secondary treated domestic wastewater directly to the lower Columbia River (Table 4) Four of these facilities are located in Oregon, and seven are located in Washington These municipal WWTPs serve populations less than 10,000 and receive no significant contribution of industrial wastewater to their treatment systems

Three minor domestic WWTP facilities—Ilwaco and Ft Columbia State Park (Washington) and Warrenton (Oregon)—discharge to river segment 1A (Figure 1a). The Cathlamet WWTP in Washington discharges to river segment 2A (Figure 1b). Three facilities discharge to river segment 2C (Rainier, Riverwood Mobile Home Park, and Stella) (Figure 1b). The Kalama WWTP discharges to river segment 3A (Figure 1c) The Camas WWTP discharges to river segment 4A, and both the U S Army Corps of Engineers in Oregon and the City of North Bonneville in Washington discharge treated wastewater to the upper portion of river segment 4B (Figure 1d)

The City of Washougal has recently received a permit to discharge directly to the Columbia River. This facility presently discharges treated sanitary and some pretreated and/or untreated industrial wastewaters directly to the river The Washougal facility will discharge an average of 1 MGD of treated wastewater to river segment 4B (Figure 1D).

*2.2.2.1 **Pollutants of Concern.*** Pollutants of concern discharged by minor municipal WWTPs include BOD, TSS, nutrients, and pathogens

*2.2.2.2 **NPDES Permit Effluent Limits.*** NPDES permit limits for specific effluent constituents discharged by minor domestic WWTP facilities were summarized from permits on file with ODEQ and WDOE (Appendix C). Permit specifications include limits for flow, BOD, TSS, pH, and fecal coliform bacteria, as well as removal efficiency of BOD and TSS Flow limits in Oregon are based on average dry weather flow and range from 0 013 to 0 5 MGD. Flow limits in Washington are based on monthly average flow and range from 0.005 to 2.33 MGD The Stella WWTP in Washington was the only facility with a daily maximum limit (0 0035 MGD) Monthly average effluent limits for BOD range from 20 to 30 mg/L, with average monthly loading limits of BOD ranging from 1 25 to 583 lb/day Effluent limits for Stella differ from those of other minor domestic WWTPs, because limits for the Stella facility are based on daily averages and maximum concentrations (30 and 40 mg/L, respectively) for both BOD and TSS Effluent limits for TSS differ only slightly among minor domestic facilities in

TABLE 4 SUMMARY OF PERMITTED MINOR DOMESTIC DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Treatment Plant Type	Type of Discharge
OREGON										
City of Warrenton[b]	OR002087-7	3-31-92	Warrenton	Clatsop	7	1A	46°10'40"	123°55'0"	Two cell lagoon	Treated municipal wastewater
City of Rainier[b]	OR002038-9	1-31-95	Rainier	Columbia	67	2C	46°5'13"	122°56'48"	Activated sludge	Treated municipal wastewater
Riverwood Mobile[b] Home Park	OR003114-3	9-30-94	Riverwood	Columbia	70 6	2C	46°4'7"	122°53'45"	Recirculating gravel filter with disinfection	Treated municipal wastewater
U S Army Corps[b] of Engineers	OR202262-4	12-31-89	Bonneville	Multnomah	146 1	4B	45°37'57"	122°57'22"	NA[a]	Treated sanitary wastewater and fish hatchery wastes
WASHINGTON										
Town of Ilwaco	WA002315-9	8-21-92	Ilwaco	Pacific	3 0	1A	46°18'19"	124°01'58"	Activated sludge	Treated municipal wastewater
Ft Columbia State Park	WA003870-9	6-30-87	Chinook	Pacific	8 0	1A	46°15'03"	123°55'18"	Rotating biological contact	Treated municipal wastewater
Town of Cathlamet	WA002266-7	1-28-85	Cathlamet	Wahkiakum	40 0	2A	46°12'20"	123°23'15"	Aerated lagoon	Treated municipal wastewater
Stella Wastewater Treatment Plant	WA003915-2	10-15-82	Un-incorporated	Cowlitz	56 4	2C	46°11'26"	123°07'20"	Package aerated lagoon	Treated municipal wastewater
Town of Kalama	WA002032-0	7-6-84	Kalama	Cowlitz	75 5	3A	46°00'32"	122°50'42"	Activated sludge	Treated municipal wastewater
City of Camas	WA002024-9	11-24-91	Camas	Clark	121 2	4A	45°34'44"	122°23'17"	Extended aeration	Treated municipal wastewater
City of North Bonneville	WA002338-8	7-28-88	North Bonneville	Skamania	145	4B	45°37'49"	121°58'11"	Activated sludge	Treated municipal wastewater

[a] NA = Not available
[b] Latitude and Longitude were not present in NPDES files Values shown are estiamtes

the study area All facilities except those of Warrenton, OR and Cathlamet, WA have monthly average TSS limits of either 20 or 30 mg/L The limits for Warrenton and Cathlamet are 50 and 75 mg/L, respectively

Fecal coliform bacteria and pH limits are the same for all minor domestic WWTP facilities The monthly average fecal coliform concentration limit is 200 colonies/100 mL with a weekly average limit of 400 colonies/100 mL The Stella facility fecal coliform limits are based on daily averages and daily maximums The range of effluent pH for all minor domestic WWTPs is restricted to 6 0 to 9.0

2.2.2.3 NPDES Permit Monitoring Requirements. NPDES monitoring requirements for influent and effluent from minor domestic WWTP facilities were summarized from permits available in ODEQ and WDOE files (Appendix D). Monitoring requirements for all minor domestic facilities include measurements of flow, BOD, TSS, fecal coliform bacteria, pH, and residual chlorine Oregon facilities are also required to monitor chlorine usage WDOE permits have additional requirements for temperature, DO, and settleable solids.

The required monitoring frequency and type of sample that must be analyzed for each constituent varies among facilities Monitoring requirements for flow range from every other day to continuous monitoring. Sampling frequency for BOD and TSS range from weekly to quarterly Samples must be grabs, 8-hour, or 24-hour composites Fecal coliform sampling requirements range from weekly to quarterly grab samples Sampling requirements for pH range from daily to weekly grab samples Requirements for residual chlorine sampling range from daily to every-other-day grab sampling. WDOE requirements for temperature, DO, and settleable solids range from daily to three-per-week grab samples.

2.3 INDUSTRIAL POINT SOURCES

Twenty-four industrial facilities discharge directly to the waters of the lower Columbia River below Bonneville Dam. These facilities discharge a variety of pollutants: the composition discharged depends on the type of industry and the specific operational practices employed at each facility The major types of industry that discharge to the lower Columbia River include aluminum plants, pulp and paper mills, wood products facilities, seafood processing plants, power generating facilities, and chemical plants Each of these industries is discussed in detail in the following sections.

2.3.1 Aluminum Industry Point Sources of Pollution

Three aluminum plants discharge directly to the lower Columbia River below Bonneville Dam (Table 5) The Reynolds Metals Co plants in Troutdale, OR (RM 120) and Longview, WA (RM 63) are aluminum smelting facilities The Aluminum Company of America (ALCOA) facility in Vancouver, WA (RM 103) consists of three separate facilities Vanalco, Inc is the primary aluminum smelting facility, Vanexco, Inc is the extrusion and anodizing facility, and AC-PC, Inc produces aluminum wire The Reynolds Metals Company (Longview) discharges to river segment 2C (Figure 1b) The Reynolds Metals (Troutdale) and the ALCOA facilities discharge to river segment 4A (Figures 1c and 1d)

*2 3.1.1 **Pollutants of Concern.*** Pollutants of concern from aluminum industry discharges include aluminum, benzo(a)pyrene, fluoride, antimony, chromium, nickel, zinc, and to a lesser extent BOD, TSS, and pathogens from on-site sanitary wastewater treatment facilities.

*2.3.1.2 **NPDES Permit Effluent Limits.*** Permit effluent limits for aluminum industries were summarized from permits available in ODEQ and WDOE files (Appendix E). Two outfalls are permitted at the Reynolds Metals (Troutdale) facility. Outfall 001 discharges combined sanitary wastewater, cooling water, non-contact cooling water, electrostatic precipitator scrubber water, stormwater, and boiler blowdown Outfall 002 discharges treated sanitary wastewater that mixes with the final wastestream (i e , Outfall 001) Two outfalls are also permitted at the ALCOA facility Outfall 001 discharges treated process wastewater, contact and non-contact cooling water, and stormwater, while outfall 002 discharges treated sanitary wastewater Effluent limits are set at six locations at the Reynolds Metals Co (Longview) facility Because only outfalls 001 and 002 at the Reynolds Metals facility discharge directly to the Columbia River, only effluent limits for these outfalls are presented in Appendix E

Specific effluent constituents with limits for these aluminum industry facilities are BOD, TSS, total cyanide, oil and grease, fecal coliform bacteria, pH, fluoride, aluminum, benzo(a)pyrene, antimony, and nickel The Longview Reynolds Metals Company is the only facility that has a flow limitation (monthly average 0 22 MGD) The ALCOA facility (outfall 001) has additional limits for chromium and zinc These two Washington facilities also have additional effluent limitations for residual chlorine, and must conduct bioassays, and meet specific temperature criteria

Limits for BOD and TSS are similar for the three aluminum industry facilities. Monthly average effluent limits for BOD for the two Washington facilities are 25 mg/L, while the limit is 30 mg/L for the Oregon facility. Monthly average effluent limitations for TSS are 30 mg/L for all three facilities. Limits for total cyanide range from 0 15 to 5 8 lb/day, based on a

TABLE 5 SUMMARY OF PERMITTED ALUMINUM INDUSTRY POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Facility	Type of Discharge
OREGON										
<u>Major</u>										
Reynolds Metals Co [a]	OR000006-0	3/31/91	Troutdale	Multnomah	120	4A	45°33'57"	122°24'37"	Primary aluminum smelting	Non-contact cooling water, treated sanitary wastes, contact cooling water, boiler blowdown, and electrostatic-precipitator scrubber water
WASHINGTON										
<u>Major</u>										
Reynolds Metals Co	WA000008-6	10/15/95	Longview	Cowlitz	63	2C	N46°08'05"	W123°00'10"	Primary aluminum smelting	Industrial and sanitary wastewater, non-contact cooling water, stormwater
The Aluminum Co of America (ALCOA)	WA000029-9	31/7/94	Vancouver	Clark	103	4A	N45°38'58"	W122°44'41"	Primary aluminum smelting aluminum forming, aluminum finishing	Industrial wastewater, stormwater

[a] Latitude and Longitude were not present in NPDES files Values shown are estimates

monthly average Monthly average oil and grease limits range from 10 to 175 lb/day Fecal coliform limits are 200 colonies/100 mL based on a monthly average and 400 colonies/100 mL based on a weekly average Limits for pH are generally 6 0 to 9 0, except for outfall 001 at the Reynolds Metals (Longview) facility, the limit is set at 6 8 to 8 5 Monthly average fluoride limits range from 100 to 608 lb/day Monthly average aluminum limits range from 9 18 to 52 lb/day The benzo(a)pyrene monthly average limit ranges from 0 002 to 0 05 lb/day The antimony monthly average limits range from 0 98 to 9 8 lb/day The limit for nickel ranges from 0 42 to 2 8 lb/day The ALCOA facility monthly average limits for chromium and zinc are 0 8 and 1 8 lb/day, respectively

2.3.1.3 NPDES Permit Monitoring Requirements NPDES Monitoring requirements for aluminum industry permits were obtained from ODEQ and WDOE files (Appendix F) These requirements include measurements of flow, temperature, pH, BOD, TSS, oil and grease, cyanide, residual chlorine, fecal coliform, fluoride, aluminum, benzo(a)pyrene, antimony, cadmium, copper, chromium, lead, nickel, and zinc

Monitoring requirements for aluminum industries vary between the two states Continuous flow measurements are required for the two Washington facilities, while daily measurements are allowed for Reynolds Metal in Troutdale, OR Continuous temperature monitoring is required for the Washington facilities, while no monitoring of temperature is required for the Oregon facility Washington facilities must monitor BOD at least weekly and TSS daily by analyzing 24-hour composite samples. The Oregon facility must monitor BOD and TSS twice monthly by analyzing a grab sample. Oil and grease monitoring at the Washington facilities must be conducted daily using grab samples, while the Oregon facility is required to analyze three 24-hour composite samples per week Free cyanide monitoring is required only for outfall 002A of the Reynolds Metals Longview facility. These cyanide samples must be daily 24-hour composites

Both Oregon and Washington facilities are required to measure residual chlorine samples in daily grab samples and fecal coliform bacteria concentration in weekly grab samples Benzo(a)pyrene, fluoride, antimony, aluminum, and nickel monitoring requirements vary from daily to weekly 24-hour composites At the ALCOA facility, chromium and zinc must be sampled twice weekly and daily, respectively, both as 24-hour composites Although no bioassay limit was set for the Reynolds Metals Troutdale facility, bioassay monitoring is required either quarterly or semi-annually.

2.3.2 Pulp and Paper Industry

Six major pulp and paper facilities discharge effluent to the main stem of the lower Columbia River below Bonneville Dam. Four of these facilities are located in Washington and two are located in Oregon. Five of these facilities have NPDES permits as shown in Table 6 The remaining facility, Boise Cascade Corporation in St. Helens, Oregon, does not have its own NPDES permit This facility discharges its effluent to a secondary treatment system owned and operated by the City of St Helens NPDES permit effluent limits and monitoring requirements for the City of St Helens are discussed in Sections 2 2.1.2 and 2 2 1.3, respectively

The pulp and paper mills located along the lower Columbia River use both chemical (kraft and sulfite) and mechanical pulping processes Pulp produced by any of the pulping processes may be bleached The amount of production which is bleached varies, ranging from 10 percent or less at Longview Fibre to 100 percent at some mills (Matthews, L 5 May 1992, personal communication).

The Boise Cascade Corporation facility in Vancouver, Washington does not produce pulp on-site, but instead purchases pulp for paper production. This mill applies sodium hypochlorite bleach to 100 or more tons per day of reprocessed waste paper to manufacture secondary fiber pulp (Matthews, L , 5 May 1992, personal communication).

The James River II, Inc (Clatskanie, OR) mill discharges treated effluent at RM 42 within river segment 2A (Figure 1b). The two pulp and paper mills located in Longview, WA (Weyerhaeuser Paper and Longview Fibre) discharge to RM 63.5 and RM 67 5, respectively within river segment 2C (Figure 1b). The Boise Cascade paper mill in Vancouver, WA and the James River II mill in Camas, WA discharge to RM 106 and RM 120, respectively within river segment 4A (Figures 1c and 1d).

2.3.2.1 ***Pollutants of Concern.*** Pollutants of concern that may be discharged from pulp and paper industry facilities include BOD, TSS, copper, lead, nickel, chlorinated organic compounds (e g , TCDD and TCDF), biocides (e g , slimicides), and fecal coliform bacteria

2.3.2.2 ***NPDES Permit Effluent Limits.*** NPDES permit effluent limits for pulp and paper mills were summarized from permits available in ODEQ and WDOE files (Appendix G) Effluent limits vary from facility to facility, and among the various outfalls located at a given facility These limits are based on U.S. EPA's effluent guidelines which are based on process types and production capacity. At the Wauna James River II facility, outfall 001 discharges treated process wastewater while outfalls 002, 003, and 004 discharge stormwater, water

TABLE 6 SUMMARY OF PERMITTED PULP AND PAPER INDUSTRY POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Industry	Type of Discharge
OREGON										
James River II, Inc (Wauna mill)	OR000079-5	11-30-95	Clatskanie	Clatsop	42 0	2A	46°09'13"	123°23'51"	Bleached kraft/groundwood pulp and paper mill	Process wastewater, stormwater, water supply-filter backwash, log washer effluent
WASHINGTON										
Weyerhaeuser Paper Co (Longview)	WA000012-4	5-10-96	Longview	Cowlitz	63 5	2C	46°7'50"	122°59'27"	Kraft and thermomechanical pulp and paper board mill Chlor-alkali plant Wood products Newsprint de-inking	Process wastewater, treated sanitary wastewater
Longview Fibre Co	WA000007-8	5-10 96	Longview	Cowlitz	67 5	2C	46°05'45"	122°55'00"	Kraft and NSSC pulp, paper, and paperboard mill	Process wastewater, treated sanitary wastewater, water supply-filter backwash
Boise Cascade Corp (Vancouver)	WA000026-4	2-13-95	Vancouver	Clark	106 0	4A	45°37'20"	122°40'50"	Paper mill (pulp is purchased)	Process wastewater (process wastewater is from paper production only)
James River II, Inc (Camas mill)	WA000025-6	5-10-96	Camas	Clark	120 0	4A	45°35'00"	122°24'30"	Kraft and sulfite, bleached and unbleached and paper mill	Process wastewater, treated sanitary pulp wastewater

supply-filter backwash water, and log washer effluent. The Boise Cascade (Vancouver) facility has limits for BOD, TSS, and pH, and must report data on discharge flow and effluent temperature For Weyerhaeuser Paper outfalls 001 and 002, there are reporting requirements for the discharge of treated process wastewater, and sanitary wastewater from outfall 005 At that plant, permit limits are also set for the discharge of wastewater from the chlor-alkali plant before mixing with the other wastestreams The Longview Fibre Company permit limits apply to outfall 001, which discharges treated process wastewater, sanitary wastewater, and boiler blowdown water At the Camas James River II facility, the combined discharge of treated process wastewater and sanitary wastewater is permitted

For the pulp and paper industry facilities, monthly average BOD effluent limits for process wastewater and/or combined wastewater vary depending on process type and production level and range from 3,400 lb/day to 31,100 lb/day. Monthly average limits for TSS range from 4,700 to 54,800 lb/day At the Weyerhaeuser Paper facility, monthly average effluent limits for the chlor-alkali plant wastewater discharge are 4 1 lb/day for copper, 2.0 lb/day for lead, and 3 1 lb/day for nickel Effluent limits for pH are generally lower than those for domestic wastewaters (5 0 to 9 0 or 5 0 to 8 5) Fecal coliform limits do not apply to the discharge of process effluent, but only apply to the discharge of treated sanitary wastewater only These limits are 200 colonies/100 mL on a monthly average and 400 colonies/100 mL as a daily maximum limit.

Effluent limits for TCDD are production based and range from $4 6 \times 10^{-7}$ to 18×10^{-7} lb/day on an annual average for this industry. Effluent limits for AOX are set on a production basis of 3 0 lb/ADT Recent legislation enacted by the State of Washington on 11 June 1992 alters the way AOX limits are to be set for Washington pulp and paper mills. The Boise Cascade facility has no effluent limits for TCDD or AOX because it does not produce bleach kraft pulp.

2.3.2.3 ***NPDES Permit Monitoring Requirements.*** Monitoring requirements for pulp and paper mills were summarized from permits available from ODEQ and WDOE files (Appendix H) All five paper industry facilities have effluent limits on BOD, TSS, pH, and reporting requirements for flow and temperature. Monitoring frequency requirements for the measurement of flow, pH, and temperature range from grab samples to 24-hour continuous measurements. BOD and TSS in process effluent must be monitored daily to five times per week in 24-hour composite samples.

In addition to BOD, TSS, pH, temperature and flow, Weyerhaeuser Paper must monitor residual chlorine, copper, lead, nickel, fecal coliform, TCDD, TCDF, and AOX The frequency requirement for monitoring of copper, lead, and nickel is twice per year using composite samples Monitoring requirements at the James River II Wauna pulp and paper mill include BOD, TSS, pH, temperature, flow, TCDD, TCDF, and AOX Monitoring frequency required for TCDD and TCDF at all facilities is quarterly with 24-hour composites required at the Washington facilities and 3-day composites required at the Oregon facility Monitoring frequency requirements for AOX also varied between states The sampling frequency required in Washington was weekly and monthly in Oregon using 24-hour and 3-day composites, respectively Constituents monitored by Longview Fibre include BOD, TSS, pH, temperature, flow, oil and grease, TCDD, TCDF, and AOX Monitoring requirements for the Camas James River II mill include BOD, TSS, pH, temperature, flow, fecal coliform, TCDD, TCDF, and AOX

Washington NPDES permits for the pulp and paper mill industry also specify that slimicide usage be summarized and reported annually. No slimicide usage data were available in NPDES permit files for 1989 or 1990

2.3.3 Wood Products Industry Point Sources of Pollution

Six permitted wood products industry point sources discharge to the lower Columbia River below Bonneville Dam (Table 7) These industries include two plywood manufacturers, one veneer mill, one wood chip transfer facility, one sawmill, and one former wood treatment facility.

Because the types of wastewater discharge from these facilities vary, they are difficult to generalize The Astoria Plywood Corporation is permitted to discharge log pond water and log yard runoff at RM 15 within river segment 1B (Figure 1a). The International Paper Company (Longview) is a former wood treatment facility currently permitted to discharge treated sanitary wastewater at RM 66.5 within river segment 2C (Figure 1b) A draft permit for this facility also permits the discharge of treated groundwater from an on-site groundwater remediation project This groundwater was contaminated with pentachlorophenol and creosote compounds by the former wood treatment activities The Boise Cascade veneer mill is permitted to discharge non-contact cooling water and cooling tower blowdown at RM 86 within river segment 3A (Figure 1c) Three facilities discharge to river segment 4A (Figures 1c and 1d) The James River II Sundial Chip Reloading facility is permitted to discharge treated stormwater runoff at RM 119 Fort Vancouver Plywood is permitted to discharge stormwater and non-contact cooling water at RM 105 2 And Columbia Vista Corporation is permitted to discharge mill washdown water, stormwater, and steamcleaner water at RM 115 6

*2 3.3.1 **Pollutants of Concern.*** Pollutants of concern that may be discharged from wood products industry include BOD, TSS, oil and grease, phenols (including pentachlorophenol), creosote compounds, and metals including copper, cadmium, chromium, and zinc. Fecal coliform

TABLE 7 SUMMARY OF PERMITTED WOOD PRODUCTS INDUSTRY POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Industry	Type of Discharge
OREGON										
Minor										
Astoria Plywood Corp [a]	OR000043-4	12-31-95	Astoria	Clatsop	15 0	1B	46°11'44"	123°47'37"	Plywood manufacture	Wet storage facility (log pond) water
Boise St Helens Veneer Mill [a]	OR002733-2	12-31-95 and 7-31-91	St Helens	Columbia	86 0	3A	45°50'55"	122°47'57"	Veneer mill	Non-contact cooling water and boiler blow-down
James River Sundial Chip Reloading Facility [a]	OR003269-7	7-31-93	Fairview	Multnomah	119 0	4A	45°33'45"	122°25'44"	Wood chip facility	Treated stormwater runoff
WASHINGTON										
Minor										
International Paper Co	WA004012-6 WA003872-5	Draft 5-31-81	Longview	Cowlitz	66 5	2C	46°06'15"	122°57'00"	Former wood products, groundwater remediation	Sanitary wastes and treated groundwater
Fort Vancouver Plywood Co	WA000004-3	8-7-92	Vancouver	Clark	105 2	4A	45°37'44"	122°41'24"	Plywood manufacture	Saw raft, stormwater runoff, and non-contact cooling water
Columbia Vista Corp	WA003996-9	6-12-92	Vancouver	Clark	115 6	4A	45°35'10'	122°28'05"	Sawmill	Mill washdown water, stormwater, and steam-cleaner effluent

[a] Latitude and Longitude were not present in NPDES files Values shown are estimates

bacteria associated with the discharge of treated sanitary wastewater from International Paper (Longview) may also be of concern

2.3.3.2 NPDES Permit Effluent Limits. NPDES permit limits for the wood products industry were summarized from ODEQ and WDOE permit files (Appendix I) Permit effluent limits vary according to the type of wastewaters discharged there is not a single constituent that must be measured by all facilities listed in Appendix I NPDES does not require specific flow rate limitations for all facilities For example, the flow limit for the Astoria Plywood Corporation log pond is listed as "as low as practicable" The maximum daily discharge allowed is 0.432 MGD at International Paper Daily maximum temperature limits are specified for two facilities—150° F for the Boise Cascade Corporation (St Helens) veneer mill and 85° F for the Fort Vancouver Plywood Oil and grease limits are mandated for several facilities (monthly average of 10 mg/L) Effluent limits for International Paper's treated sanitary wastewater discharge include BOD, TSS, and fecal coliform bacteria Monthly average limits for BOD and TSS are 62 lb/day The draft permit for International Paper specifies daily maximum concentration limits for nitrate-N (10 mg/L), total polyaromatic hydrocarbons (PAH) (2.2 ug/L), and pentachlorophenol (10 ug/L). Fort Vancouver Plywood has wastewater discharge limits for temperature (85° F), oil and grease (10 mg/L), pH (6.0–9.0), and settleable solids (0.1 mL/L) Columbia Vista Corporation has wastewater discharge limits for monthly average and daily maximum oil and grease concentrations (10 mg/L and 15 mg/L, respectively), pH (6.0–9.0), daily maximum pentachlorophenol concentrations (10 ug/L), and a total recoverable metals limit of 1.0 toxicity units

2.3.3.3 NPDES Permit Monitoring Requirements NPDES Permit monitoring requirements for the wood products industry are summarized in Appendix J These requirements generally reflect permit effluent limits The frequency of required flow monitoring varies from continuous to monthly Temperature monitoring requirements vary from weekly to monthly grab samples Oil and grease monitoring is required weekly, using grab samples. The draft permit for International Paper requires BOD, TSS, fecal coliform bacteria, and total organic carbon monitoring twice weekly by grab sample Required monitoring for nitrate-N, pentachlorophenol, and total polyaromatic hydrocarbons (PAH) is weekly using grab samples Pentachlorophenol monitoring at Columbia Vista is required yearly using grab samples Total recoverable metals (copper, cadmium, chromium, and zinc) at Columbia Vista is required monthly also by grab sample Although no permit limit was set for phenol, Fort Vancouver Plywood's permit requires monthly grab samples be analyzed for phenol

2.3.4 Seafood Processing Industry Sources of Pollution

Eight permitted facilities discharge seafood processing waste to the lower Columbia River below Bonneville Dam (Table 8) All of these facilities are located in the estuarine portion of the river at or below river mile 12 (River Segments 1A and 1B) (Figure 1a) Seven of the facilities process fresh fish and shellfish Although Bioproducts, Inc has been grouped with the seafood processing industries, it converts seafood processing waste into fish feed for commercial fish farming operations The NPDES permit for Bioproducts includes the discharge of water from a small demonstration fish farming facility

*2 3.4.1 **Pollutants of Concern.*** Pollutants of concern for these industries are BOD, TSS, oil and grease, nutrients, and possible pathogens

*2.3.4.2 **NPDES Permit Effluent Limits.*** NPDES effluent limits for seafood processing facilities are presented in Appendix K For TSS and oil and grease, Washington and Oregon facilities have permit limits that depend on the type and amount of fish or shellfish processed The two facilities in Washington have additional limits for BOD (which also depend on the type and amount of product processed), temperature (daily maximum of 65^{o} F), and pH Bioproducts is the only facility with a flow limitation (0 52 MGD) The pH of processed wastewater must be kept between 6 0 to 9 0 for the two Washington facilities and Bioproducts

*2.3.4.3 **NPDES Permit Monitoring Requirements.*** Monitoring requirements for seafood processing facilities are presented in Appendix L. Washington facilities must measure discharge flow, TSS, oil and grease, BOD, pH, temperature, and fecal coliform concentration The Chinook Packing Company in Washington is also required to measure total phosphorus and ammonia Oregon facilities, whose monitoring requirements are specified in the general NPDES permit, must measure only TSS and oil and grease

NPDES monitoring and reporting requirements for seafood processors also depend on other factors WDOE permits require monitoring for four months during peak processing during the first and fourth years of the permit The general ODEQ permit does not require the monitoring of TSS and oil and grease if the waste is screened through a number 40 mesh or finer screen, or if an acceptable alternative of treatment method is used.

2.3.5 Power Generating Facilities

Two NPDES-permitted power generating facilities discharge to the lower Columbia River below Bonneville Dam the Trojan Nuclear Power Plant and the Beaver Generating Plant (Table 9) The Trojan Nuclear Power Plant (Rainier, OR) is classified as a major facility and discharges cooling water through outfall 001 and treated sanitary wastewater via outfall 002 at

TABLE 8 SUMMARY OF PERMITTED SEAFOOD PROCESSING DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Facility	Type of Discharge
OREGON										
Warrenton Deep Sea, Inc [a]	OR000193-7	12-31-91	Warrenton	Clatsop	7 0	1A	46°09'59"	123°54'56"	Seafood processing	Seafood processing waste
Point Adams Packing Co [a]	OR000086-8	12-31-91	Hammond	Clatsop	9 0	1A	46°12'19"	123°56'52"	Seafood processing	Seafood processing waste
Bioproducts, Inc [a]	OR000061-2	7-31-91	Warrenton	Clatsop	10 8	1A	46°11'45"	123°55'58"	Fish food processing, fish aquaculture	Fish tank water, fish process waste, and wash down water
Pacific Coast Seafood Co [a]		12-31-91	Warrenton	Clatsop	11 0	1A	46°10'11"	123°54'49"	Seafood processing	Seafood processing waste
Ocean Foods of Astoria [a]	OR000192-9	12-31-91	Astoria	Clatsop	12 0	1B	46°11'33"	123°48'42"	Seafood processing	Seafood processing waste
Astoria Seafood Co [a]	OR000151-1	12-31-91	Astoria	Clatsop	12 0	1B	46°11'46"	123°47'55"	Seafood processing	Seafood processing waste
WASHINGTON										
Jessie's Ilwaco Fish Co	WA000036-1	3-25-96	Ilwaco	Pacific	3 0	1A	46°18'27"	124°02'14"	Seafood processing	Seafood processing waste
Chinook Packing Co	WA000015-9	5-20-96	Chinook	Pacific	6 0	1A	46°16'18"	123°56'48"	Seafood processing	Seafood processing waste

[a] Latitude and Longitude were not present in NPDES files Values shown are estimates

TABLE 9 SUMMARY OF PERMITTED POWER GENERATION POINT SOURCES TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Discharge
__OREGON__									
__Major__									
Trojan Nuclear Power Plant	OR002345-1	11-30-95	Rainier	Columbia	72.5	3A	46°02'26"	122°52'56"	Cooling water, treated sanitary wastewater, settling basin effluent, boiler blowdown, neutralizing tank effluent, oil/water separator effluent
__Minor__									
Beaver Generating Plant[b]	OR202743-0	NA[a]	Clatskanie	Columbia	54.0	2B	46°10'48"	123°11'0"	Cooling water

[a] NA = Not available
[b] Latitude and Longitude were not present in NPDES files. Values shown are estimates

RM 72 5 within river segment 3A (Figure 1c). The discharge of settling basin effluent, boiler blowdown, neutralizing tank effluent, and oil/water separator effluent is regulated before discharge of the final effluent The Beaver Generating Plant (Clatskanie, OR) is classified as a minor facility Its permit is for the discharge of cooling water at RM 54 within river segment 2B, the only direct permitted point source discharge to this river segment (Figure 1b).

2.3.5 1 Pollutants of Concern Pollutants of concern for both plants include temperature impacts to the river due to the discharge of heated effluent, TSS, sodium, sulfate, aluminum, boron oil and grease, copper, iron, and to a lesser extent, BOD and pathogens from the discharge of treated sanitary wastewater at the Trojan Nuclear Power Plant

2.3.5.2 NPDES Permit Effluent Limits NPDES permit limits for power plants were summarized and are presented in Appendix M. Effluent limits for the Beaver Generating Plant include limits for flow (1 44 MGD), residual chlorine (0 2 to 0 5 mg/L), temperature (100° F maximum), pH (6 0 to 9 0), TSS (monthly average of 15 mg/L), and copper and iron (daily maximum of 1 mg/L). Effluent limits for the Trojan Nuclear Power Plant are more extensive and include limits for flow (64 3 MGD), sodium (monthly average of 25 mg/L), residual chlorine (0 1 mg/L), sulfate (monthly average of 240 mg/L), boron (monthly average of 0 1 mg/L), aluminum (monthly average of 0 5 mg/L), heat (7 9 x 10^6 BTU/hr), temperature (monthly average temperature change not to exceed 5° C), pH (6.0 to 9 0), BOD and TSS (monthly average of 12 5 lb/day), and copper and iron (monthly average of 1 0 lb/day)

2.3.5.3 NPDES Permit Monitoring Requirements NPDES monitoring requirements for the Trojan Nuclear Power and Beaver Generating plants are presented in Appendix N. For both plants, monitoring is required for all permit limit parameters. In addition, monthly fecal coliform bacteria sampling is required for the treated sanitary wastewater stream at the Trojan Nuclear Power Plant Weekly total dissolved solids monitoring and twice monthly measurements of oil and grease are also required at the Trojan facility

Continuous monitoring is required for flow, temperature, and chlorine residual Requirements for pH monitoring range from continuous to weekly Requirements for BOD and TSS sampling range from weekly to monthly, the type of sample varies from a grab to a 24-hour composite Monitoring requirements for sodium, sulfate, aluminum, and boron are twice monthly, 24-hour composites. Total copper and iron sampling are required monthly, but vary from grab to 24-hour composite sampling.

2.3.6 Chemical Industry

Four chemical facilities discharge to the lower Columbia River below Bonneville Dam (Table 10) These include Chevron Chemical Company (St. Helens), a fertilizer plant classified as a major facility It discharges process wastewater and cooling water at RM 82 within river segment 3A (Figure 1c). Kalama Chemical, Inc. is a manufacturer of organic chemicals and discharges at RM 74 within river segment 3A (Figure 1c). Historically, this facility produced phenols for the plywood industry. Today it produces commercial products for the food, flavor/fragrance, and pharmaceutical industries. In 1989, the effluent contained 2 6 million gallons of treated groundwater from an on-site groundwater remediation pump-and-treat process Discharge of cooling water is regulated at outfall 001, and discharge of treated process wastewater is regulated at outfall 002. Virginia Chemicals, Inc. (or Hoecht-Celanese Corporation) in Kalama, WA is a hydrosulfite production facility (classified as a minor facility) It is permitted to discharge treated process wastewater (sodium and zinc hydrosulfite production) at RM 76 within river segment 3A (Figure 1c). The GATX Terminals Corporation in Vancouver, WA is an antifreeze production/packaging, and bulk liquid handling service (classified as a minor facility). It discharges boiler blowdown, water softener regenerate, stormwater, and hydrostatic test flow water at RM 104 within river segment 4A (Figure 1c)

2.3.6.1 Pollutants of Concern. Pollutants of concern include BOD, TSS, oil and grease, potentially toxic organic compounds, cyanide, copper, nickel, zinc, magnesium, cobalt, arsenic, chromium, lead, cadmium, tin, and nutrients (e.g., total phosphorus, ammonia-N, and organic-N)

2.3.6.2 NPDES Permit Effluent Limits. Permit limits were summarized from ODEQ and WDOE files and are presented in Appendix O. Permit effluent limits varied because of the variety and size of the chemical industries identified.

Effluent limits for Chevron Chemical include flow (daily maximum of 25 MGD), pH (6.0 to 9.0), temperature, oil and grease (daily average of 10 lb/day), ammonia-N (monthly average of 229 lb/day) and organic-N (monthly average 368 lb/day).

Effluent limits for Kalama Chemical include limits for flow (daily maximum of 0.225 MGD), temperature, pH, and daily average limits for BOD (37 lb/day), TSS (52 lb/day), oil and grease (15 lb/day), copper (0.348 lb/day), zinc (0 627 lb/day, nickel (0.205 lb/day), total phosphorus (5 0 mg/L), and ammonia-N (15 mg/L). Additional limits are set for 56 volatile and semi-volatile organic compounds.

TABLE 10 SUMMARY OF PERMITTED CHEMICAL INDUSTRY POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Industry	Type of Discharge
OREGON										
<u>Major</u>										
Chevron Chemical Co	OR000163-5	12-31-91	St Helens	Columbia	82 0	3A	45°55'10"	122°48'52"	Fertilizer manufacture	Process wastewater and cooling water
WASHINGTON										
<u>Major</u>										
Kalama Chemical, Inc	WA000028-1	12-14-95	Kalama	Cowlitz	74 0	3A	46°01'18"	122°51'35"	Production of chemicals used in the plywood, food, flavor/fragrance, and pharmaceutical industries	Non-contact cooling water, treated process wastewater, process area stormwater runoff
<u>Minor</u>										
Virginia Chemicals, Inc (Hoecht-Celanese Corp)	WA000035-3	5-15-81	Kalama	Cowlitz	76 0	3A	45°59 43"	122°50'29"	Hydrosulfite production	Non-contact cooling water
GATX Terminals Corp	WA000041-8	09-23-92	Vancouver	Clark	104 0	4A	45°38'09"	122°42'38"	Antifreeze production/packaging, bulk liquid storage and handling service	Boiler blowdown, water softener regenerent, stormwater and hydrostatic testing water

Effluent limits for Virginia Chemicals (Hoecht-Celanese) include flow (daily average 1 0 MGD) and zinc (daily maximum 1 25 lb/day) Effluent limits for GATX Terminals Corporation include temperature, pH, total organics/solvents, and an acute salmonid bioassay

2.3.6.3 NPDES Permit Monitoring Requirements Monitoring requirements for chemical industries discharging to the lower Columbia River are presented in Appendix P Monitoring requirements for the Chevron Chemical facility include daily monitoring of flow, temperature, and pH and twice weekly, 24-hour composite sampling for ammonia-N and organic-N Weekly grab samples for oil and grease are also required Monitoring requirements for Kalama Chemical include continuous monitoring of flow, temperature, and pH, and weekly monitoring of oil and grease, copper, nickel, zinc, total phosphorus, ammonia-N, total phenols. Kalama Chemical must do monthly monitoring of cyanide, and quarterly monitoring of cobalt, arsenic, chromium, lead, cadmium, magnesium, tin and 56 volatile and semivolatile organic compounds Required monitoring at Virginia Chemicals includes continuous monitoring of flow and temperature, weekly grab samples for pH, and weekly, 24-hour composite samples for zinc

2.3.7 Miscellaneous Industrial Point Sources of Pollution

Four miscellaneous industrial point sources to the lower Columbia River were identified (Table 11) Pendleton Woolen Mills in Washougal, WA is classified as a major industrial facility and discharges at RM 122 8 within river segment 4B (Figure 1d). Only outfall 001, however, discharges directly to the Columbia River From outfall 001, discharge is permitted for treated process wastewater from the dye house, wool mixing department, boiler house, and wool finishing department Discharge of air conditioning condensate and stormwater runoff is permitted via outfalls 004, 005, and 006 to an unnamed tributary of Gibbons Creek

The remaining miscellaneous industrial facilities were classified as minor These facilities discharge to river segment 4A (Figure 1c) Great Western Malting Company (RM 105 1) and Ideal Basic Industries (Holnam Inc.) in Vancouver, WA (RM 105.5) are permitted to discharge non-contact cooling water. Northwest Packing Company (RM 105.1) is permitted to discharge can cooling and non-contact cooling water

2.3.7.1 Pollutants of Concern. Pollutants of concern from miscellaneous industry include heat due to the discharge of cooling water effluent, oil and grease, BOD, COD, TSS, phenol, chromium, and sulfide.

2.3.7.2 NPDES Permit Effluent Limits. NPDES effluent limits for miscellaneous industrial facilities are presented in Appendix Q. Effluent limits for Pendleton Woolen Mills include pH (6.0-9 0) and daily average limits for flow (1 MGD), oil and grease (10 mg/L), BOD

TABLE 11 SUMMARY OF PERMITTED MISCELLANEOUS INDUSTRIAL POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Industry	Type of Discharge
WASHINGTON										
Major										
Pendleton Woolen Mills	WA000023-0	8-23-96	Washougal	Clark	122 8	4B	45°34'27"	122°21'04"	Wool finishing	Treated process wastewater, air-conditioning condensate, and stormwater
Minor										
Great Western Malting Co	WA000001-9	7-21-82	Vancouver	Clark	105 1	4A	45°37'52"	122°41'39"	Malt house	Non-contact cooling water
Ideal Basic Industries Co , Inc (Holnam, Inc)	WA000032-9	6-22-83	Vancouver	Clark	105 5	4A	45°37'37"	122°41'11"	Cement plant	Non-contact cooling water
Northwest Packing Co	WA003910-1	8-3-94	Vancouver	Clark	105 1	4A	45°37'56"	122°41'23"	Fruit and vegetable processing	Can cooling and non-contact cooling water

(204 lb/day), TSS (321 lb/day), total chromium (1 3 lb/day), phenol (1 3 lb/day), sulfide (2 6 lb/day), chemical oxygen demand (COD) (1487 lb/day), and effluent toxicity. A dieldrin limit of 0 038 ug/L is also imposed when the facility is discharging treated groundwater from an on-site groundwater remediation program

Effluent limits for the remaining miscellaneous industry facilities are similar Flow limits range from 0 0049 to 9 9 MGD as a daily maximum, temperature from 56 to 100° F as a daily maximum, and pH from 6 0 to 9 0

2 3.7 3 NPDES Permit Monitoring Requirements. Permit monitoring requirements were summarized from permit files available from ODEQ and WDOE and are presented in Appendix R Monitoring is required only for permit limit parameters with an additional requirement of annual monitoring of priority pollutants at Pendleton Woolen Mills. The frequency of flow measurement required is continuous. Temperature and pH monitoring requirements vary from weekly grab samples to continuous monitoring. At the Pendleton Woolen Mills facility oil and grease and BOD monitoring are required weekly using 24-hour composites. Sampling of phenol and sulfide (and dieldrin when treated groundwater is discharged) are required weekly using 24-hour composites. Effluent COD and TSS monitoring are required twice weekly on 24-hour composite samples. Monthly effluent toxicity testing is also required

2.4 AGRICULTURAL FACILITY POINT SOURCES

All point sources classified as agricultural on the lower Columbia River are fish hatcheries Three fish hatchery operations discharge wastewater directly to the lower Columbia River below Bonneville Dam (Table 12). In Prescott, OR the Oregon Department of Fish and Wildlife (ODFW) operates a fish hatchery that discharges fish culture water at RM 73 within river segment 3A (Figure 1c). Another ODFW fish hatchery is located in Wahkeena, OR and discharges fish culture water at RM 134 within river segment 4B (Figure 1d) The Vancouver Trout hatchery in Washington discharges fish culture water at RM 113 5 within river segment 4A (Figure 1d)

2.4.1 Pollutants of Concern

Pollutants of concern from fish hatcheries include BOD, TSS, settleable solids, and chemicals (antibiotics) used in fish rearing ponds.

TABLE 12 SUMMARY OF PERMITTED AGRICULTURAL (FISH HATCHERY) POINT SOURCE DISCHARGERS TO THE LOWER COLUMBIA RIVER

Source	Permit Number	Expiration Date	City	County	River Mile	River Reach	Latitude (North)	Longitude (West)	Type of Discharge
OREGON									
Oregon Department of Fish and Wildlife	OR002996-3	12-31-95	Prescott	Columbia	73	3A	NA	NA	Fish culture water, holding tanks-cleaning water
Oregon Department of Fish and Wildlife	OR002792-8	12-31-95	Wahkeena	Multnomah	134	4B	NA	NA	Fish culture water, holding tanks-cleaning water
WASHINGTON									
Vancouver Trout Hatchery	WA003827-0	1-7-81	Vancouver	Clark	113 5	4A	45°34'59"	122°32'37"	Fish culture water, holding tanks-cleaning water

[a] NA = Not available

2.4.2 NPDES Permit Effluent Limits

Effluent limits for Oregon facilities are presented in Appendix S. Limits specified for Oregon facilities include daily average limits for settleable solids (0.1 mL/L), TSS (5 mg/L), and pH (6 0–9 0) Additional limits are set for hatchery clean-up operations for settleable solids (0 2 mL/L) and TSS (15 mg/L). Effluent limits for the Vancouver Trout Hatchery include flow (4 05 MGD), settleable solids (daily average 0 1 mL/L), and TSS (daily maximum 15 mg/L) These effluent limitations are net allowable values above that of the intake water The Vancouver Trout Hatchery is also required to report the pounds of fish stock and pounds of fish food used monthly

2.4.3 NPDES Permit Monitoring Requirements

NPDES Permit monitoring requirements for fish hatcheries were summarized and presented in Appendix T Although Oregon requires its facilities be monitored weekly for flow, settleable solids, and TSS, the permit also states that monitoring need only be performed during the month of highest production each quarter. Monitoring at the Vancouver Trout Hatchery is required weekly for flow and settleable solids and daily for TSS during cleanup operations

2.5 POINT SOURCE POLLUTANT LOADING ESTIMATES

From data in ODEQ and WDOE permit and DMR files, pollutant loading of as many constituents as possible was estimated for 1989 and 1990 The goal was either to calculate monthly loading based on monthly average flow and monthly average pollutant concentration, or to use monthly average loading as reported in the DMRs. Long-term trends in pollutant discharge data were not part of this analysis Instead, the goal of point source pollutant loading estimates was four-fold:

- To determine what loading data were available
- To estimate recent loading to the lower Columbia River where data were available
- To compare estimates among permitted discharges
- To compare estimates of loading with estimates of loading from other non-point and in-place pollution sources.

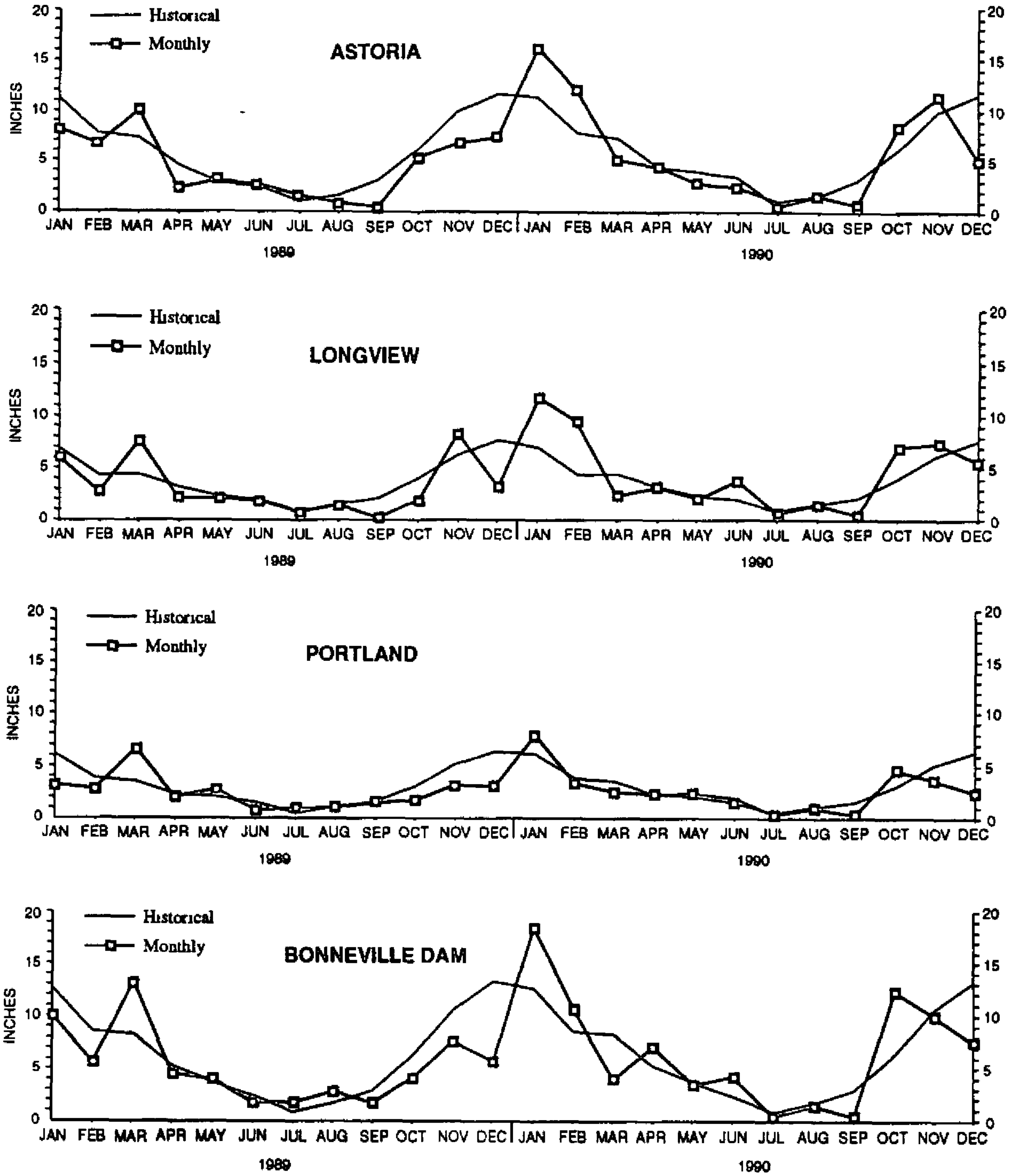
The two most recent years for which complete data were available (1989 and 1990) were selected for calculations Loading estimates were made on a seasonal (dry and wet) basis to establish the possible variation in loading due to rainfall. Heavy winter rainfall affects the discharge of municipal WWTPs with combined stormwater and sanitary sewer systems, as well as that of facilities that discharge stormwater

Monthly (1989–1990) rainfall data from four stations (Astoria, Longview, Portland, and the Bonneville Dam) were compared to historical (1951 to 1981) averages to evaluate whether 1989 and 1990 dry and wet periods were atypical (Figure 2, Appendix U) Although total 1989 rainfall was slightly less than the historical average at all four stations, the monthly average rainfall in March exceeded the monthly historical average The 1990 total annual rainfall was greater than the historical average at all stations, except Portland Monthly rainfall greater than monthly historical averages occurred in January, February, and October at the Astoria, Longview, and the Bonneville Dam stations Generally, these years may be considered representative of a "dry" year (1989) and of a moderately "wet" year (1990)

Pollutant loading estimates for 1989 and 1990 for each facility and all summary information on these facilities are presented in Appendices V and W, respectively Data are presented as seasonal mass loading estimates, except for temperature, pH, and fecal coliform bacteria which were all seasonal averages Loading estimates for each point source category to each river segment will be summarized where data were sufficient. Although Portland is permitted to discharge treated wastewater from pipe 002 to the Oregon Slough (Portland Harbor) when necessary, no wastewater was discharged via pipe 002 in 1989 or 1990.

2.5.1 Wastewater Discharge

Seasonal flow from each point source category was estimated for 1989 and 1990 Although data were not available for several fish hatcheries, seafood processing facilities, or minor industrial facilities not required to report flow (Table 13, Appendices V and W). Total estimated annual average wastewater discharge ranged from 0 41 MGD for river segment 2B (Cathlamet Channel to river mile 54) to 177 MGD for river segment 4A (Willamette River to Sandy River) No direct NPDES discharges occurred to river segment 1C (Tongue Point to Tenasillahe Island) Increases during November to April were evident for domestic WWTPs because many of them have combined stormwater and domestic sewer systems Where data were complete for both years, however, the coefficient of variation indicated that annual discharge between the two years did not vary considerably for each facility type



Source NOAA (1989a, 1989b, 1990a, 1990b)

Figure 2. Monthly nfall (1989 and 1990 and historical data) for Astoria, Longview, Portland, and Bonneville Dam

TABLE 13 SEASONAL AND ANNUAL (1989-1990) WASTEWATER DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 1 of 3)

(Million gallons per day)

Facility Type	1989 Dry[a]	1989 Wet[b]	1989 Annual Average	1990 Dry	1990 Wet	1990 Annual Average	Two-Year Average ± CV
River Reach 1A - Mouth of Columbia River to Youngs Bay							
Seafood Processing	NA	NA		0 02[c]	0 01[c]	0 02[c]	
Domestic - Minors	0 40	0.94	0 47	0 45	0.83	0 64	0 56 ± 22%
Subtotal	0.40	0 94	0 47	0 47	0.84	0.66	
River Reach 1B - Youngs Bay to Tongue Point							
Seafood Processing	NA	NA		NA	NA		
Domestic - Major	1 82	6 03	3 93	2 70	6.48	4.59	4 26 ± 11%
Wood Products	NA	NA		NA	NA		
Subtotal	1 82	6 03	3 93	2.70	6.48	4.59	
River Reach 1C - Tongue Point to Tenasillahe Island							
No direct NPDES discharges to this river segment.							
River Reach 2A - Tenasillahe Island to Cathlamet Channel							
Domestic - Minor	0.03	0.13	0 08	NA	NA		
Pulp and Paper	39.9	40 5	40 2	42.6	41 4	42 2	41 2 ± 3%
Subtotal	39.93	40.63	40 3	42.6	41 4	42.2	
River Reach 2B - Cathlamet Channel to River Mile 54							
Power - Minor	NA	NA		0 52	0 30		
Subtotal				0.52	0.30		
River Reach 2C - River Mile 54 to Cowlitz River							
Domestic - Major	4 91	8.24	6 58	5.88	10.4	8.14	7 36 ± 12%
Domestic - Minor	0.31[d]	0.49[d]	0 40[d]	0 22[e]	0.65[e]	0.44[e]	
Pulp and Paper	135	116	126	120	108	114	120 ± 7%

TABLE 13. SEASONAL AND ANNUAL (1989-1990) WASTEWATER DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER (Page 2 of 3)

(Million gallons per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
Aluminum	10.1	9.77	9 94	8 04	0.13[f]	4.09	7 02 ± 46%
Wood Products	0 01	0 02	0.02	0 01	0.03	0.02	0 02 ± 0%
Subtotal	150.3	134 5	142 4	134 2	119.2	126 7	135 ± 8%
River Reach 3A - Cowlitz River to Lewis River							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Major	35.0	36 2	35 6	34.4	34 4	34 4	35 0 ± 2%
Domestic - Minor	0.10	0.34	0 22	NA	NA		
Power - Major	44.6	45.1	44 9	43.7	46.0	44.9	44 9 ± 0%
Chemical - Minor	NA	NA		0.93	0 90	0 92	
36.5Chemical - Major	36 5	27.5	32 0	37.9	32.9	35.4	33 7 ± 7%
Wood Products	NA	NA		NA	NA		
Subtotal	116.2	109 1	112.7	116.9	114.2	115.6	114.2 ± 2%
River Reach 3B - Lewis River to Willamette River							
Domestic - Major	NA	NA		2 80	3 21	3.01	
Subtotal				2 80	3 21		
River Reach 4A - Willamette River to Sandy River							
Fish Hatchery	1.88	2.29	2 09	1 89	1.91	1 90	2 0 ± 7%
Domestic - Major	83.8	102.7	93 3	87 6	105	96.3	94 8 ± 2%
Aluminum	6.14	6.16	6 15	6.02	5.28	5 65	5.90 ± 6%
Pulp and Paper	67.2	64 8	66 0	66.9	65.3	66.1	66.1 ± <1%
Miscellaneous Ind.	8.81[g]	8.63[g]	8 72[g]	8.78[h]	8.65[h]	8 72[h]	
Wood Products	NA	NA		NA	NA		
Chemical - Minor	NA	NA		NA	NA		
Subtotal	167.8	184.6	176 2	171 2	186.1	178.7	17[illegible] 1%

TABLE 13 SEASONAL AND ANNUAL (1989-1990) WASTEWATER DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 3 of 3)

(Million gallons per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
River Reach 4B - Sandy River to Bonneville Dam							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Minor	0.57	1 30	0 94	0 02[i]	0.02[i]	0 02[i]	
Miscellaneous Ind.	0.61	0.62	0 62	0 58	0 64	0.61	0.62
Subtotal	1.18	1 92	1 55	0 60	0.66	0.63	
GRAND TOTAL	477 6	477.7	477 7	472.0	472.4	472 2	475 ± 1%

NA = Not available

[a] Dry refers to discharge from May 1 to September 30.

[b] Wet refers to discharge from October 1 to April 30

[c] Data for one facility (Chinook Packing) only.

[d] Data unavailable for the Riverwood Mobile Home Park and the Stella WWTP.

[e] Data unavailable for the Stella WWTP.

[f] Data unavailable for process discharge for Reynolds Metals Co (Longview)

[g] Data unavailable for Northwest Packing.

[h] Data unavailable for Ideal Basic Industries (Holnam, Inc)

[i] Data unavailable for the City of North Bonneville WWTP

2.5.2 BOD Loading

BOD loading for each point source category was calculated for the dry and wet seasons of 1989 and 1990 (Table 14) (Appendices V and W) Not all facilities were required to monitor BOD discharge, and data were unavailable for other facilities Annual average sub-totals by river segment ranged from 106 lb/day in river segment 1A (Mouth of the Columbia River to Youngs Bay) to 43,150 lb/day in river segment 4A (Willamette River to Sandy River) No direct NPDES discharges occurred to river segment 1C (Tongue Point to Tenasillahe Island) The only direct discharger to river segment 2B (Cathlamet Channel to river mile 54), the Beaver Generating Plant, did not report BOD loading. BOD discharge from domestic WWTPs increased in the winter Where data were complete for both years, the coefficient of variation indicated BOD discharge did n· vary considerably between 1989 and 1990.

Data were available for loading of chemical oxygen demand (COD) from two facilities Based on seasonal loading data, the estimated annual average (1989 and 1990) loading of COD to river segment 3A from Kalama Chemical was 77,620 lb/year or 213 lb/day (Appendices V and W) The estimated annual average (1989 and 1990) loading of COD to river segment 4B from Pendleton Woolen Mills was 17,401 lb/year or 472 lb/day.

2.5.3 TSS Loading

TSS loading was calculated for each point source category for dry and wet seasons of 1989 and 1990 (Table 15, Appendices V and W). Because not all facilities were required to measure TSS discharge, data were unavailable for several facilities Annual average sub-totals to each river segment ranged from 18 6 lb/day loaded to river segment 2B (Cathlamet Channel to river mile 54) to 55,700 lb/day loaded to river segment 4A (Willamette River to Sandy River) Estimated loading to river segment 2C (river mile 54 to Cowlitz River) was 50,500 lb/day No direct NPDES discharges occurred to river segment 1C (Tongue Point to Tenasillahe Island) Based on the coefficient of variation, yearly variation in TSS discharge was greater than that for either BOD or wastewater discharge.

2.5.4 Effluent Fecal Coliform Bacteria Concentrations

Seasonal averages of fecal coliform bacteria concentration were calculated from the available data in ODEQ and WDOE files (Table 16, Appendices V and W) Fecal coliform bacteria monitoring was required only at facilities that discharged treated domestic or sanitary wastewater and at Washington seafood processing facilities. However, fecal coliform data for the Washington seafood facilities were not located When available, seasonal fe. coliform averages were based on the reported monthly 30-day averages Otherwise, the seas average was based on the monthly maximum values.

TABLE 14 SEASONAL AND ANNUAL (1989-1990) BOD DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 1 of 3)

(pounds per day)

Facility Type	1989 Dry[a]	1989 Wet[b]	1989 Annual Average	1990 Dry	1990 Wet	1990 Annual Average	Two-Year Average ± CV
River Reach 1A - Mouth of Columbia River to Youngs Bay							
Seafood Processing	NA	NA		NA	NA		
Domestic - Minors	64 0	163	114	74 5	122	98.3	106 ± 10%
Subtotal	64 0	163	114	74 5	122	98.3	
River Reach 1B - Youngs Bay to Tongue Point							
Seafood Processing	NA	NA		NA	NA		
Domestic - Major	263	315	289	207	348	278	284 ± 3%
Wood Products	NA	NA		NA	NA		
Subtotal	263	315		207	348		
River Reach 1C - Tongue Point to Tenasillahe Island							
No direct NPDES discharges to this river segment.							
River Reach 2A - Tenasillahe Island to Cathlamet Channel							
Domestic - Minor	5 66	34.1	19 9	NA	NA		
Pulp and Paper	3,710	3,290	3,500	3,660	4,300	3,980	3,740 ± 9%
Subtotal	3,720	3,320	3,520	3,660	4,300	3,980	
River Reach 2B - Cathlamet Channel to River Mile 54							
Power - Minor	NA	NA		NA	NA		
Subtotal							
River Reach 2C - River Mile 54 to Cowlitz River							
Domestic - Major	239	367	303	253	597	425	364 ± 24%
Domestic - Minor	13.3[c]	14.1[c]	13 7[c]	7 00[d]	25.1[d]	16.1[d]	
Pulp and Paper	16,900	20,000	18,450	13,800	19,900	16,850	17,650 ± 6%

TABLE 14. SEASONAL AND ANNUAL (1989-1990) BOD DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 2 of 3)

(pounds per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
Aluminum	15.3	14.1	14.7	14.9	17.1	16.0	15.4 ± 6%
Wood Products	0.40	1.34	0.87	0.33	1.54	0.94	0.91 ± 5%
Subtotal	17,168	20,397	18,800	14,075	20,541	17,300	18,050 ± 6%
River Reach 3A - Cowlitz River to Lewis River							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Major	8,110	9,330	8,720	5,140	7,050	6,095	7,410 ± 25%
Domestic - Minor	32.7	72.1	52.4	NA	NA		
Power - Major	1.81	3.09	2.45	4.16	4.04	4.10	3.28 ± 36%
Chemical - Minor	NA	NA		NA	NA		
Chemical - Major	16.7[e]	33.2[e]	25.0[e]	19.2[e]	49.9[e]		
Wood Products	NA[f]	NA[f]		NA[f]	NA[f]		
Subtotal	8,161	9,438	8,800	5,163	7,104	6,130	7,470 ± 25%
River Reach 3B - Lewis River to Willamette River							
Domestic - Major	NA	NA		441	745	593	
Subtotal				441	745	593	
River Reach 4A - Willamette River to Sandy River							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Major	11,700	16,700	14,200	16,900	18,500	17,700	15,950 ± 16%
Aluminum	13.6	7.54	10.6	3.25	6.85	5.05	7.83 ± 50%
Pulp and Paper	24,700	29,800	27,250	23,900	30,200	27,050	27,150 ± 1%
Miscellaneous Ind.	NA	NA		NA	NA		
Wood Products	NA	NA		NA	NA		
Chemical - Minor	NA	NA		NA	NA		
Subtotal	36,404	46,508	41,500	40,803	48,707	44,800	43,150 ± 5%

TABLE 14. SEASONAL AND ANNUAL (1989-1990) BOD DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 3 of 3)

(pounds per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
River Reach 4B - Sandy River to Bonneville Dam							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Minor	220	188	204	1.17[g]	1.23[g]	1 20[g]	
Miscellaneous Ind.	209	285	247	49 5	104	76 8	162 ± 74%
Subtotal	429	473	451	50 7	105 2	78.0	
GRAND TOTAL	66,200	80,600	73,400	64,500	82,000	73,250	73,300 ± 1%

NA = Not available

[a] Dry refers to discharge from May 1 to September 30

[b] Wet refers to discharge from October 1 to April 30.

[c] Data unavailable for Riverwood Mobile Home Park and Stella WWTP

[d] Data unavailable for the Stella WWTP.

[e] Data unavailable for Chevron Chemical Co.

[f] Data unavailable for the St. Helens-Veneer Mill (Boise Cascade).

[g] Data unavailable for the City of North Bonneville WWTP

TABLE 15. SEASONAL AND ANNUAL (1989-1990) TSS
DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 1 of 3)

(pounds per day)

Facility Type	1989 Dry[a]	1989 Wet[b]	1989 Annual Average	1990 Dry	1990 Wet	1990 Annual Average	Two-Year Average ± CV
River Reach 1A - Mouth of Columbia River to Youngs Bay							
Seafood Processing	NA	NA		NA	NA		
Domestic - Minors	52.4	107 8	80 1	60 4[c]	79.0[c]	69.7[c]	
Subtotal	52.4	107.8		60.4	79 0		
River Reach 1B - Youngs Bay to Tongue Point							
Seafood Processing	NA	NA		NA	NA		
Domestic - Major	301	590	446	233	696	465	456 ± 3%
Wood Products	NA	NA		NA	NA		
Subtotal	301	590	233	696			
River Reach 1C - Tongue Point to Tenasillahe Island							
No direct NPDES discharges to this river segment.							
River Reach 2A - Tenasillahe Island to Cathlamet Channel							
Domestic - Minor	10 4	27.1	18 8	NA	NA		
Pulp and Paper	15,800	13,900	14,850	19,300	13,200	16,250	15,600 ± 6%
Subtotal	15,800	13,900		19,300	13,200		
River Reach 2B - Cathlamet Channel to River Mile 54							
Power - Minor	NA	NA		17 1	10.0		
Subtotal				17.1	10 0		
River Reach 2C - River Mile 54 to Cowlitz River							
Domestic - Major	289	535	412	338	848	593	503 ± 25%
Domestic - Minor	11.9[d]	17.1[d]	14 5[d]	8 97[e]	35 5[e]	22.2[e]	
Pulp and Paper	52,900	59,700	56,300	35,700	49,600	42,700	49,500 ± 19%

TABLE 15. SEASONAL AND ANNUAL (1989-1990) TSS
DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 2 of 3)

(pounds per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
Aluminum	791	424	608	584	19.1[f]	--	
Wood Products	0.49	1.71	1.10	0.26	1.38	0.82	0.96 ± 21%
Subtotal	54,000	60,700	57,400	36,600	50,500	43,600	50,500 ± 19%
River Reach 3A - Cowlitz River to Lewis River							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Major	16,900	16,900	16,900	13,500	17,100	15,300	16,100 ± 7%
Domestic - Minor	19.0	33.8		NA	NA		
Power - Major	7.16	8.64	7.90	9.91	10.9	10.4	9.15 ± 20%
Chemical - Minor	NA	NA		NA	NA		
Chemical - Major	270[g]	365[g]	318[g]	18.9[g]	96.8[g]	57.9[g]	
Wood Products	NA	NA		NA	NA		
Subtotal	17,200	17,300	17,300	13,500	17,200	15,400	16,400 ± 8%
River Reach 3B - Lewis River to Willamette River							
Domestic - Major	NA	NA		497	1,406	952	
Subtotal				497	1,406		
River Reach 4A - Willamette River to Sandy River							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Major	12,200	18,500	15,350	14,000	18,600	16,300	15,800 ± 4%
Aluminum	788	504	646	331	279	305	476 ± 51%
Pulp and Paper	35,100	43,500	39,300	35,200	43,900	39,550	39,400 ± <1%
Miscellaneous Ind.	NA	NA		NA	NA		
Wood Products	NA	NA		NA	NA		
Chemical - Minor	NA	NA		NA	NA		
Subtotal	48,100	62,500	55,300	49,500	62,800	56,150	55,700 ± 1%

TABLE 15. SEASONAL AND ANNUAL (1989-1990) TSS
DISCHARGES FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 3 of 3)

(pounds per day)

Facility Type	1989			1990			Two-Year Average ± CV
	Dry[a]	Wet[b]	Annual Average	Dry	Wet	Annual Average	
River Reach 4B - Sandy River to Bonneville Dam							
Fish Hatchery	NA	NA		NA	NA		
Domestic - Minor	74.3	108	91 2	1 01[h]	0 98[h]	1,00[h]	
Miscellaneous Ind.	354	325	340	115	176	146	243 ± 56%
Subtotal	428	433	431	116	177	293	362 ± 27%
GRAND TOTAL	136,000	156,000	146,000	120,000	146,000	133,000	140,000 ± 7%

NA = Not available

[a] Dry refers to discharge from May 1 to September 30

[b] Wet refers to discharge from October 1 to April 30

[c] Data unavailable for Ft. Columbia State Park WWTP

[d] Data unavailable for Riverwood Mobile Home Park and Stella WWTP.

[e] Data unavailable for the Stella WWTP.

[f] Data unavailable for the process wastewater effluent

[g] Data unavailable for Chevron Chemical Co.

[h] Data unavailable for the City of North Bonneville WWTP

TABLE 16. SEASONAL (1989-1990) FECAL COLIFORM CONCENTRATIONS DISCHARGED FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 1 of 2)

(units are in colonies/100 ml)

Facility Type	1989		1990	
	Dry[a]	Wet[b]	Dry	Wet
River Reach 1A - Mouth of the Columbia River to Youngs Bay				
City of Warrenton	<5	<10	<10	<10
Town of Ilwaco	14	13	15	15
Ft Columbia State Park	21	0	NA	NA
River Reach 1B - Youngs Bay to Tongue Point				
City of Astoria	9	9	65	18
River Reach 1C - Tongue Point to Tenasillahe Island				
No data				
River Reach 2A - Tenasillahe Island to Cathlamet Channel				
Town of Cathlamet	21	72	NA	NA
River Reach 2B - Cathlamet Channel to River Mile 54				
No data				
River Reach 2C - River Mile 54 to Cowlitz River				
Cowlitz Co. Regional WWTP	60	75	15	58
City of Rainier	25	4	11	13
Riverwood Mobile Home Park	NA	NA	5	0
Stella WWTP[c]	NA	NA	NA	NA
Weyerhaeuser Paper Co.[d]	15	2 (2,000)[e]	543	2
Reynolds Metals Co. (Longview)	11	10	13	14
International Paper	2	2	2	2
Longview Fibre Co	<2	<2	NA	NA

TABLE 16. SEASONAL (1989-1990) FECAL COLIFORM CONCENTRATIONS DISCHARGED FROM POINT SOURCES TO THE LOWER COLUMBIA RIVER
(Page 2 of 2)

(units are in colonies/100 ml)

Facility Type	1989		1990	
	Dry[a]	Wet[b]	Dry	Wet
River Reach 3A - Cowlitz River to Lewis River				
Town of Kalama	48	7	NA	NA
Trojan Nuclear Power Plant	2	2	2	2
City of St. Helens[f]	12 (1,740)[g]	29 (638)[g]	22	51
River Reach 3B - Lewis River to Willamette River				
Salmon Creek WWTP	NA	NA	2	3
River Reach 4A - Willamette River to Sandy River				
City of Portland	55	12	162	62
City of Gresham	108	68	28	78
City of Vancouver (Eastside)	125	36	79	35
City of Vancouver (Westside)	46	54	96	79
City of Camas	18	56	NA	NA
Reynolds Metals Co. (Troutdale)	10	1	1	1
ALCOA	158	0	45	95
River Reach 4B - Sandy River to Bonneville Dam				
U.S. Army Corps of Engineers	3	1	14	29
City of North Bonneville	2	11	NA	NA

NA = Not available

[a] Dry refers to discharge from May 1 to September 30

[b] Wet refers to discharge from October 1 to April 30

[c] Stella WWTP not required to measure fecal coliform bacteria

[d] Values are from pipe 005, effluent discharge from sanitary sewage treatment facility.

[e] The value in parentheses was recorded from a sample from the pulp and paper mill process effluent

[f] Monitoring data and permit limit set at discharge from primary to secondary treatment system.

[g] Data in parentheses recorded from final effluent following combination and secondary treatment of municipal and pulp and paper mill primary effluent.

Fecal coliform bacteria concentrations were generally below 200 colonies/100 mL, indicating chronic violations of fecal coliform permit limits did not occur at those facilities during 1989 or 1990 Because these are seasonal averages, this lack of chronic violation does not indicate that a violation did not occur in a particular month. Elevated seasonal average fecal coliform levels were noted for Weyerhaeuser Paper during the 1990 dry season (Table 15)

Samples collected from the process effluent of Weyerhaeuser Paper in Longview and from the final effluent from St Helens, OR contained elevated levels of fecal coliform bacteria Recent studies have questioned the use of fecal coliform bacteria as indicators of fecal contamination due to false positive results in pristine environments (Toranzos 1991) and poor correlation with enteric viruses and other enteric pathogens in water (Cornax et al 1991) The strain of bacteria detected in pulp and paper mill effluent may be *Klebsiella pneumoniae*, which is not of fecal origin (Matthews, L , 5 May 1992, personal communication) These levels are associated with the pulp and paper process wastewater, which suggests that fecal coliform bacteria in this instance are giving a false indication of the presence of pathogenic organisms

2.5.5 Estimate of Metals, Cyanide, Boron, and Fluoride Loading

Annual loading (1989 and 1990) was estimated based on data available in ODEQ and WDOE files (Appendices V and W). Annual loading estimates by river segment are presented in Table 17 Loading estimates were calculated using all available data, regardless of type (i e , total metals, dissolved metals, total recoverable metals were all summed together) Values in parentheses are estimates using detection limit values Given the lack of metals, cyanide, boron, and fluoride monitoring requirements, data were unavailable for river segments 1A, 1B, and 1C (mouth of the Columbia River to Tenasillahe Island) and river segment 3B (Lewis River to the Willamette River).

The largest quantity of data on metals, cyanide, boron, and fluoride loading were available for river segments 2C (River Mile 54 to Cowlitz River), 3A (Cowlitz River to Lewis River), and 4A (Willamette River to the Sandy River). These segments have the highest concentrations of major domestic WWTPs and industrial point source discharges. Data were most common for cyanide, aluminum, antimony, copper, chromium, iron, zinc, boron, and fluoride Fewer data were available for mercury, molybdenum, nickel, and sodium. No data were available for estimation of loading to river segment 4A for almost all constituents

The loading of metals, cyanide, fluoride, and boron to river segment 4A was generally greater where other comparisons (primarily to river segment 2C) were possible, with the exception of aluminum and sodium. Based on the available data, point source loading of aluminum to river segment 4A is estimated to be 17,229 lb/year or 47 lb/day based on the average of 1989 and

TABLE 17 ANNUAL (1989-1990) METALS, CYANIDE, BORON, AND FLUORIDE LOADING TO THE LOWER COLUMBIA RIVER

River Segment	Year	Total CN (lbs)	Free CN (lbs)	Al (lbs)	Sb (lbs)	As (lbs)	Ba (lbs)	B (lbs)	Cd (lbs)	Cr (lbs)	Co (lbs)	Cu (lbs)	F (lbs)	Fe (lbs)	Pb (lbs)	Mg (lbs)	Mn (lbs)	Hg (lbs)	Mo (lbs)	Ni (lbs)	Ag (lbs)	Na (lbs)	Sn (lbs)	Zn (lbs)
Data unavailable for River Reach 1A, 1B, 1C, and 2A																								
2B	1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA (49[e])	NA	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(32)[e]	NA	139	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2C	1989	827	NA	11945	(1480)	NA	NA	NA	NA	NA	NA	NA (109)	147037	NA	NA (37)	NA	NA	NA	NA	(825)	NA	NA	NA	NA
	1990	318[b]	NA	5605[b]	586[c]	NA	NA	NA	NA	NA	NA	NA	50948[d]	NA	NA	NA	NA	NA	NA	239[e]	NA	NA	NA	NA
3A	1989	NA	NA	30841	NA	NA	NA	7070	NA	NA	296	52	NA	3	NA	NA	NA	NA	NA	19	NA	1379880	NA	11
	1990	NA	NA	22648	NA	NA	NA	8745	NA	NA	NA	19[f]	NA	9	NA	NA	NA	NA	NA	5[f]	NA	1278940	NA	6[f]
Data unavailable for River Reach 3B																								
4A	1989	74	3666 (256)	25289	122	(5143)	(23028)	70047	(1262)	29 (2324)	NA	(4322)	361504	51348	(3483)	NA	8576	(1518)	(1158)	384 (756)	(756)	NA	NA	22883 (1756)
	1990	36 (21)	5180 (4628)	9169	67	(5625)	(22141)	57656	(1022)	14 (117)	NA	2921 (7350)	291590	62162	(3454)	NA	3096 (3714)	(1381)	(1830)	231 (1261)	(1308)	NA	NA	28535
4B	1989	NA	NA	NA	NA	NA	NA	NA	NA	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1990	NA	NA	NA	NA	NA	NA	NA	NA	117	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not available
[a] Data in parentheses are loading calculations based on detection limit concentrations.
[b] Wet season data for Reynolds Metals Co (Longview) not available
[c] Only data for the dry season available
[d] Based on dry season data only from Reynolds Metals Co (Longview)
[e] Only data for the dry season available
[f] Only data for the wet season available
[g] Data for the dry season from Kalama Chemical not available
NA = Not Available

CN = Cyanide
Al = Aluminum
Sb = Antimony
As = Arsenic
Ba = Barium
B = Boron
Ag = Silver
Zn = Zinc

Cd = Cadmium
Cr = Chromium
Co = Cobalt
Cu = Copper
F = Fluoride
Fe = Iron
Na = Sodium

Pb = Lead
Mg = Magnesium
Mn = Manganese
Hg = Mercury
Mo = Molybdenum
Ni = Nickel
Sn = Tin

1990 data (Table 17) The difference in 1989 and 1990 loading estimates for aluminum to river segment 4A is due to reductions in aluminum loading from the ALCOA (Vancouver) and Reynolds Metals (Troutdale) aluminum smelting facilities. Loading of aluminum was greatest to river segment 3A (24,745 lb/year or 73 lb/day) based on the average of 1989 and 1990 data Aluminum loading to river segment 2C was estimated to be 8,775 lb/year or 24 lb/day (1989 and 1990 average), but data for the wet season were not available from Reynolds Metals (Longview) Therefore, estimated loading of aluminum from this source is likely an under-estimate

Estimated cyanide loading was greatest to river segment 2C (573 lb/year or 1 6 lb/day) based on the average of 1989 and 1990 data. However, because cyanide loading data for the wet season were unavailable from Reynolds Metals (Longview) in 1990, this is likely an estimate Loading to river segment 4A was estimated to be 55 lb/year or 0.15 lb/day based on the average of 1989 and 1990 data.

Sodium loading was only available for river segment 3A (from the Trojan Nuclear Power Plant) Sodium loading was estimated to be 1,329,410 lb/year or 3,642 lb/day based on the average of 1989 and 1990 data

Loading estimates (based on 1989 and 1990 averages, respectively) to river segment 4A were greatest for cyanide (measured as free cyanide, 4,423 lb/year or 12 lb/day), boron (63,852 lb/year or 175 lb/day), fluoride (326,547 lb/year or 895 lb/day), iron (56,755 lb/year or 155 lb/day), and zinc (25,709 lb/year or 70 lb/day)

Generally, the data were inadequate for determining the relative contribution of each point source to metals, cyanide, boron, and fluoride loading to the river. This weakness is due to the lack of data from many point sources not required to monitor these parameters. For some NPDES-permitted sources required to monitor these pollutants, the data were not found in the files

An additional uncertainty is whether or not reported loading estimates on the DMRs are based on detected concentrations or are occasionally estimated based on detection limit values Where the reported concentrations were clearly marked as detection limit values, calculations presented here indicate these values in parentheses However, many of the estimated loading values are based on detection limit values These estimates are likely overestimates of actual loading, but the degree of overestimation is not presently known.

2.5.6 Nutrient Loading Estimates

Few data were available for accurate estimation of nutrient loading Domestic wastewater treatment facilities are likely significant point sources of nutrients, but NPDES permits for these facilities do not require nutrient monitoring From the data available, ammonia-N loading to river segment 3A from the Chevron Chemical fertilizer plant and Kalama Chemical is 20,857 lb/year or 57 lb/day (average of 1989 and 1990 estimates) Organic nitrogen loading from Chevron Chemical to river segment 3A was estimated at 33,842 lb/year or 93 lb/day No data were available for nitrate Data for total phosphorus were available from Kalama Chemical to estimate loading to river segment 3A (944 lb/year or 2.6 lb/day)

Again, these nutrient loading data are generally inadequate for determining the relative contribution of nutrients to the lower Columbia River from NPDES-permitted point sources, because there are few data from major domestic sources These domestic sources are likely the most significant point sources of nutrients to the lower Columbia River

2.5.7 Organic Compound Loading Estimates

Very few data were available for accurate loading estimates of potentially toxic oil and grease and organic compounds Estimates of loading of oil and grease were possible for river segments 2B, 2C, 3A, 4A, and 4B. Loading of oil and grease from the Beaver Generating plant to river segment 2B was estimated at 2,105 lb/year or 5 8 lb/day. Loading of oil and grease from the Reynolds Metals (Longview) facility to river segment 2C was estimated at 34,188 lb/year or 94 lb/day Loading to river segment 3A from the Chevron Chemical and the Trojan Nuclear Power Plant was estimated at 40,532 lb/year or 111 lb/day Loading of oil and grease from the Reynolds Metals (Troutdale) facility to river segment 4A was estimated at 17,861 lb/year or 49 lb/day Oil and grease loading to river segment 4B from the Pendleton Woolen Mills was estimated at 7,079 lb/year or 19 lb/day. However, since data from major domestic wastewater treatment plants are not available, the relative importance of various point sources cannot be determined.

The loading of benzo(a)pyrene to river segment 4A was estimated at 10 lb/year or 0.03 lb/day (average of 1989 and 1990 data) Loading of total phenol to river segment 3A was estimated at 30 lb/year or 0.08 lb/day (average of 1989 and 1990 data). Based on detection limit values, loading of total phenol to river segment 4A was estimated to be 12,763 lb/year or 35 lb/day The loading of phenol to river segment 4B was estimated to be 68 lb/year or 0 19 lb/day (average of 1989 and 1990 data). Data for pentachlorophenol loading to river segment 2C were available for the wet season in 1989 only and were below detection limits. Wet season loading was estimated to be less than 2,727 lb/less than 15 lb/day.

Discharge monitoring reports for AOX in lb/ADT, without the associated monthly production figures, precluded calculating AOX loading on a mass-per-unit-of-time basis Because monitoring requirements for TCDD and TCDF have only recently been instigated, data for 1989 and 1990 do not include TCDD or TCDF Some estimates of TCDD and TCDF loading were available (Tetra Tech 1990) TCDD discharge from various pulp and paper mills along the lower Columbia River ranged from 2.4×10^{-6} lb/day (1 1 mg/day) based on detection limit values to 6.3×10^{-6} lb/day (2 88 mg/day) Loading of TCDF ranged from 9.5×10^{-6} lb/day (4 32 mg/day) to 7.9×10^{-5} lb/day (36 mg/day)

Generally, the organic pollutant data were even more inadequate than the metals data for determining the relative contribution of each point source to organic pollutant loading to the lower Columbia River Many point sources are not required to monitor many of the organic pollutants studied here For some sources with NPDES permit requirements to monitor these organic pollutants, the data were not found in the permit monitoring files An additional uncertainty is whether or not reported loading estimates on the DMRs are based on detected concentrations or are occasionally estimated based on detection limit values Where the reported concentrations were clearly marked as detection limit values, calculations presented here indicate these values in parentheses Many of the estimated loading values are based on detection limit values. These estimates are likely overestimates of the actual loading, but the degree of overestimation is not presently known

2.6 COMPARISON OF ESTIMATED LOADING TO NPDES PERMIT LIMITS

Because few of the facilities characterized have effluent limits for metals or organic pollutants, NPDES limits were not extensively compared Generally, NPDES limits for metals and organic pollutants were not exceeded Extensive data are available on BOD and TSS, allowing for a comparison of the estimated loading of those pollutants to NPDES permit limits

Annual BOD and TSS loading (average of 1989 and 1990) from facilities with BOD and/or TSS data was compared to the NPDES permit monthly average limit (Table 18) On an average, only the Kalama Chemical facility exceeded the NPDES permit limits (for TSS only) Because these values are seasonal averages, this analysis does not suggest that individual monthly violations did not occur for any particular facility The total permitted monthly average BOD loading was 128,325 lb/day, but the 1989-1990 average BOD loading was 73,727 lb/day, or about 54,500 lb/day less than the NPDES permits allowed. The total permitted monthly average TSS loading was 221,346 lb/day, but the 1989-1990 average TSS loading was 140,081 lb/day, or about 81,000 lb/day less than the NPDES permits allowed This finding indicates

TABLE 18. COMPARISON OF ESTIMATED BOD AND TSS LOADING TO PERMIT LIMITS (1989-1990) (Page 1 of 5)						
			BOD		TSS	
Facility	Pipe ID Number	River Segment	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)
City of Warrenton		1A	59	112	30	188
Point Adams Packing		1A	NA	VL	NA	VL
Town of Ilwaco		1A	47	112	45	112
Fort Columbia State Park		1A	0 12	1 25	0 17	1.25
Warrenton Deep Sea, Inc.		1A	NA	VL	NA	VL
Bioproducts Incorporated		1A	NA	NL	NA	NL
Pacific Coast Seafoods Co		1A	NA	VL	NA	VL
Jessie's Ilwaco Fish Co		1A	NA	VL	NA	VL
Chinook Packing Co		1A	NA	VL	NA	VL
Total 1A			106	225	75	301
City of Astoria		1B	283	1,050	454	1,050
Astoria Seafood Co		1B	NA	VL	NA	VL
Ocean Foods of Astoria		1B	NA	VL	NA	VL
Total 1B			283	1,050	454	1,050
No direct discharges to Segment 1C						
TOTAL SEGMENT 1			389	1,275	529	1,351

TABLE 18. COMPARISON OF ESTIMATED BOD AND TSS LOADING TO PERMIT LIMITS (1989-1990)
(Page 2 of 5)

Facility	Pipe ID Number	River Segment	BOD		TSS	
			Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)
Town of Cathlamet		2A	20	50	19	183
James River II, Inc. (Wauna Mill)	001	2A	3,723	11,000	11,078	18,600
James River II, Inc. (Wauna Mill)	002	2A	2	NL	6	NL
James River II, Inc (Wauna Mill)	003	2A	14	NL	4,466	NL
James River II, Inc (Wauna Mill)	004	2A	9	NL	13	NL
Total 2A			3,769	11,050	15,582	18,783
Cowlitz County Regional WWTP		2C	364	500	502	500
City of Rainier		2C	15	83	18	83
Riverwood Mobile Home Park		2C	NA	2	NA	2
Longview Fibre Co	001	2C	8,167	10,800	27,643	38,800
Weyerhaeuser Paper Co (Longivew)	001	2C	9,439	26,800	21,684	46,600
Weyerhaeuser Paper Co. (Longview)	005	2C	25	70	33	70
Weyerhaeuser Paper Co. (Longview)	Chlor-Alkali	2C	NA	NL	194	189
Reynolds Metals Co (Longview)	001	2C	15	31	18	38
Reynolds Metals Co (Longview)	002	2C	NA	NL	590	925
International Paper Co. (Longview)		2C	1	62	1	62
Total 2C			18,027	38,348	50,682	87,269
TOTAL SEGMENT 2			21,796	49,398	66,263	106,052

TABLE 18 COMPARISON OF ESTIMATED BOD AND TSS LOADING TO PERMIT LIMITS (1989-1990) (Page 3 of 5)						
			BOD		TSS	
Facility	Pipe ID Number	River Segment	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)
ODFW - Prescott Ponds Fish Hatchery		3A	NA	NL	NA	NL
City of St Helens		3A	7,405	12,800	16,095	26,862
Town of Kalama		3A	52	100	26	100
Chevron Chemical Co (Fertilizer)	001	3A	NA	NL	NA	NL
Kalama Chemical, Inc	001	3A	NA	NL	NA	NL
Kalama Chemical, Inc.	002	3A	30	37	187	52
Portland General Electric Co , Trojan Nuclear	001	3A	NA	NL	NA	NL
Portland General Electric Co , Trojan Nuclear	002	3A	3	13	3	13
Portland General Electric Co , Trojan Nuclear	003	3A	NA	NL	1	NL
Portland General Electric Co , Trojan Nuclear	004	3A	NA	NL	NA	NL
Portland General Electric Co , Trojan Nuclear	005	3A	NA	NL	3	15
Portland General Electric Co , Trojan Nuclear	006	3A	NA	NL	3	15
Virginia Chemicals, Inc - Hoecht-Celanese		3A	NA	NL	NA	NL
Boise Cascade Corp - St Helens Veneer Mill		3A	NA	NL	NA	NL
Total 3A			7,490	12,950	16,318	27,057
Salmon Creek WWTP		3B	593	500	950	500
Total 3B			593	500	950	500
TOTAL SEGMENT 3			8,083	13,450	17,268	27,557

TABLE 18 COMPARISON OF ESTIMATED BOD AND TSS LOADING TO PERMIT LIMITS (1989-1990) (Page 4 of 5)						
			BOD		TSS	
Facility	Pipe ID Number	River Segment	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)
Vancouver Trout Hatchery		4A	NA	NL	NA	1,240
City of Portland		4A	12,639	25,000	12,964	25,000
City of Gresham		4A	892	1,668	878	1,668
City of Vancouver (Eastside)		4A	469	1,000	296	1,000
City of Vancouver (Westside)		4A	1,945	3,000	1,663	3,000
Reynolds Metals Co. (Troutdale)	001	4A	NA	NL	131	1,134
Reynolds Metals Co. (Troutdale)	002	4A	2	25	8	25
James River II, Inc. (Camas Mill)		4A	25,437	29,250	37,507	47,250
The Aluminum Company of America (Alcoa-Vancouver)	001	4A	NA	NL	328	400
The Aluminum Company of America (Alcoa-Vancouver)	002	4A	6	NL	9	NL
Boise Cascade Corp (Vancouver)		4A	1,703	3,400	1,904	4,700
James River II, Inc. - Sundial Chip Reloading		4A	NA	NL	NA	NL
Northwest Packing Co.		4A	NA	NL	NA	NL
GATX Terminals Corp.		4A	NA	NL	NA	NL
Great Western Malting Co.		4A	NA	NL	NA	NL
Fort Vancouver Plywood Co.		4A	NA	NL	NA	NL
Ideal Basic Industries - Holnam, Inc		4A	NA	NL	NA	NL
Columbia Vista Corp.		4A	NA	NL	NA	NL
Total 4A			43,094	63,343	55,688	85,417

TABLE 18. COMPARISON OF ESTIMATED BOD AND TSS LOADING TO PERMIT LIMITS (1989-1990) (Page 5 of 5)						
			BOD		TSS	
Facility	Pipe ID Number	River Segment	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)	Estimated Annual Loading (lb/d)	Maximum Permit Limit (lb/d)
ODFW - Wahkeena Fish Hatchery		4B	NA	NL	NA	NL
Pendleton Woolen Mills	002	4B	162	194	242	304
City of Camas		4B	201	583	89	583
U.S. Army Corps of Engineers		4B	1	50	1	50
City of North Bonneville		4B	1	32	1	32
Total 4B			366	859	333	969
TOTAL SEGMENT 4			43,459	64,202	56,021	86,386
LOWER COLUMBIA RIVER TOTAL			73,727	128,325	140,081	221,346

NA = Data not available

VS = Limit variable, depends on types of fish/shellfish processed.

NL = No limit specified

that on a long-term average basis WWTPs were generally effective in meeting NPDES permit loading limits However, certain individual facilities may have specific difficulties in controlling the discharge of BOD and TSS (e g, Kalama Chemical). Municipal WWTPs with combined stormwater and sewer systems also have difficulty in meeting NPDES permit effluent limits given the large inflows of stormwater they receive during the wet season (e g, City of Portland)

2.7 SUMMARY

The following is a summary of the point source discharges by river segment indicating the types of facilities located within each river segment and the estimate of pollutant loading to that segment Generally, monitoring requirements for metals and organic pollutants are most extensive in the industrialized segments of the river (Table 19) Monitoring of conventional pollutants is required of facilities in all river segments, except for river segment 1C, which has no direct NPDES discharges Requirements for monitoring of nutrients and additional inorganic parameters (e.g, cyanide, sulfate, and boron) are concentrated in river segments 3A and 4A.

Generally, available data for the study are adequate for addressing the relative importance of conventional pollutants like BOD and TSS. The permit monitoring data on wastewater discharge, BOD, and TSS loading are adequate for determining the relative importance of each discharge type and for quantifying the total point source pollutant load to the lower Columbia River However, data from permit monitoring files are inadequate for determining the relative importance of loading of nutrients, metals, cyanide, boron, fluoride, and organic pollutants

2.7.1 River Segment 1

River segment 1 includes the estuarine portion of the lower Columbia River below the upstream end of Tenasillahe Island (RM 0 to RM 38). Present permitted direct discharges to this segment include three minor domestic facilities, one major domestic facility, eight seafood processing facilities, and one wood products facility Data on flow, BOD, and TSS discharge were available only for the domestic wastewater facilities

Because of reporting requirements, few data were available for the permitted seafood processing industries It appeared that much of the processing waste was not discharged in 1989 or 1990, but was marketed as fertilizer and animal feed, or landfilled. Based on domestic wastewater loading only, average point source discharge to this segment during 1989 and 1990 was 4 83 MGD of wastewater, 390 lb/day of BOD, and 536 lb/day of TSS. Average seasonal fecal coliform levels in domestic wastewater discharges ranged from 0 to 65 colonies/100 mL. Data on nutrients, metals, boron, fluoride, cyanide, and organic compounds were not available for loading estimates

TABLE 19 POLLUTANT PARAMETERS WITH NPDES PERMIT MONITORING REQUIREMENTS
(Page 1 of 3)

Parameters	River Segments									
	1A	1B	1C	2A	2B	2C	3A	3B	4A	4B
Metals										
Aluminum						X	X			
Antimony						X			X	
Arsenic							X			
Barium									X	
Cadmium						X	X		X	
Chromium						X	X		X	X
Cobalt										
Copper					X	X	X		X	
Iron					X		X		X	
Lead						X	X		X	
Magnesium							X			
Manganese									X	
Mercury							X			
Nickel						X	X			
Silver							X			
Sodium										
Tin							X			
Zinc						X	X		X	

TABLE 19. POLLUTANT PARAMETERS WITH NPDES PERMIT MONITORING REQUIREMENTS (Page 2 of 3)										
	River Segments									
Parameters	1A	1B	1C	2A	2B	2C	3A	3B	4A	4B
Radioisotopes										
Thorium 232									X	
Conventionals										
Temperature	X			X	X	X	X	X	X	X
pH	X	X		X		X	X	X	X	X
Dissolved Oxygen	X					X	X	X	X	X
BOD[a]	X	X		X		X	X	X	X	X
TSS	X	X		X	X	X	X	X	X	X
COD										X
Fecal Coliform Bacteria	X	X		X		X	X	X	X	X
Oil and Grease	X	X			X	X	X		X	X
Color							X			
Residual Chlorine	X	X		X	X	X	X	X	X	X
Additional Inorganic Parameters										
Cyanide						X	X		X	
Sulfide										X
Sulfate							X			
Boron							X		X	
Fluoride						X			X	

TABLE 19. POLLUTANT PARAMETERS WITH NPDES PERMIT MONITORING REQUIREMENTS (Page 3 of 3)										
	River Segments									
Parameters	1A	1B	1C	2A	2B	2C	3A	3B	4A	4B
Nitrogen and Phosphorus Compounds										
Total Phosphorus	X						X		X	
Ammonia-N	X						X		X	
Nitrate-N						X	X		X	X
Total Kjeldahl Nitrogen							X		X	X
Organic Compounds										
Benzo(a)pyrene									X	
Chloroform							X			
Dieldrin										X
Pentachlorophenol					X				X	
Phenols							X		X	X
PAHs					X					
Dioxins and Furans				X		X	X		X	
AOX				X		X	X		X	
Volatile and Semivolatile Organic Compounds							X		X	X
Total Toxic Organics (TTO)							X			
Total Organic Solvents									X	

[a] Either biochemical oxygen demand or carbonaceous biochemical oxygen demand.

2.7.2 River Segment 2

River segment 2 includes the area of the river above Tenasillahe Island to the confluence with the Cowlitz River (RM 38 to RM 72) Present permitted direct discharges to this segment include four minor domestic facilities, one major domestic facility, one minor power generating facility, three pulp and paper mill facilities, one aluminum smelting facility, and one wood products facility This segment of the river is relatively industrialized and includes the urban area of Longview, WA

Data on flow, BOD, and TSS loading were available for all facilities, except for the Riverwood Mobil Home Park and the Stella domestic wastewater facility Average point source discharge to this segment during 1989 and 1990 was 177 MGD of wastewater, 21,800 lb/day of BOD, and 66,100 lb/day of TSS. Average seasonal fecal coliform levels in sanitary and domestic wastewater discharges ranged from less than 2 to 543 colonies/100 mL. The elevated fecal coliform concentration was noted in the treated sanitary effluent from the Weyerhaeuser Paper pulp and paper mill in Longview One sample collected from the process wastewater effluent this mill was 2000 colonies/100 mL in 1989. No data were available for estimating nutrient loading.

Limited data were available on metals, boron, fluoride, cyanide, and organic compound loading Estimated point source loading of total cyanide was 2.3 lb/day (1989 data), 33 lb/day of aluminum (1989 data), 3.2 lb/day of antimony (incomplete data from 1990), 22 lb/day of boron, 403 lb/day of fluoride (1989 data), 0 3 lb/day of iron (1989 and 1990 data), and 1 3 lb/day of nickel (incomplete data from 1990). Monitoring data on organic compound loading to river segment 2 were not available, except for wet season loading of pentachlorophenol based on detection limits values (15 lb/day) and the loading of oil and grease (99 lb/day) Effluent loading from the three bleached kraft pulp mills in this river segment was estimated as 0.000011 lb/day or 5 0 mg/day from the data in a Tetra Tech study (1990).

2.7.3 River Segment 3

River segment 3 includes the stretch of river above the confluence with the Cowlitz River to the confluence with the Willamette River (RM 72 to RM 102). The permitted direct discharges to this segment come from one minor domestic facility, three major domestic facilities, two major chemical facilities, one minor chemical facility, one major power generating facility, one wood products and one fish hatchery. Data on flow, BOD, and TSS discharges were unavailable for some periods for domestic facilities, as well as the minor chemical, and the wood products facilities. No data were available for the fish hatchery. During 1989 and 1990, average point source loading to this segment was 117 MGD of wastewater, 8,060 lb/day of BOD, and 17,400 lb/day of TSS. Annual COD loading was estimated at 213 lb/day. Average seasonal fecal coliform levels in sanitary and domestic wastewater effluents ranged from 2 to 51 colonies/100 mL. However, data available for the 1989 final effluent of the St. Helens facility indicated mean seasonal values of 638 to 1740 colonies/100 mL. Limited data on metals, cyanide, and organic compound loading were available. Point source loading of various metals were 73 lb/day of aluminum (average of 1989 and 1990 data), 0 1 lb/day of copper (1989 data), 0 05 lb/day of nickel (1989 data), 0.02 lb/day of iron, and 0.03 lb/day of zinc (1989 data) Estimated loading of boron and sodium were 22 lb/day and 3462 lb/day, respectively

Estimates for nutrient loading were also available for this river segment Ammonia nitrogen loading was estimated at 57 lb/day Organic nitrogen loading was estimated at 93 lb/day Total phosphorus loading was estimated at 2 6 lb/day.

Loading estimates of organic pollutants include an estimate of oil and grease loading (111 lb/day) Point source loading of total phenol to this segment was estimated at 0 08 lb/day Dioxin loading based on the loading estimates in Tetra Tech (1990) was 0 0000071 lb/day (3 2 mg/day)

2.7.4 River Segment 4

River segment 4 includes the area of the river above the confluence with the Willamette River to the Bonneville Dam (RM 102 to RM 146) Currently, the permitted direct discharges to this segment are from three minor domestic facilities, four major domestic facilities, two pulp and paper mills (one facility does not produce bleached kraft pulp), two aluminum smelting and processing facilities, one minor chemical facility, four miscellaneous industrial facilities, three wood products facilities, and two fish hatcheries This is the most industrial and urbanized segment of the river and receives discharges from the cities of Portland, Vancouver, Gresham, Camas, and Washougal

Average point source discharges to this segment during 1989 and 1990 were 178 MGD of wastewater, 43,600 lb/day of BOD, 56,100 lb/day of TSS, and 472 lb/day of COD Average seasonal fecal coliform levels in sanitary and municipal wastewater effluents ranged from 1 to 29 colonies/100 mL No data on nutrients were available for this river segment.

Data on metals, fluoride, boron, and cyanide loading for this river segment were the most extensive of all of the segments examined. However, several of the metals concentrations were below detection limits in the effluents. Average loading estimates based on detected concentrations of metals and flow data were 0 15 lb/day of total cyanide, 12 lb/day of free cyanide, 47 lb/day of aluminum, 0.25 lb/day of antimony, 175 lb/day of boron, 0 45 lb/day of chromium, 16 lb/day of copper, 895 lb/day of fluoride, 155 lb/day of iron, 23 lb/day of manganese, 0 84 lb/day of nickel, and 70 lb/day of zinc

Loading of organic compounds included an estimate of oil and grease loading (68 lb/day) Based on detected levels in effluent, average loading of phenol was 0 19 lb/day Loading of benzo(a)pyrene to this segment averaged 0 03 lb/day. Data on dioxin discharge were not available in the DMRs, and no dioxin loading data from Tetra Tech (1990) were available for the James River II (Camas) facility, the only identified point source of dioxin in this river segment

3.0 NON-POINT SOURCES

Non-point source pollution refers to pollutants that enter waters from dispersed water-based or land-use activities The loading of pollutants from non-point sources is dependent on many factors including the type of pollutant, vegetative cover, soil characteristics, topography, local weather patterns, and the frequency and intensity of storm events For this report, non-point source pollution was characterized by summarizing the following:

- Land use in counties bordering the river
- Pollutant data for tributaries
- Information on urban stormwater and combined sewer overflow (CSO) runoff
- Data on atmospheric deposition
- Data on accidental chemical spills.

3.1 LAND USE

Non-point sources of environmental pollution and water quality degradation are often directly related to land use. The investigation into the various land uses along the lower Columbia River study area was conducted at the county level, but inconsistencies in data collection, record maintenance, and level of analysis make comparisons between counties difficult. To convert local data to a useful comparative measure, general categories of land use were established to group similar land uses in each county. Four categories—forest, agriculture, urban, and other—are used in this discussion. *Forest* includes public lands and national forests, as well as private land managed for timber production. *Agricultural* land use refers to all lands used for cropland, livestock, and general, commercial and non-commercial farming. *Urban* land use is a broad category covering residential, industrial, manufacturing, and incorporated areas. The *other* category groups roadways, railroad rights-of-way, marinas, recreation areas, and other areas such as timber mills, cemeteries or golf courses that are not inside urban areas More detailed information about each category is included in this section

3 1.1 Data Collection and Methodology

There are eight county jurisdictions within the lower Columbia River basin study area (Figure 3) Each county may have similar land uses but differing degrees of influence on the lower Columbia River based on those uses with the greatest proximity to the river The areas of the drainage basins that contribute water to the lower Columbia River in each county also vary greatly

Data on existing land uses in each of the eight counties adjacent to the Columbia River from Bonneville Dam to the mouth of the river were collected by telephone interview and document research Telephone contact was made with each of the county jurisdictions and, where applicable, the larger incorporated cities within each county. The most useful sources of information were planning departments, county offices of the USDA Soil Conservation Service, and the County Assessors Incorporated areas were contacted in Multnomah and Clark counties because of their substantial urban area and the lack of information from county sources within these communities The U S Census of Agriculture and the USDA Soil Conservation Service data and maps were used to estimate existing land-use acreage in most of the counties The Washington State Department of Natural Resources was also interviewed by telephone

After data collection on land-use areas and estimated acreage was complete, an investigation was made into the non-point sources of pollution associated with each category. Literature review and interviews were conducted to determine the types and possible sources of non-point contributions. Each land use category was then defined in terms of the types of pollutants that could run off in stormwater to the lower Columbia River. Because no detailed field work was conducted for this task and land uses were not mapped or ground-truthed, the results presented are general. These results are not intended for use in determining non-point source locations or definitive pollutant loadings

3.1.2 Oregon Counties

Three Oregon counties (Clatsop, Columbia, and Multnomah) border the lower Columbia from the river mouth to Bonneville Dam (Figure 3) The land-use information collected will be summarized by country in the sections that follow

3 1.2.1 ***Clatsop County.*** Clatsop County lies in the North Coast-Lower Columbia drainage basin and is bounded on the west by the Pacific Ocean (Figure 3). The County occupies the area on the south side of the mouth of the Columbia along river segments 1A through 2A Major drainage includes the Skipanon, Lewis and Clark, Youngs, Wallooskee, and John Day rivers, as well as other small creeks and streams The Clatsop County planning department does not have current tabulations of existing land use As a result, information from the

COLUMBIA RIVER BI-STATE WATER QUALITY PROGRAM

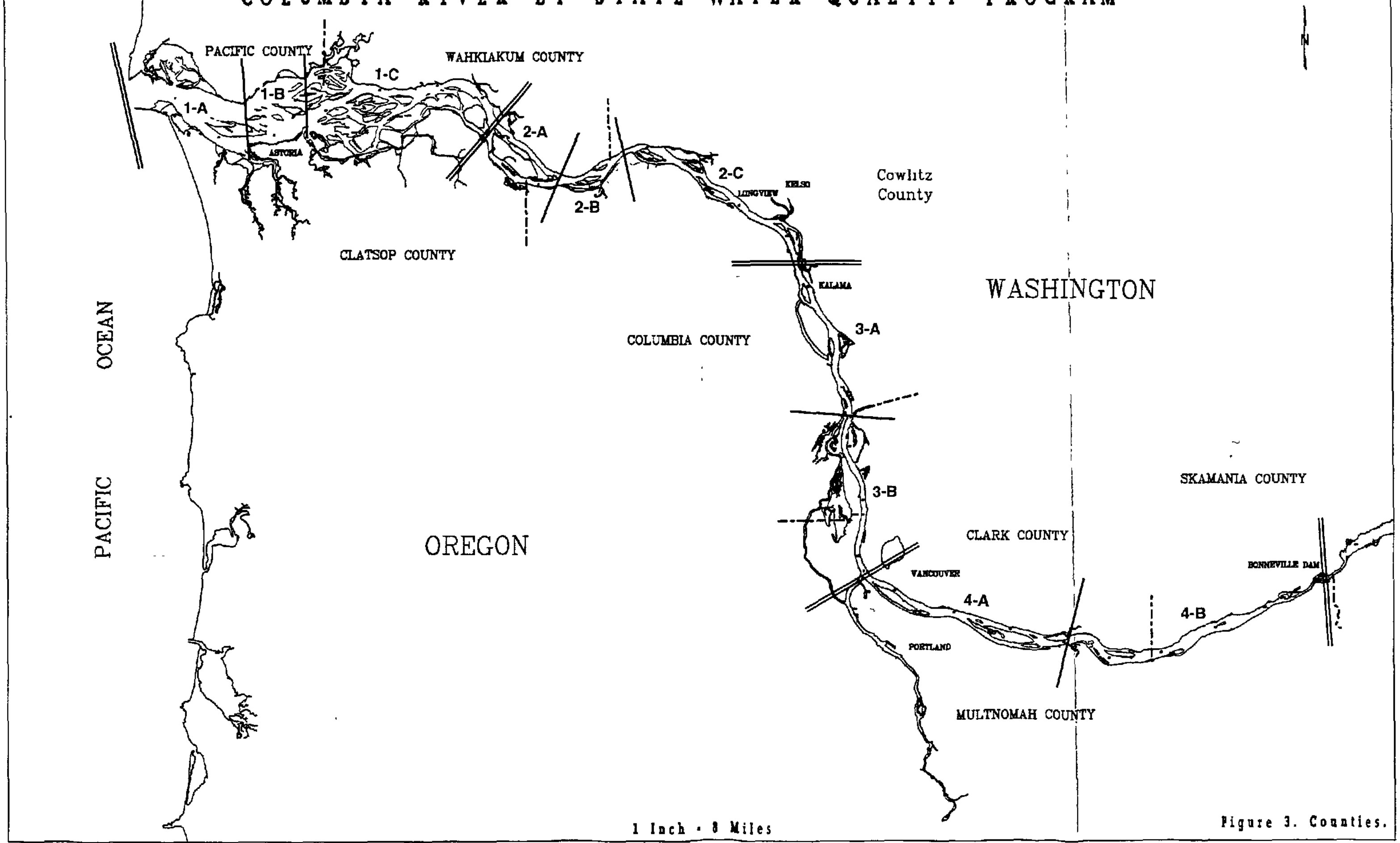


Figure 3. Counties.

Clatsop County office of the USDA Soil Conservation Service was used to calculate land use acreage

The pattern, topography, and related land use in Clatsop County ranges from low, flat alluvial plains near the mouth of the Columbia River, which extends down the Pacific Coast and inland along the River, to heavily forested, rugged slopes in excess of 3,000 ft The county includes sensitive island areas of the Lewis and Clark National Wildlife Refuge and the Columbian White-Tailed Deer National Wildlife Refuge just to the east of Astoria. Adjacent to the river and its sensitive areas, the Burlington Northern Railroad is leveled and bermed the entire length of the county along the river. Areas of urban settlement and industry are scattered along the shoreline Urban areas, including the City of Astoria, are generally located at the confluence of the Columbia and the other tributaries in the county

The remainder of the county is primarily forest land (454,803 acres or 86 percent) Thirty-three percent of the forest is in the public domain Agricultural land use is generally on small parcels (25,821 acres or 5 percent of the total) and located on the alluvial plain adjacent to the Columbia River or further down the coast Urban land use totals 14,719 acres, of which 65 percent (Warrenton and Astoria) drains to the mouth of the Columbia River Other land uses include roads, railroads, marinas and docking facilities, and mill works

3.1.2.2 ***Columbia County.*** Columbia County lies adjacent to, and east of Clatsop County (Figure 3) Columbia County extends from river segment 2A to 3B The County has a broad alluvial plain along the Columbia and is diked and leveled for most of its shoreline from Clatsop County to the City of Rainier The river narrows from an easterly to a northerly flow at Rainier North of Columbia City and south of St Helens broad, flat plains characterize the shoreline The roadways and railroad parallel and levee the river through this area Upland of the highway, steep, forested slopes take over the landscape.

The Columbia County planning department had no recent tabulations of existing land use. The information from the County Resource Inventory was compiled from 1985 county planning data, aerial photos, and a physical inventory Most land in Columbia County drains into the Columbia River although a large area drains into the Nehalem basin and then to the Pacific Ocean

Columbia County is primarily forest (288,000 acres or 67 percent of the total) Of its 73,949 acres of agriculture land, 58 percent pasture with the remaining in cropland use The pasture land is non-irrigated, located away from the river, and inter-mixed with forest The cropland is primarily located near the river The urban lands in Columbia County (17,000 acres) drain to the River The three primary urban areas are the cities of Columbia City, Rainier, and St Helens

3.1.2.3 Multnomah County Multnomah County is the easternmost county adjacent to the river on the Oregon side (Figure 3) This county extends along the lower Columbia River from river segment 3B to river segment 4B Multnomah County has the longest river shoreline of any county in the study area The boundary with Columbia County transects Sturgeon Lake, which lies on a wide alluvial island within the Columbia River Sauvie Island is formed at the confluence of the Columbia and the Willamette Rivers The City of Portland and its associated urban area lies directly south The pattern of land use along the shoreline in Multnomah County is dominated by urban settlement and industry The transportation system generally runs parallel and adjacent to the shoreline

The unincorporated area is primarily forest and farm land with approximately 5,100 acres of rural residential property Forest land makes up 52 percent of the county and is primarily located to the east Multnomah County has 74,016 acres (25 percent) developed with urban uses The cities of Portland and Gresham continue to develop and are slowly filling in the farmLands within and near their city boundaries Portland stormwater drains into the Willamette River, which flows into the Columbia River, and Gresham runoff drains to the Sandy River and then to the Columbia River Beyond the urban areas, south and east of the Bonneville Dam, forests take over the landscape Most of Multnomah County is classified as forest and steep, deeply incised drainages reach up the slopes toward Mt Hood.

3.1.3 Washington Counties

Five Washington counties border the lower Columbia River from its mouth to Bonneville Dam (Figure 3) The land use information collected as part of this survey will be summarized by county

3.1.3.1 Pacific County. Pacific County encompasses 908 square miles and is located at the mouth of the Columbia River in the southwest corner of the state (Figure 3) It is bordered on the west by the Pacific Ocean and to the south by the Columbia River and Wahkiakum County, including the lower Columbia River shoreline from river segment 1A to 1B Elevations range from sea level to 2,600 ft. Much of the county consists of low coastal terraces, hills and low mountains. Pacific County is densely forested with only a short Columbia River shoreline, approximately 15 percent of its southern border Major drainages are the Grays and Deep rivers Most of the county land adjacent to the Columbia River is lowland alluvial plain Numerous islands and sensitive wildlife habitat characterize the land use in this southwest corner of the county. The City of Ilwaco is the largest urban area along the Columbia shoreline Agricultural activity is limited to the narrow valleys and coastal terraces of the county

*3 1 3.2 **Wahkiakum County.*** Wahkiakum is the smallest county (261 square miles or 166,848 acres) to border the Columbia River in the study area (Figure 3). It is adjacent to Pacific County on the west, Cowlitz County on the east, and the Columbia River on the south and extends along the lower Columbia River shoreline from river segment 1C to 2B Most of the county is forest (146,346 acres or 88 percent of total land) The pattern of land use adjacent to the river is characterized by very steep slopes ascending directly from the river bank to elevations of 1,200 ft before opening into more broad plateau areas Deeply incised streams and creeks flow from the mountainsides and into the river Skamokawa Creek, a major drainage in the county, channels flow from three major valley systems into the river at Skamokawa, just northwest of the Columbian White-Tailed Deer National Wildlife Refuge The only urban area along the shoreline is the City of Cathlamet Lumbering is a major industry in the county

*3.1 3.3 **Cowlitz County.*** Cowlitz County is the second largest county in the study area It is bordered on the west by Wahkiakum County, on the east by Skamania County, and on the south by the Columbia River and Clark County (Figure 3). River segments included along the shoreline of this county include segments 2B, 2C, and 3A The county is primarily forest land (583,024 acres or 80 percent of the total) However, the land-use pattern adjacent to the river is intensely urbanized Major population and industrial settlements at Kelso and Longview flank the Cowlitz River at its confluence with the Columbia Low-level alluvial plains occupy the shoreline for much of the county's border along the river Other major drainages such as the Cowlitz and Kalama rivers carry flows from the forested uplands, including the Mount St Helens area Interstate 5 runs parallel and sometimes adjacent to the Cowlitz River and runs south along the Columbia.

*3 1.3 4 **Clark County.*** Clark County is approximately 65 miles inland from the Pacific Coast It is bordered by Cowlitz County on the north, Skamania County to the east, and the Columbia River to the south (Figure 3) This county includes the river segments 3B, 4A, and a portion of river segment 4B Elevation ranges from sea level to 3,000 ft The Lewis River forms the border with Cowlitz County, and with the Lake River forms a number of islands and alluvial plains along the shoreline to the south. This area is the Ridgefield National Wildlife Refuge, a designated sensitive wildlife area. To the south is the City of Vancouver with its industrialized and urbanized characteristics. Urban development extends away from the river up the Interstate 5 corridor from Vancouver Much of the county adjacent to the river is lowland plains and valleys transected by numerous streams and creeks. The urban/industrial areas of

Washougal and Camas are upstream from Vancouver A major east-west transportation route parallels and is adjacent to the river for most of the Clark County shoreline on the Columbia

Clark County has 226,969 acres (57 percent) of forest The forest land is both public (103,174 acres) and private land (123,795 acres) with the Gifford Pinchot Forest comprising the majority of the public land The Gifford Pinchot Forest is located in the northeastern portion of the county, on the edge of the Cascade Mountains, and does not drain directly to the Columbia River Although some agricultural uses are located along the river, most are located north of the urban areas that face directly on the river.

3.1.3.5 Skamania County. Skamania County is the easternmost county on the Washington side and the largest in the study area (Figure 3) It is bordered by Clark and Cowlitz counties on the west and the Columbia River on the south This county borders the upper section of river segment 4B and includes Columbia River shoreline above the Bonneville Dam Moving east from Clark County, land use abruptly becomes undeveloped Elevations range from 75 ft along the Columbia to 8,365 ft at Mount St Helens The creation of the Columbia River Gorge National Scenic Area has placed all of the Skamania County Columbia River shoreline into a protected category Skamania County has 1,044,016 acres of forest land or 98 percent of the county total Out of that, the Gifford Pinchot National Forest and other federal and state lands comprise 931,136 acres Urban development is minimal, consisting solely of small towns such as Stevenson Agricultural land (less than 1 percent) in the county includes 455 acres of orchards and vineyards located on the upland terraces and small alluvial plains of the Columbia River

3.1.4 Results

By far the largest land-use type in the study area is forest land (Table 20) Much of this land is not located on the river and in many cases drains to tributary streams rather than directly into the Columbia. Agricultural uses, the second largest classification, comprises less than 10 percent of total land use in the counties bordering the river.

3.1.5 Non-Point Pollutant Sources to the Lower Columbia River

Non-point sources of pollution are the numerous pollution sources not readily identifiable to a single discharge point (point source). Because non-point pollution does not originate from a single location, these sources are difficult to pinpoint and ultimately control. Non-point pollution originates from the activities of many different people, places, and animals, and their impacts can combine in sometimes unpredictable ways to degrade and alter the environment

TABLE 20 LAND USE SUMMARY
(Estimated Acreage)

	Forest	Agriculture	Urban	Other	Total
Oregon					
Clatsop	454,803	25,821	14,719	19,857	515,200
Columbia	288,000	73,949	23,000	54,731	439,680
Multnomah	142,498	35,011	74,016	19,195	270,720
Washington					
Clark	226,969	94,646	43,699	36,030	401,344
Cowlitz	583,024	37,612	36,816	74,644	732,096
Pacific	530,000	34,870	720	15,510	581,100
Skamania	1,044,016	6,726	2,235	17,295	1,070,272
Wahkiakum	146,346	14,616	1,280	4,606	166,848
TOTAL	3,415,656	323,251	196,485	241,868	4,177,260
	81.8%	7 7%	4 7%	5.8%	100%

Non-point pollution consists of sediment, bacteria, nutrients, and toxic chemicals that are discharged into the environment where they are easily incorporated into runoff waters (surface and groundwater), transported to streams and ultimately into the Columbia River Runoff waters include drainage from roads, parking lots, forests, pastures, croplands, orchards, golf courses, lawns, failing septic systems, and other activities

Land-based activities throughout the lower Columbia River basin that can generate non-point pollution include a wide range of activities associated with forest, agriculture, urban, and rural residential land uses The level of possible impact is roughly proportional to the amount of land employed in each of these activities (Table 20)

*3 1 5.1 **Forest.*** Forest lands are defined as national forests and public and private lands managed for timber production Because forest lands are the largest percentage (81 8 percent) of land use in the counties bordering the lower Columbia River, they potentially can contribute the greatest impacts to water quality via non-point pollution sources Growing, harvesting, or processing timber can potentially have an adverse effect on water quality, especially logging and clearcutting practices, road building and maintenance, reforestation, slash burning, fertilizer and herbicide/pesticide application, and removal of streamside vegetation. Several water quality problems can arise from these forest management practices (PSWQA 1988):

- Excessive erosion of sediments due to increased runoff and resultant accumulation of sediments in the receiving water
- Accumulation and decomposition of excess log debris in the water
- Elevated stream temperatures due to loss of vegetative cover
- Introduction of toxic chemicals and/or nutrients into the water due to excessive application and runoff of fertilizers, herbicides, and/or pesticides.

Forest management practices can influence receiving waters by increasing sediment, turbidity, temperature, nitrates, phosphates, and trace organic chemicals, as well as by decreasing DO An excess of these chemical parameters can lead to impaired fish respiration, smothered spawning areas, decreased light penetration, increased abrasion, altered biological processes, increased algae blooms, accelerated eutrophication, unpleasant appearance and odors, and increased levels of toxicity and possibly poisoning of aquatic and/or human species

Methods of controlling sources of non-point pollution are designated as best management practices (BMPs) BMPs are designed to prevent pollution and alter its cause The following are samples of forestry BMPs that have been recommended in other watersheds (PSWQA 1988)

- Limit the miles of logging roads
- Avoid steep slopes for roads and clearing
- Control water runoff and ultimately soil erosion
- Maintain vegetated buffers along all water bodies
- Minimize amount of time that log rafts are stored in the water
- Apply fertilizers, pesticides, and herbicides cautiously and at a safe distance from waterbodies.

Other measures in Washington to control forest management other than BMPs are the Forest Practices Act (Chapter 76 09 RCW), the Forest Practice/Water Quality Management Plan (WDOE 1979), and the Timber, Fish, and Wildlife (TFW) Agreement (Forest Practices Act, 1987, Title 222 WAC). Likewise, in Oregon the state and privately held lands are regulated by a similar Forest Practices Act (ORS Chapter 527) The State of Oregon also has administrative rules that govern chemical application, slash disposal, reforestation, road construction/maintenance, and harvesting activities on forested lands (Hays, S., 12 February 1992, personal communication) For managing Federal lands there is the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), and the Resource Planning Act (RPA)

According to the DNR and the Oregon Department of Forestry (ODOF), chemicals are used only when necessary on state lands Use of insecticides is restricted and used only when severe infestations occur (Cline, L , 28 August 1991, personal communication) Examples of commonly-used insecticides are Metasystox R and Thiodan They are used to control weed growth and other unwanted vegetation along roads and on reforestation sites These insecticides may be used once or twice yearly depending on the trees being grown and the particular site conditions. Commonly used herbicides include Atrazine, Velpar, Roundup, Tordon, Garlon, Accord, Rodeo, and several 2,4-D derivatives To a lesser extent, both fungicides and rodenticides are applied when needed. The most frequently used fungicides are Bravo and

Daconil 2787 (Schuttie, R , 11 February 1992, personal communication) A complete list of chemicals potentially used on Oregon and Washington forest lands is provided in Appendix X

The U S Forest Service does not allow pesticide use on federally owned lands (U S Forest Service, 1991, personal communication) Although ODOF does not own state lands adjacent to the lower Columbia River, they provide technical assistance to private land owners throughout Oregon (Cline, L , 28 August 1991, personal communication) Private land owners must apply for a permit from ODOF to do any forest management activities (spraying, cutting, or use of any equipment) Use of chemicals in both Oregon and Washington forests is heavily regulated and, if used, ample buffers must be maintained along streams and riparian areas (Cline, L , 28 August 1991, and Schuttie, R , 11 February 1992, personal communication)

3 1.5.2 ***Agriculture.*** Agricultural lands are defined as those areas used for commercial and non-commercial cropland, livestock, and general farming This use includes dryland and irrigated agriculture, rangeland, orchards, dairy and hobby farms, with grains the major crop grown As the second most prevalent land use within the study area, agriculture accounts for 7.7 percent of the acreage within the counties bordering the lower Columbia River Typical problems associated with agricultural activities near waterbodies are improper handling of animal waste, access to streams by livestock, poor pasture practices (overgrazing), soil erosion, and excessive chemical applications (fertilizers, fumigants to control insects, and defoliants to control vegetation) (U S Department of Commerce 1988a and 1988b) The effects on water of these activities are possible increases of fecal coliform levels, nitrates, phosphates, sediments, turbidity, temperature, and trace organic chemicals, as well as a decrease in DO In addition to these results, fecal coliform and other bacteria may harm aquatic biota in receiving waters or pose a health risk to humans from recreational contact and contaminated drinking water Appendix Y contains a list of the agricultural chemicals commonly used in Oregon and Washington

Non-point pollution from agricultural activities can also be controlled through the use of BMPs These BMPs would include conservation tillage, terracing, contour farming, planting cover crops, nutrient and pesticide management systems, improved irrigation and drainage systems, fencing of streams, and revegetating unstable stream banks. Constructing roofs over animal confinement areas, confining and storing liquid and solid animal wastes, properly applying manure wastes to fields, and installing drainage systems to separate clean runoff and surface water from contaminated wastewater are also BMPs (PSWQA 1988).

3.1.5.3 Urban. Within the study area urban lands occupy 4 7 percent of county land bordering the lower Columbia River. Urban areas typically contain large areas of impervious surface (buildings and pavement) that create large volumes of surface water runoff Surface runoff is one of the major mechanisms by which non-point sources of pollutants are transported to surface water bodies and eventually to the river. As precipitation falls on these impervious surfaces, sediment and chemicals are picked up and carried via gutters and drains to receiving waters Some of the activities normally associated with urban lands involve automobiles, household and garden chemicals, pet wastes, septic systems, and new construction Possible pollutants discharged via urban runoff include sediments, nutrients, pathogens, heavy metals, and organic compounds (petroleum products, pesticides, insecticides, and fertilizers) (PSWOA 1988)

To control these types of non-point pollution, two approaches need to be implemented prevention and treatment The public needs to be educated on the proper use and disposal of potential pollutants they handle at home and work If some of these harmful substances enter the environment, then treatment methods should be in place to capture and partially treat and filter the surface runoff before its discharge into the receiving water Some examples of structural and non-structural BMPs are detention/retention ponds, oil/water separators, biofiltration swales, vegetated buffers, filter fences, seeding and mulching, and straw bales.

3.1.5.4 Other Sources. Other land uses are defined as marinas, storage tanks, highways, railroads, accidental spills, public utility corridors, rural unincorporated areas, landfills, recreational lands, mining, quarries, airports, cemeteries, golf courses, and other activities These uses account for 5 8 percent of the county lands bordering the lower Columbia River Many of these uses involve activities, and therefore resultant pollutants, similar to the ones listed under urban lands Accidental spills in the Columbia River or its tributaries are discussed separately in Section 3 5 Marinas are also discussed as a potential source of in-place pollutants in Section 4 5 3.

Marinas Marinas and boats have a direct effect on the water in which they are located, used, or moored Because boats are also repaired and maintained at marinas, they could potentially introduce contaminants into the water Detergents and paints from cleaning and scraping boat hulls, solvents, chemicals, gasoline, and diesel fuel could all potentially be spilled into the water Recreational and commercial boats can discharge raw sewage, contaminated bilge water, petroleum products, and various trash into surrounding waters The practice of discharging wastes is illegal but still occurs and is particularly noticeable on holiday weekends and in confined waters (i e., bays, inlets, or sloughs). This practice introduces bacterial contaminants into the surrounding water and shellfish beds. These contaminants can make shellfish unfit for human consumption and can close waters for swimming and other water-contact activities Federal, state, and local regulations govern boat discharges of sewage, oil, debris, and trash (WDOE 1989) In some parts of the study area, there are concentrations of live-aboard houseboats WDOE has received and responded to complaints in Clark, Cowlitz and Wahkiakum counties involving illegal discharges from houseboats (Randall, L , 13 February 1992, personal communication). Such violations present a water quality issue of high concern for humans and shellfish in the immediate area of these discharges. More strategically placed pumpouts need to be available for boater use and public education on environmentally sound boating practices needs to be promoted

<u>Storage Tanks</u> Leaking storage tanks pose a threat to surface and groundwater Many of these abandoned tanks are old, rusty, and may contain liquids that are flammable, combustible, and highly toxic The leakage and residue from these tanks can leach and be carried into surface and groundwaters and eventually into receiving waters or, more importantly, wells used for drinking water These substances are potentially harmful to people and animals that come in contact with them Federal and state regulations address removal of old tanks and new requirements for newly installed storage tanks (WDOE 1989). Both Washington and Oregon have initiated underground storage tank (UST) programs All tanks larger than 110 gallons that contain petroleum or hazardous liquids are required to obtain a permit Home heating oil and tanks smaller than 1100 gallons located on farms are exempt from this permitting program Although both state UST programs depend on voluntary permit application, USTs must be licensed and large fines are levied against known violators (Bolender, W , 11 February 1992, personal communication). While licensed USTs may pose only a slight concern to water quality in the Columbia River, unregulated, abandoned, and old tanks present a high concern These USTs are usually 30–50 years old, composed of bare steel, corroded, and contain at least small amounts of products potentially leaking into the ground (Simms, S , 13 February 1992, personal communication) Both Washington and Oregon maintain databases with information on all licensed and leaking USTs that have been discovered These lists are thought to represent only about half of the USTs in existence. Clean-up techniques and public education programs are also integral components of these UST programs.

<u>Highways and Railroads.</u> The highways and railroads that parallel most of the lower Columbia River can potentially direct non-point pollutants into the river Highways are impervious surfaces Their runoff can contain petroleum products, gasoline, diesel fuel, sediment, and other substances spilled on the roadway Likewise, railroad cars can leak oil, grease, wastewater, and spilled cargo onto the tracks and directly into the river. Because the railroad tracks lie close to the banks of river, these pollutants have a greater potential for reaching the river unfiltered and therefore pose a greater threat to the health of fish, shellfish, and humans

Highways Federal and state jurisdictions have guidelines for highway construction BMPs regarding erosion and sediment control Regulations also exist for restricting the types and quantities of cargo hauled by road and rail In the spring the Washington Department of Transportation (WDOT) and Oregon Department of Transportation (ODOT) spray herbicides (typically soil residuals such as Roundup and Amisol) (Hay, J, 28 August 1991, personal communication) along the shoulders of the state highways to control vegetation The ODOT does not spray chemicals within 25 ft of streams or culverts with flowing water (Hay, J, 28 August 1991, personal communication) Occasionally in certain areas Casaron, Krinite, and 2,4-D are used to control noxious weeds and berry bushes (Hay, J., 28 August 1991, personal communication) In other cases, WDOT and ODOT mow the shoulders and median areas to control vegetation The highway departments also dredge existing drainage channels as needed to remove sediment and vegetation accumulation Often these activities disrupt the growth of beneficial plants which are known to uptake various types of pollutants (Kulzer 1990) These plants should be harvested and disposed of in a landfill at the end of the growing season because they are potentially classified as toxic substances However, sometimes these plants are mowed or sprayed during the summer and left to decompose, thus returning a portion of the pollutants to the channel and the water running through it.

Railroads Two railroad companies own, operate and maintain tracks along portions of the lower Columbia River. Burlington Northern manages the tracks on the Washington side and those running from Portland to Astoria, OR Union Pacific handles the remaining track from Portland, OR east past Bonneville Dam Both companies operate under identical federal and state regulations concerning railroad rights-of-way maintenance, disposal practices, and spill procedures Annually, or as needed, herbicides are applied along the berm to control vegetation Every few years, as needed, the drainage channels below the berm are cleaned out to remove the accumulation of sediment and vegetation This potentially polluted material is usually hauled to a landfill. If it is left to decompose, the pollutants concentrated in sediment and plant tissue are returned to the environment Every year railroad ties are replaced and repaired as needed. Usually concrete and steel ties are installed to replace the old creosote/wood ties These worn ties are collected and typically sold to be burned for fuel at a plant in Bovie, Minnesota (Kluthe, S., 11 February 1992, personal communication)

<u>Accidental Spills</u> The U S Coast Guard National Response Center in Washington, D C maintains a national database on spills that occur on the land and in the water by various modes of transportation This database is composed only of spills reported to the U S Coast Guard, and its the validity is not confirmed by the Coast Guard Between 1989 and 1991, 130 spills on land were reported in the counties that border the Columbia River Eighteen reported spills took place on highways and involved gasoline, oil, diesel, sodium hydroxide,

and coal tar pitch. Eleven spills occurred from railroads and were comprised of oil, chlorine, creosote, and coal tar pitch Because there is no way to predict the timing, quantity, or quality of accidental spills, they pose the a potentially serious threat to the river

Some of these land-based spills can potentially seep into the groundwater and ultimately into the river if conditions allow However, this type of non-point pollution may be of lesser concern compared to other sources because soil can adsorb the spill material and prevent it from leaching into the surrounding groundwater or surface waters. As long as the soil is not too porous and the water table is not too shallow, this type of contamination is minimal

Public Utility Corridors. In some counties, particularly Skamania, many miles of power line corridors located close to the river. Approximately 120 miles of power line corridor with an average width of about 100 ft, stretches from the Bonneville Dam to Vancouver, WA Power line right-of-way also requires maintenance of brush and vegetation. In the last six years, no chemicals have been sprayed in this corridor. Bonneville Power Administration (BPA) removes only the brush and vegetation as needed with chain saws or tractors Periodically, a noxious weed problem arises which may require the application of certain chemicals (Mattix, J , 28 August 1991, personal communication) Because the power line corridor covers a small area (approximately 1450 acres), the use of chemicals is infrequent, and the lines are placed as far away as 1 mile from the river, this activity presents a low concern for water quality in the lower Columbia River

3.1.6 Summary

As discussed, forest lands dominate the land use along the lower Columbia River. These lands are not, however, prevalent directly along the river and its tributaries. The forests adjacent to the river are mostly recreational areas and designated sensitive areas not involved in timber production activities. Therefore, the effects of forest management practices on non-point pollution in the lower Columbia River are less than what land-use categories might indicate However, in some of the watersheds that drain into the Columbia most of the land is in timber production Forestry in these watersheds would pose a high concern for water quality issues of chemical use and sediment load.

While overall, agriculture is a moderate concern, in certain locations and along some tributaries it poses a high concern for water quality For example, along many portions of the river only the land along the water's edge is flat enough for agricultural use.

Typically, a wider range of chemicals (fertilizers, pesticides, insecticides) are used during more seasons of the year in agriculture than in forestry-related activities Under agricultural use, more water is intentionally sprayed on the land (irrigation) than is used in forestry, creating more potential for runoff to carry pollutants into nearby surface waters. There have been reported incidents of dairy farms in Pacific County creating water quality problems caused by animal wastes entering surface waters (Randall, L , 13 February 1992, personal communication) These kinds of water quality violations not only degrade water quality but also are a health risk to shellfish and the food chain

In upstream areas east of Bonneville Dam, agricultural lands predominate along the river's edge Dryland agriculture, irrigated croplands and orchards routinely need to be sprayed with fertilizers, herbicides and pesticides in order to produce sufficient quality and quantity of food products for consumer markets Soil erosion from repeated plowing turns rivers muddy after rainstorms and occasionally creates dust storms that carry particles to the river (Cline, L , 28 August 1991, personal communication) All this agricultural activity above Bonneville Dam can potentially affect the water quality and ultimately the food chain below the dam, depending on the season and environmental conditions

Urban areas containing numerous industries occupy a large percentage of land in the study area, particularly from Portland to the river mouth. The non-point impact of urban land is much greater than might be implied by the county summaries presented in Table 20 because urban areas are concentrated along the shoreline of the river and at the confluences of several tributaries Urban land use represents a high concern for water quality, especially in localized areas containing large cities and along some tributaries. Studies in the Puget Sound basin are finding that urban runoff is the largest source of toxic pollutants to Puget Sound (PSWQA 1992) The same conclusions are probably true for urbanized sections of the Columbia River

Other sources of pollution lie in close proximity to the Columbia River and its tributaries and therefore have a greater opportunity to add to non-point pollution than indicated by the counties' total acreage A few of these sources potentially contribute non-point pollutants directly to the river depending on time of year (i.e., highways, railroads, leaking USTs, and boating) These sources can vary from high to low concern for water quality depending on site-specific circumstances.

In designing a sampling program to assess non-point pollution loading, stations should be located off urban areas and at the confluence of large tributaries to the river Locating stations off urban areas will allow for greatest capture of non-point pollutants from sources near the river. Sampling locations at the confluence of large tributaries will allow examination of pollutant input from large drainage basins A sampling station should ideally be situated as far upstream as possible (above or at least below Bonneville Dam) to assess any point and non-point contributions from upstream sources

3.2 URBAN STORMWATER AND COMBINED SEWER OVERFLOW RUNOFF

Potentially important contributors to pollutant loading to the Columbia River are urban and stormwater runoff from residential, commercial, and industrial areas, and combined sewer overflows (CSOs) from municipal wastewater collection systems discharging mixed stormwater and untreated municipal sewage Runoff from stormwater carries dissolved and particulate pollutants picked up from a wide range of undisturbed and disturbed drainage areas and thus can be considered non-point pollution These sources are typically routed to discrete outfalls, where they are discharged directly to the Columbia River and its tributaries Pollutant loading from these sources may be estimated using nationally derived averages, but these values can result in under- or over-estimation by as much as 10 times for some pollutants [e g , for nutrients (Dierberg 1991)] More accurate estimates would be derived if based on regional or site-specific information

With the passing of the Water Quality Act of 1987, the Clean Water Act was amended to instigate a phased approach to controlling pollutants in stormwater discharges. The amendment [Section 402(p)] also established regulations governing stormwater discharge permit application requirements under the NPDES program These requirements pertain to stormwater discharges associated with industrial activity and medium-to-large municipal separate stormwater systems Therefore, extensive site-specific data will soon become available

To fill this information gap, a telephone survey of several municipalities and port facilities along the Columbia River was conducted during August 1991 to determine the extent of site-specific data on urban stormwater runoff The survey also sought to determine whether or not stormwater monitoring or significant drainage modifications such as separation of storm and municipal sewage systems were planned for the near future. This survey and its results are described in detail in the following text

3.2.1 Data Collection and Methodology

To determine the current and historical level of stormwater and CSO monitoring within the study area, a phone survey was conducted during August 1991 with utilities or public works supervisors from each city or port that potentially discharges stormwater to the lower Columbia River

The following questions were asked in the survey

- Has your city ever measured the flow and/or composition of urban, stormwater and CSO runoff?

- Are any improvements planned to the stormwater/CSO system?

- Is a stormwater/CSO monitoring program planned?

- Do you anticipate applying for a NPDES stormwater permit?

3.2.2 Municipalities

The urban population centers contacted for this survey included Ilwaco, WA and Warrenton, OR in river segment 1A, Astoria, OR in river segment 1B, and Cathlamet, WA in river segment 2A River segment 2C contained a number of urban population centers including Rainier and Clatskanie, OR and Stella and Longview, WA River segment 3A included St Helens and Columbia City, OR and Kalama, WA The most urbanized river segment was river segment 4A, which included surveys of Portland, Gresham, and Fairview, OR and Vancouver and Kelso, WA The survey of river segment 4B included surveys of Washougal and North Bonneville, WA

The results of the survey of these cities are given in Table 21 and are summarized below Until very recently, the monitoring of stormwater has not been a priority for the smaller cities Only Portland has established a comprehensive monitoring program, although the data are not yet available Now that new regulations for stormwater discharges are in place, many of the cities intend to improve their stormwater systems. Types of improvements include the separation of stormwater and sanitary lines and catchments (e.g., Ilwaco, WA), the elimination of natural drainageways, and the elimination of system leaks to reduce infiltration and inflow

The completion of the stormwater system improvements will in many cases depend on state matching grants For some cities (e g , Kalama, WA), major capital improvements are necessary to their sewage treatment plants, making improvements to the stormwater systems unlikely in the near future Several cities (e g , Gresham, OR and Ilwaco, WA) have formed separate stormwater utilities. Stormwater monitoring programs have also been planned as part of these system improvements As of August 1991, only Portland had begun the application process for NPDES permits for stormwater

TABLE 21 STORMWATER, CSO, AND URBAN RUNOFF SURVEY RESULTS FOR CITIES IN STUDY AREA
(Page 1 of 2)

City	River Segment	Monitoring Data		Future Plans		
		Flow	Quality	Stormwater Improvements	Stormwater Monitoring	NPDES Stormwater Permit Required
Oregon						
Warrenton	1A	NA	NA	Computer Modeling of System	Yes	No
Astoria	1B	NA	NA	Eliminate Natural Drainage Ways	Yes	Maybe
Rainier	2C	NA	NA	Separate Storm and Sanitary Sewers	None	No
Clatskanie	2C	NA	NA	None	None	No
St Helens	3A	Historical	NA	None	None	No
Columbia City	3A	NA	NA	None	None	No
Gresham	4A	NA	NA	Stormwater Utility Planned	None	Yes
Portland	4A	Yes	Some	Ongoing	Ongoing	Yes
Fairview	4A	NA	NA	None	None	Maybe with Gresham
Washington						
Ilwaco	1A	NA	NA	Separate Sanitary and Stormwater Sewer	None	No
Cathlamet	2A	NA	NA	None	None	No
Stella	2C	NA	NA	None	None	No

TABLE 21 STORMWATER, CSO, AND URBAN RUNOFF SURVEY RESULTS FOR CITIES IN STUDY AREA
(Page 2 of 2)

City	River Segment	Monitoring Data		Future Plans		
		Flow	Quality	Stormwater Improvements	Stormwater Monitoring	NPDES Stormwater Permit Required
Longview	2C	Dike Pump Record	NA	Comprehensive Plan Being Finalized	Comprehensive Plan Being Finalized	Yes (industrial)
Kalama	3A	NA	NA	None	None	No
Ridgefield	3B	NR	NR	NR	NR	NR
Vancouver	4A	Limited Areas	NA	Comprehensive Plan in Preparation	Comprehensive Plan in Preparation	Yes
Kelso	4A	Dike Pump Record	NA	Comprehensive Plan Being Finalized	Comprehensive Plan Being Finalized	Probably (under Diking District)
Camas	4A	NA	NA	None	None	No
North Bonneville	4B	NA	NA	None	None	No
Washougal	4B	NA	NA	None	None	No

NA = No data available

NR = No response

Estimates of loading to the lower Columbia River from urban/CSO runoff are not possible due to the paucity of data Discharge data for composition and flow are available only for Portland, whose CSO and stormwater outfalls discharge into either the Willamette River or the Columbia Slough

3.2.3 Port Districts

The public port districts located along the Columbia River oversee a wide variety of facilities including marine terminals, barge facilities, industrial development, marinas, airports, and railroads The port facilities surveyed were located along the lower Columbia River from river segment 1B to river segment 4B. In Oregon the ports surveyed included the Port of Astoria (river segment 1B), the Port of St Helens (river segment 3A), and the Port of Portland (river segment 4A) More port facilities were surveyed in Washington The ports surveyed included Wahkiakum No 1 and the Port of Longview in river segments 2A and 2C, respectively The Port of Kalama is located in river segment 3A Three ports in river segment 4A were surveyed (Camas/Washougal, Vancouver, and Wahkiakum No 2) The Port of Skamania was also surveyed (river segment 4B)

The results of the survey of the port districts are given in Table 22 Almost no data on stormwater flow and composition are available from these ports The port districts oversee a diverse range of tenants who are themselves responsible for their own environmental monitoring and regulation Of the facilities actually operated by the port districts, most are not included in any type of comprehensive stormwater system, primarily because of their disparate functions and locations Most of the port districts do not anticipate obtaining an NPDES permit for stormwater However, the Port of Portland has already submitted applications for a number of general stormwater permits issued by the State of Oregon These include permits for both marine and airport (Portland International Airport) facilities A cooperative effort between the City of Portland and Port of Portland has also been undertaken for the municipal stormwater permit application.

The Portland International Airport facility, although a potentially significant source of stormwater pollutants, is not likely a significant direct source of contaminants to the Columbia River Stormwater runoff from the airport receives treatment from oil/water separators and detention basins and is then discharged to the Multnomah Drainage District, which does not drain directly to the river (Hancock, D , 18 February 1992, personal communication)

TABLE 22 STORMWATER, CSO, AND URBAN RUNOFF SURVEY RESULTS FOR PORTS IN STUDY AREA						
Port	River Segment	Monitoring Data		Future Plans		
		Flow	Quality	Stormwater Improvements	Stormwater Monitoring	NPDES Stormwater Permit Required
Oregon						
Astoria	1B	NA	NA	None	None	Yes
St Helens	3A	NA	NA	None	None	Maybe for airpark
Portland	4A	NA	NA	None	Yes	Yes
Washington						
Wahkiakum No 1	2A	NA	NA	None	None	No
Longview	2C	NA	Yes	Some	None	Yes
Kalama	3A	NA	NA	None	None	Yes
Woodland	3A	NA	NA	None	None	No
Wahkiakum No 2	4A	NA	NA	None	None	No
Camas/Washougal	4A	NA	NA	None	None	Maybe for Airport
Vancouver	4A	NA	NA	Comprehensive Plan in Preparation	Comprehensive Plan in Preparation	Yes (general)
Skamania	4B	NA	NA	None	None	No

NA = No data available

3 2.4 Summary

The most urban segment of the study area is river segment 4A, which includes the cities of Portland, Gresham, and Fairview, OR and Vancouver, Kelso, and Camas, WA Other significant urban areas include the city of St Helens, OR in river segment 3A, Longview, WA in river segment 2C, and Astoria, OR in river segment 1B Large port facilities are associated with several of these urban areas in river segments 1B, 2C, 3A, and 4A Almost no data are available on the quantity or composition of stormwater and CSO runoff to the lower Columbia River, making accurate estimates of pollutant loading difficult The results of the stormwater/CSO survey provided very little useful information for the formulation of the water quality reconnaissance survey Within the next one to three years several stormwater monitoring programs will be in place (in addition to Portland's program) and will be generating data The upcoming monitoring programs, implementation of new stormwater legislation, and the separation of the stormwater systems from the sanitary systems that several cities have planned will make possible the quantification of a potentially important source of pollutant loading and may also affect present estimates of pollutant loading from municipal point sources

3.3 POLLUTANT LOADING FROM COLUMBIA RIVER TRIBUTARIES

A comprehensive survey of pollutant loading to a river cannot be undertaken without considering the tributaries that empty into the river Each of the tributaries of the lower Columbia River contributes to the overall pollutant loading of the river. The pollutants discharged from these tributaries are derived from both point and non-point pollution sources within the tributary drainage areas The quantity and quality of the discharge of the upper Columbia River to the lower Columbia River below the Bonneville Dam determine the initial quality and contribute to pollutant loading of the lower river This section describes qualitative information on the extent of pollution problems in tributaries that discharge to the lower Columbia River and the available data on flow and water quality near the mouths of these tributaries before discharge. In this section an attempt will also be made to estimate and compare pollutant loading from tributary sources including the contribution of the upper Columbia River

The five largest tributaries to the lower Columbia River are the Willamette, Cowlitz, Lewis, Sandy, and Kalama rivers. Flow data and drainage area information and comparisons among these five tributaries and the drainage areas of the lower and upper Columbia River are presented in Table 23. The Sandy River in Oregon is the second smallest of the five and the farthest upstream tributary to empty into the lower Columbia This confluence occurs at the boundary between river segments 4A and 4B at river mile 123.5 (Figure 1d) The Willamette

TABLE 23 SUMMARY OF TRIBUTARY FLOWS AND DRAINAGE AREAS TO THE LOWER COLUMBIA RIVER				
Drainage Area	Drainage Area (mi^2)	Relative Percent Area of Total Lower Columbia River Drainage	Annual Average Discharge (MGD)	Relative Percent Discharge of Input Flows
Total Lower Columbia	19,100	100	--	--
Willamette River	11,100	58	20,900	65
Cowlitz River	2,480	13	5,990	19
Lewis River	828	4	3,130	10
Sandy River	436	2	1,390	4
Kalama River	200	1	653	2
TOTAL	15,044	78	32,063	100
Drainage Area	Drainage Area (mi^2)	Relative Percent Area of Total Columbia River Drainage Basin	Annual Average Discharge (MGD)	Relative Percent Discharge of Input Flows
Upper Columbia River	239,900	93	121,800	79
Lower Columbia River	19,100	7	32,063[a]	21

[a] Includes only estimates of flow from the five major rivers identified above. These rivers drain approximately 78 percent of the lower Columbia River Basin.

River is the largest of these five tributaries The confluence of the Willamette River with the lower Columbia River occurs at the boundary of river segment 3B and 4A at river mile 87 5 (Figure 1c) The Lewis River is the third largest tributary and empties into the lower Columbia River at the break between river segment 3A and 3B (Figure 1b) The Kalama River is the smallest of the five largest tributaries and empties to river segment 3A just above the downstream segment boundary with river segment 2C (Figure 1c) The Cowlitz River is the second largest tributary to the lower Columbia River. The confluence of the Cowlitz River coincides with the river segment boundary between river segments 2C and 3A (Figures 1b and 1c)

The flow and drainage area estimates in Table 23 indicate that approximately 78 percent of the drainage area of the lower Columbia River is comprised of these five tributary drainage basins Approximately 71 percent of the drainage area is comprised of the tributary basins of only two of these rivers (the Willamette and Cowlitz). The Willamette River basin alone accounts for approximately 58 percent of the lower Columbia River drainage area When compared to the drainage area of the upper Columbia River, the lower Columbia River contains only about 7 percent of the total Columbia River drainage basin

Comparison of tributary flows produces roughly the same result, although the relative contribution of the Willamette and Cowlitz rivers appears somewhat higher, due in part to lack of information on the contribution of flow from other lower Columbia River tributaries However, the contribution of flow of the lower Columbia River tributaries compared to the contribution of the upper Columbia River is somewhat greater than the comparison of drainage areas suggests (21 percent not including all lower Columbia River tributary flows). This may be due in part to the heavy rains and snow that fall in the lower Columbia River basin compared to the drier upper Columbia River basin. Upper Columbia River flow is due primarily to seasonal snowmelt in spring and summer, while the lower Columbia River flow is controlled by the fluctuation in flow from the upper river and the contribution of snowmelt in spring and summer and heavy rainfall in tributary drainages during winter

3.3.1 Pollution Sources to Tributaries

An extensive review of the pollutant sources to the tributaries feeding the lower Columbia River is beyond the scope of this project However, two summary documents were consulted to identify the non-point sources of pollution to these tributaries. For the Washington tributaries, a report produced by WDOE, *Non-point Source Pollution Assessment and Management Program* (WDOE 1989), was reviewed. For the Oregon tributaries, an ODEQ document called *1988 Oregon Statewide Assessment of Non-point Sources of Water Pollution* (ODEQ 1988) was reviewed In each of these documents, the water quality for most of the tributaries that feed the lower Columbia River was assessed for adverse impacts associated with point and non-point sources Table 24 provides a list of the tributaries examined and indicates whether these water bodies are considered stressed from non-point pollution loading For those tributaries that have been adversely impacted by non-point sources, the type and source of pollution were estimated (Table 24)

Of the 40 tributaries identified in Table 24, 19 were evaluated for degradation due to pollution sources Of these 19, nine were moderately affected and four were severely affected by a variety of pollution types and sources The moderately impacted rivers were Goble and Tide creeks, Multnomah Channel, and the Youngs, Lewis and Clark, Clatskanie, Cowlitz, East Fork Lewis, and Washougal rivers Severely impacted rivers included the Columbia Slough, Skipanon, Sandy, and Willamette rivers.

The type of pollutant most frequently cited as causing degraded water quality was siltation (nine occurrences), followed by TSS (eight occurrences), pathogens (five occurrences), and thermal modifications (five occurrences) (Table 24). Other causes included nutrients (three occurrences), DO (two occurrences), ammonia (two occurrences), flow alteration (two occurrences), and filling and dredging (one occurrence) The Sandy River was the only river reported as impaired by priority pollutants, pesticides, and noxious aquatic plants. The Cowlitz River was impaired due to siltation and suspended solids. The Willamette River was impaired due to siltation and pathogens

Numerous sources of pollutants impaired the use of these rivers (Table 24). Non-irrigated crop production (six occurrences) was the most frequently cited source of pollutants Other sources included forest management practices (four occurrences), storm sewers (four occurrences), rangeland management (three occurrences), animal holding/management (three occurrences), surface mining (three occurrences), and municipal wastewater discharges (three occurrences) The sources of pesticides, priority pollutants, pathogens, and suspended solids to the Sandy River were attributed to municipal point sources, storm sewers, and landfills. The sources of siltation and total suspended solids to the Cowlitz River were dredging and the natural input of ash from the Mt. St. Helens volcano. The sources of siltation and pathogens to the Willamette River were municipal point sources and storm sewers.

3.3.2 Loading Estimates

Estimates of pollutant loading to the lower Columbia River from its tributaries were made using data compiled for flow and water quality These loading estimates incorporate only estimates based on available ambient water quality and flow data from each tributary They do not include the contribution of sediment bed load transport. The primary data sources

TABLE 24 SUMMARY OF LOWER COLUMBIA RIVER TRIBUTARIES EXAMINED (Page 1 of 3)									
River/Creek	River Segment	River Mile	County	State	Non-point Impact	Non-attainment Pollution[a]		Flow Data?	Water Quality Data?
						Type[b]	Source[c]		
Wallacut River	1A	3	Pacific	WA	NA			N	N
Chinook River	1A	5	Pacific	WA	NA			Y	N
Alder Creek	1A	10	Clatsop	OR	NA			N	N
Skipanon River	1A	11	Clatsop	OR	Severe	15,17	02,11,13,22,32	N	Y
Youngs River	1A	12	Clatsop	OR	Moderate	11,21	05,11,12,18,51,83	Y	N
Lewis and Clark River	1A	12	Clatsop	OR	Moderate	11,12,14,21	11,18	N	N
Deep River	1C	21	Wahkiakum	WA	NA			Y	N
Grays River	1C	22 5	Wahkiakum	WA	NA			Y	N
Gnat Creek	1C	28	Clatsop	OR	None			N	N
Jim Crow Creek	1C	29	Wahkiakum	WA	NA			Y	N
Skamokawa Creek	1C	33	Wahkiakum	WA	NA			Y	N
Elochman River	1C	37.5	Wahkiakum	WA	NA			Y	N
Westport Slough	2A	43	Clatsop	OR	None			N	N
Clatskanie River	2B	49	Columbia	OR	Moderate	11,14,21	11,15,23,83,86	N	Y
Beaver Slough	2B	49	Columbia	OR	None			N	N
Abernathy Creek	2C	54	Cowlitz	WA	NA			Y	N
Germany Creek	2C	56.5	Cowlitz	WA	NA			N	N
Nice Creek	2C	67	Columbia	OR	None			N	N
Cowlitz River	2C	68	Cowlitz	WA	Moderate	11,21	72,86	Y	Y

TABLE 24. SUMMARY OF LOWER COLUMBIA RIVER TRIBUTARIES EXAMINED
(Page 2 of 3)

River/Creek	River Segment	River Mile	County	State	Non-point Impact	Non-attainment Pollution[a]		Flow Data?	Water Quality Data?
						Type[b]	Source[c]		
Kalama River	3A	73	Cowlitz	WA	None			Y	Y
Goble Creek	3A	74	Columbia	OR	Moderate	11,14,21	11,15,22,76	N	N
Tide Creek	3A	76	Columbia	OR	Moderate	11,14,21	11,15,22,51,71	N	N
Lake River	3A	85.5	Clark	WA	NA			N	Y
Multnomah Channel	3A	86-102	Multnomah	OR	Moderate	11	05,32	N	N
Lewis River	3A	87	Cowlitz	WA	None			Y	N
East Fork Lewis River	3A	87	Clark	WA	Moderate	06,09,11,12,17	14,51,56,65	Y	Y
Willamette River	3B	101 5	Multnomah	OR	Severe	11,17	02,05	Y	Y
Columbia Slough	3B	101-115	Multnomah	OR	Severe	09,15,21,23	22,86	N	N
Sandy River	4A	120	Multnomah	OR	Severe	02,03,17,21,22	02,05,63	Y	Y
Washougal River	4A	120	Skamania	WA	Moderate	06,09,14,17	14,18,19	Y	Y
Young Creek	4B	128	Multnomah	OR	NA			N	N
Bridal Veil Creek	4B	132	Multnomah	OR	NA			N	N
Multnomah Creek	4B	136	Multnomah	OR	NA			N	N
Horsetail Creek	4B	138	Multnomah	OR	NA			N	N
Tumalt Creek	4B	141	Multnomah	OR	NA			N	N
McCord Creek	4B	142	Multnomah	OR	NA			N	N
Hardy Creek	4B	142	Skamania	WA	NA			N	N
Woodward Creek	4B	142	Skamania	WA	NA			Y	N

TABLE 24. SUMMARY OF LOWER COLUMBIA RIVER TRIBUTARIES EXAMINED
(Page 3 of 3)

River/Creek	River Segment	River Mile	County	State	Non-point Impact	Non-attainment Pollution[a] Type[b]	Non-attainment Pollution[a] Source[c]	Flow Data?	Water Quality Data?
Moffett Creek	**4B**	**143**	**Multnomah**	**OR**	**NA**			**N**	**N**
Hamilton Creek	**4B**	**143**	**Skamania**	**WA**	**NA**			**Y**	**N**

[a] The non-attainment codes used for the type and source of pollution are from WDOE (1989) The assessments used in ODEQ (1988) were based on slightly different categories and codes These categories were translated to approximate the categories used in WDOE (1989)

[b] Waterbody nonattainment cause codes

02 = pesticide
03 = priority organics
06 = ammonia
09 = nutrients
11 = siltation
12 = organic enrichment/dissolved oxygen
14 = thermal modifications
15 = flow alteration
17 = pathogens
21 = suspended solids
22 = noxious aquatic plants
23 = filling and draining

[c] Waterbody nonattainment source codes

02 = municipal point source
05 = storm sewers
11 = non-irrigated crop production
12 = irrigated crop production
13 = specialty crop production
14 = pastureland
15 = rangeland
18 = animal holding/management areas
19 = manure lagoons
22 = forest management
23 = road construction/maintenance
32 = land development (construction)
51 = surface mining
56 = mill tailings
63 = landfills
65 = onsite wastewater systems
71 = channelization
72 = dredging
76 = removal of riparian vegetation
83 = highway maintenance and runoff
86 = natural

NA = No data available

were the U S. EPA STORET database, the USGS National Stream Quality Accounting Network (NASQUAN) data for water quality information, and a variety of USGS reports for flow information (Hubbard et al. 1991, Williams and Riis 1989, Williams and Pearson 1985a, Williams and Pearson 1985b). If data were available from multiple stations on a given tributary, data were chosen from the station closest to the mouth of the of the river

Available data on tributary flow and conventional water quality are presented in Table 25 Water quality and flow data were divided into dry (April to September) and wet (October to March) seasons Highest flows were estimated for the Willamette and Cowlitz rivers Wet season flows were generally higher than dry season flows For smaller rivers, where data were less complete, seasonal variation in flow was not evident Only one estimate of river BOD concentration was made (1 2 mg/L) for the Washougal River during the wet season Total phosphorus concentration ranged from 0.010 mg/L (Washougal River, wet season) to 0 77 mg/L (Lake River, dry season). Total phosphorus concentrations in the Willamette River were rather high (0 11 mg/L, dry season). Nitrate-nitrite nitrogen concentrations ranged from 0.04 mg/L (Sandy River, dry season) to 0 68 mg/L (Clatskanie River, wet season) Concentrations were again high in the Willamette River (0.56 mg/L, wet season). Ammonia nitrogen concentrations ranged from 0 01 mg/L (in several rivers) to 0 09 mg/L (Willamette River, dry season) Total organic carbon concentrations ranged from 0.3 mg/L (Sandy River, dry season) to 2.0 mg/L (Willamette and Clatskanie Rivers, dry season) Fecal coliform bacteria concentrations ranged from 17 colonies/100 mL (Sandy River and East Fork Lewis River, wet season) to over 350 colonies/100 mL in the Willamette River (wet and dry seasons). The concentrations of enterococci bacteria were measured in the Willamette and Sandy rivers only Concentrations of enterococci were greatest in the Willamette River (130 colonies/100 mL, wet season) Based on available data evaluated in this study, due to the large discharge and reported pollutant levels, the Willamette River potentially has the greatest capability to affect the water quality of the lower Columbia River

The data presented in Table 25 were used to estimate nutrient loading from tributaries for which both flow and nutrient data were available (Table 26). Generally, loading estimates were greatest for the Willamette River. Although nutrient loading during the wet season was generally higher due to increased flow, the increased concentration of nitrate-nitrite nitrogen during that season caused even higher loading of nitrate-nitrite nitrogen during the wet season

3.3.2.1 Comparison of Loading from the Willamette and the Upper Columbia River. USGS NASQUAN 1989 data for a variety of parameters for the Willamette River at river mile 12.8 and at Warrendale, OR below the Bonneville Dam were used to compare estimates of constituent loading between the Willamette and the upper Columbia River. Flow and water

TABLE 25. TRIBUTARY WATER QUALITY DATA SUMMARY
(Page 1 of 3)

River/Creek	Flow Station RM[a]	Water Quality RM	Flow (cfs)	BOD[b] (mg/L)	Total P (mg/L)	NO2+NO3 N (mg/L)	NH3+NH4 N (mg/L)	TOC[c] (mg/L)	Fecal Coliforms (col /100ml)	Enterococci (col /100ml)
Sandy River	18.4	3.1								
Dry season[d]			1,088		0.02	0.04	0.03	0.3	63.5	21.2
Wet season[e]			3,237		0.11	0.21	0.03	1	17.8	16.3
Hamilton Creek										
Dry season			20.3							
Wet season			17.2							
Woodward Creek										
Dry season			15.6							
Wet season			13.2							
Washougal River										
Dry season			38.6							
Wet season			44.7	1.2	0.01	0.5	0.01		91	
Willamette River		7								
Dry season			10,638		0.11	0.31	0.09	1.6	369.2	88
Wet season			52,120		0.09	0.56	0.08	2	488.3	130.8
Lake River										
Dry season					0.77			1.8		
Wet season										
Lewis River	73.3									
Dry season			116							
Wet season										
E. Fork Lewis River	10.2	10.2								
Dry season			178		0.01	0.21	0.01		31.2	
Wet season			1,668		0.01	0.46	0.01		17.5	

TABLE 25. TRIBUTARY WATER QUALITY DATA SUMMARY
(Page 2 of 3)

River/Creek	Flow Station RM[a]	Water Quality RM	Flow (cfs)	BOD[b] (mg/L)	Total P (mg/L)	NO2+NO3 N (mg/L)	NH3+NH4 N (mg/L)	TOC[c] (mg/L)	Fecal Coliforms (col /100ml)	Enterococci (col./100ml)
Kalama River	2.8	2.8								
Dry season			415		0.1	0.06	0.02		14 6	
Wet season			1,605		0 02	0.42	0.01		10 2	
Cowlitz River	4.9	4.9								
Dry season			6,408		0.013	0.06	0 01		28 4	
Wet season			12,133		0.05	0 27	0 03		28 2	
Germany Creek										
Dry season			18 3							
Wet season			14.1							
Abernathy Creek										
Dry season			23.7							
Wet season			25 4							
Clatskanie River		4.7								
Dry season					0 06	0 32	0.05	2	87 4	
Wet season					0.05	0 68	0.03	1 2	100 6	
Elochman River										
Dry season			89							
Wet season			209							
Skamokawa Creek										
Dry season			29 9							
Wet season			37.1							
Jim Crow Creek										
Dry season			7.3							
Wet season										

TABLE 25. TRIBUTARY WATER QUALITY DATA SUMMARY (Page 3 of 3)										
River/Creek	Flow Station RM[a]	Water Quality RM	Flow (cfs)	BOD[b] (mg/L)	Total P (mg/L)	NO2+NO3 N (mg/L)	NH3+NH4 N (mg/L)	TOC[c] (mg/L)	Fecal Coliforms (col /100ml)	Enterococci (col./100ml)
Grays River										
Dry season			241							
Wet season										
Deep River										
Dry season			19.							
Wet season			3 72							
Chinook River										
Dry season			2							
Wet season										

[a] River mile

[b] Biochemical oxygen demand

[c] Total organic carbon

[d] April through September

[e] October through March

Source. U S EPA STORET Water Quality Database and USGS flow data

TABLE 26 TRIBUTARY LOADING ESTIMATES					
River	BOD[a] (lb/d)	Total P (lb/d)	$NO_2 + NO_3$ N (lb/d)	$NH_3 + NH_4$ N (lb/d)	TOC[b] (lb/d)
Sandy River					
Dry season[c]	NA	117	235	176	1,761
Wet season[d]	NA	1,921	3,666	524	17,459
Washougal River					
Dry season	NA	NA	NA	NA	NA
Wet season	289	NA	NA	NA	NA
Willamette River					
Dry season	NA	6,312	17,787	5,164	91,805
Wet season	NA	25,301	157,427	22,490	562,241
E. Fork Lewis River					
Dry season	NA	10	202	10	NA
Wet season	NA	90	4,138	90	NA
Kalama River					
Dry season	NA	224	134	45	NA
Wet season	NA	173	3,636	87	NA
Cowlitz River					
Dry season	NA	449	2,074	346	NA
Wet season	NA	3,272	17,669	1,963	NA

[a] Biochemical oxygen demand.

[b] Total organic carbon.

[c] April through September.

[d] October through March.

NA = No data available

Source: Based on flow and water quality data in Table 25 quality data at the Warrendale station were used to estimate constituent loading from the upper Columbia River Table 27 provides loading estimates for metals, nutrients, and a number of other constituents measured near the mouth of the Willamette and for the upper Columbia River based on water quality and flow measurements made at the USGS NASQUAN stations Original data and calculations are presented in Appendices Y and AA

Data were segregated into dry (April through September) and wet (October through March) seasons for calculations and eventual comparison with point source pollutant data Many pollutants were undetected Estimates were made using measured values of the reported detection limits When detection limit values comprise all or a portion of a calculation, these data are presented in parentheses Differences in the estimates of nutrient loading reflect the use of different water quality data (Tables 26 and 27) The data used for construction of Table 26 were compiled from U S EPA STORET water quality data from river mile 7, while the USGS NASQUAN data used in the following analysis were collected at river mile 12 8

Although recent investigations have called into question the accuracy of the NASQUAN dissolved metals data (Windom et al 1991)—particularly cadmium, copper, zinc, and lead—these data should be suitable for a comparative analysis However, these data, particularly the metals data, should be used with caution in further investigations of the lower Columbia River

Flow in the Willamette River varied seasonally with highest average flows (24,000 MGD) occurring in the wet season in 1989 Flow at the Warrendale station did not tend to vary seasonally in 1989, with flow in the dry season slightly higher than that of the wet season This is due to the infrequent monitoring of flow (four times per year), the seasonal flow dampening effect of upriver dams, and the general pattern of greatest flows occurring during the dry season when spring and summer snowmelt runs off the mountains of the upper Columbia River basin

Many of the constituent loading estimates were based on detection limit values In the Willamette River, actual estimates were possible for aluminum, barium, copper, iron, manganese, nickel, strontium, zinc, nutrients, and miscellaneous constituents. At the Warrendale station, actual loading estimates were possible for barium, copper, iron, strontium, nutrients, and miscellaneous constituents The concentration of detected metals (barium, copper, iron, magnesium, and strontium) was higher at the Warrendale station, while the concentration of chloride, nutrients, total dissolved solids, and TSS was higher in the Willamette River station Several metals (aluminum, manganese, nickel, and zinc) were detected in samples from the Willamette River, but were not detected in samples from the Warrendale station. Based on Warrendale station data, estimates from the upper river indicate that loading of almost all

TABLE 27 COMPARISON OF CONSTITUENT LOADING FROM THE WILLAMETTE RIVER AND FROM THE UPPER COLUMBIA RIVER, 1989
(Page 1 of 2)

	Willamette River			Warrendale (upper Columbia River)		
	Dry	Wet	Annual	Dry	Wet	Annual
Flow (MGD)	4,110	24,000	14,100	124,000	117,000	120,000
Metals (lb/d)						
Aluminum	2,200	13,000	7,590	(32,500)	(201,000)	(117,000)
Arsenic	(43 4)	(186)	(114)	(1,030)	1,440	(1,230)
Barium	214	928	571	23,200	29,800	26,500
Beryllium	(22)	(93)	(57)	(513)	(491)	(502)
Cadmium	(43)	(186)	(114)	(1,030)	(982)	(1,000)
Chromium	(43)	(186)	(114)	1,030	(1,440)	(1,230)
Cobalt	(130)	(557)	(343)	(3,080)	(2,940)	(3,010)
Copper	174	371	272	3,650	5,540	4,600
Iron	4,000	18,400	11,200	36,900	182,000	110,000
Lead	(43.4)	1,110	(578)	(1,030)	(4,630)	(2,830)
Manganese	584	1,110	848	1,030	(12,400)	(6,700)
Mercury	(8 42)	(18 6)	(13 5)	(103)	(98 2)	(100)
Molybdenum	(434)	(1,860)	(1,140)	(10,300)	(9,820)	(10,000)
Nickel	43 4	371	207	(1,030)	3,260	(2,140)
Selenium	(43 4)	(186)	(114)	(1,030)	(982)	(1,000)
Silver	(43.4)	(186)	(114)	(1,030)	(982)	(1,000)
Strontium	1,680	6,490	4,090	86,300	113,000	99,400
Zinc	555	557	556	(5,080)	(7,500)	(6,290)

TABLE 27. COMPARISON OF CONSTITUENT LOADING FROM THE WILLAMETTE RIVER AND FROM THE UPPER COLUMBIA RIVER, 1989
(Page 2 of 2)

	Willamette River			Warrendale (upper Columbia River)		
	Dry	Wet	Annual	Dry	Wet	Annual
Nutrients (lb/d)						
Silica	725,000	4,870,000	2,800,000	10,800,000	11,800,000	11,300,000
Phosphate-P	3,390	18,300	10,800	(17,700)	28,700	(23,200)
Total Phosphorus	4,070	24,900	14,500	25,100	53,600	39,400
Ammonia-N	2,300	101,000	51,800	16,000	29,400	22,700
Nitrate & Nitrite-N	13,000	224,000	118,000	(118,000)	329,000	(223,000)
Total Kjeldahl N	11,400	92,000	51,700	(354,000)	(196,000)	(275,000)
Miscellaneous (million pounds per day)						
Calcium	0.283	1.88	1.08	16.4	19.6	18.0
Chloride	0.231	1.07	0.653	2.70	4.19	3.44
Fluoride	0.004	(0.029)	(0.017)	0.206	0.196	0.201
Magnesium	0.091	0.205	0.148	4.73	5.95	5.34
Potassium	0.079	0.253	0.166	1.35	1.60	1.48
Sodium	0.284	1.42	0.852	6.12	8.36	7.24
Total Dissolved Solids	2.64	17.0	9.80	20.3	17.1	18.7
Sulfate	0.176	1.47	0.824	11.8	15.0	13.4
Total Suspended Solids	0.331	9.10	4.72	20.3	17.1	18.7

Source: U.S. Geological Survey (1989), NASQUAN data constituents detected at both stations is greater at the Warrendale station This is due primarily to the over eight-fold greater flow at this station, with smaller differences in loading controlled by differences in concentration between the two stations.

3 3.2.2 ***Loading of Aluminum, Iron, Barium and, Fluoride.*** Several constituents are typically monitored in industrial and major municipal NPDES-permitted point source discharges (Figures 4, 5, and 6) Figure 4 compares loading data for aluminum, iron, barium and fluoride Warrendale loading estimates for aluminum are based on detection limits, therefore, the estimated aluminum loading may actually be similar to that of the Willamette River depending on the actual concentration of aluminum in Columbia River water at Warrendale Iron loading from both sources was greatest during the wet season of 1989 Loading from the upper river was greater than that from the Willamette River for iron Fluoride concentration was below detection limits in the Willamette River during the wet season Fluoride loading from the upper river was a much greater source to the lower Columbia River than was that from the Willamette Barium was detected in all samples at both stations in 1989 Again, loading of barium was seasonal with loading increasing during the wet season and much greater loading occurring from the upper river

3.3.2.3 ***Loading of Arsenic, Chromium, Copper, Lead, Nickel and Zinc.*** Figure 5 compares loading of arsenic, chromium, copper, lead, nickel, and zinc. Arsenic was undetected in all samples, except those collected during the wet season at Warrendale, which resulted in a loading estimate of 1,440 lb/day Chromium also was undetected, except for samples collected during the dry season at Warrendale, which resulted in a loading estimate of 1,030 lb/day Copper was detected in all samples Copper loading was greatest during the wet season, with loading at Warrendale generally much higher than from the Willamette Lead was detected only in samples collected from the Willamette River during the wet season of 1989 Loading for lead was estimated at 1,110 lb/day Nickel was detected in samples collected from the Willamette River in both seasons and during the wet season only at the Warrendale station Loading for nickel was highest during the wet season and ranged from 43 to 371 lb/day for the Willamette River Nickel loading during the wet season at the Warrendale station was over 3,200 lb/day Zinc was also detected only in samples collected from the Willamette River Loading for zinc was similar during the wet and the dry season and averaged 556 lb/day

3.3.2.4 ***Loading of Nutrients.*** Figure 6 compares the nutrient loading data estimated at the Warrendale and Willamette stations Total phosphorus loading was greatest during the wet season at both stations Given the elevated concentration of nutrients at the Willamette station, total phosphorus loading from the Willamette River was about one-third of the loading estimated at the Warrendale station Ammonia nitrogen loading was also greatest during the wet

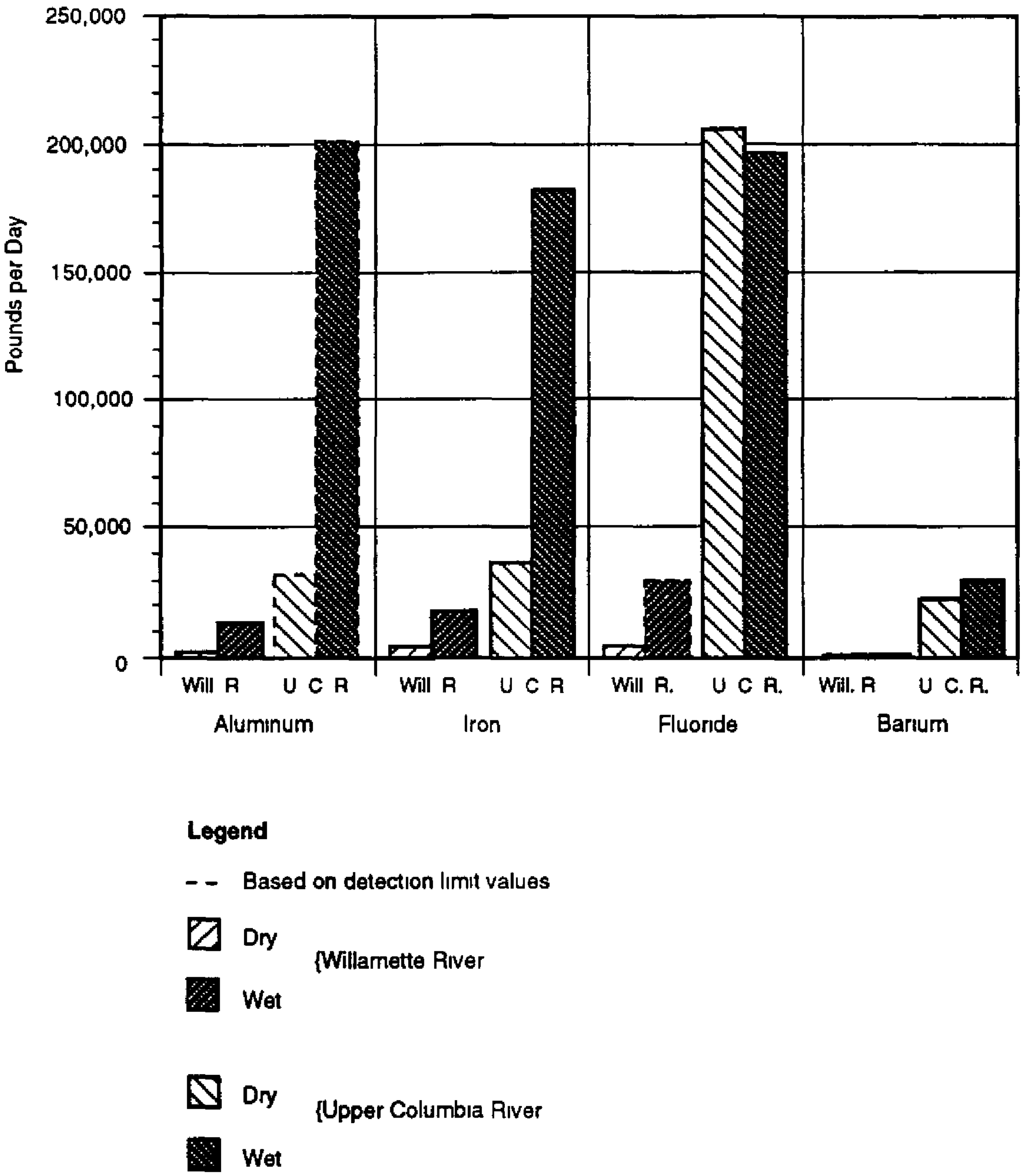


Figure 4. Comparison of Metals (Al, Fe, Ba) and Fluoride Loading from the Upper Columbia River and Willamette River

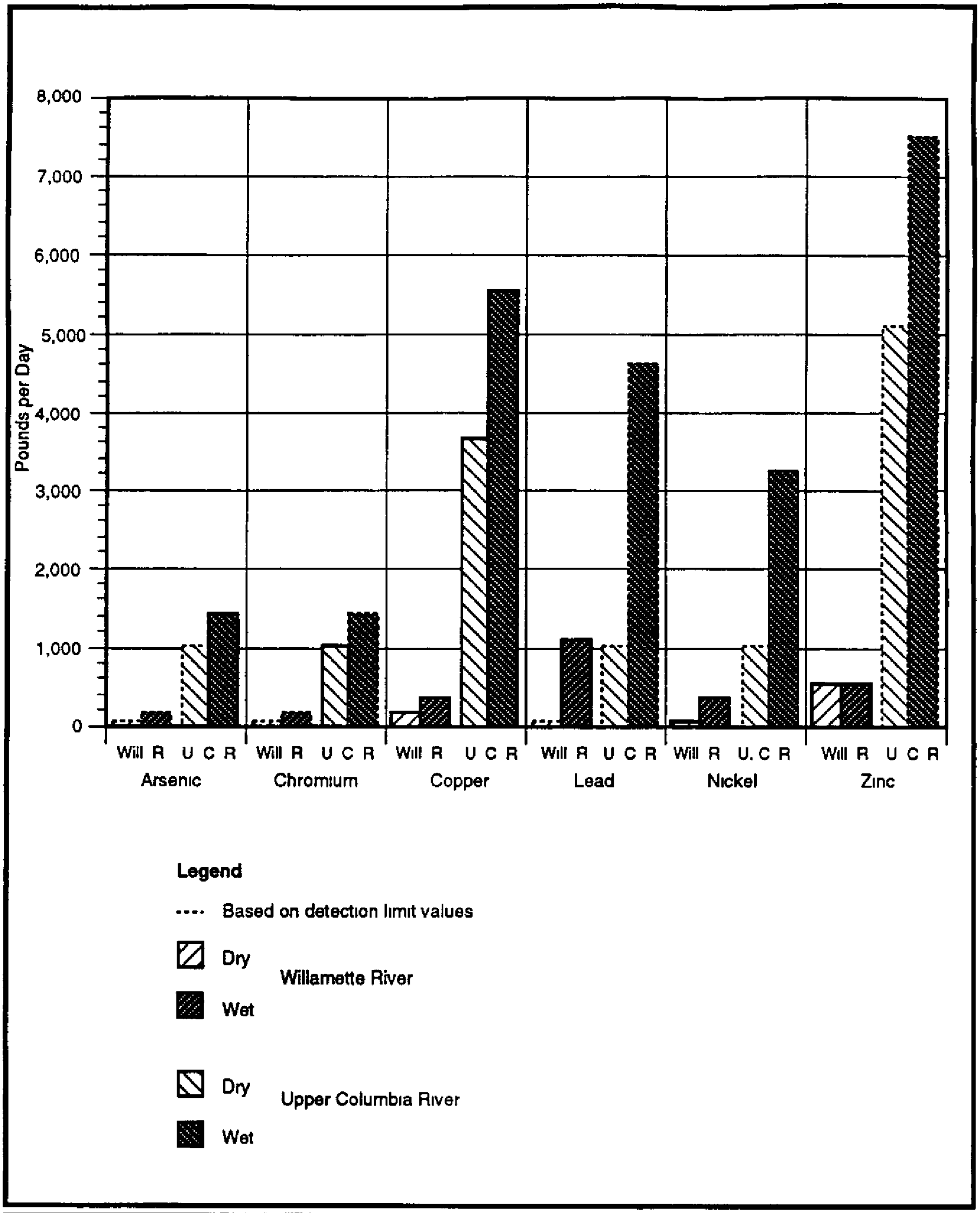


Figure 5. Comparison of Metals (As, Cr, Cu, Pb, Ni, Zn) Loading from the Upper Columbia River and Willamette River

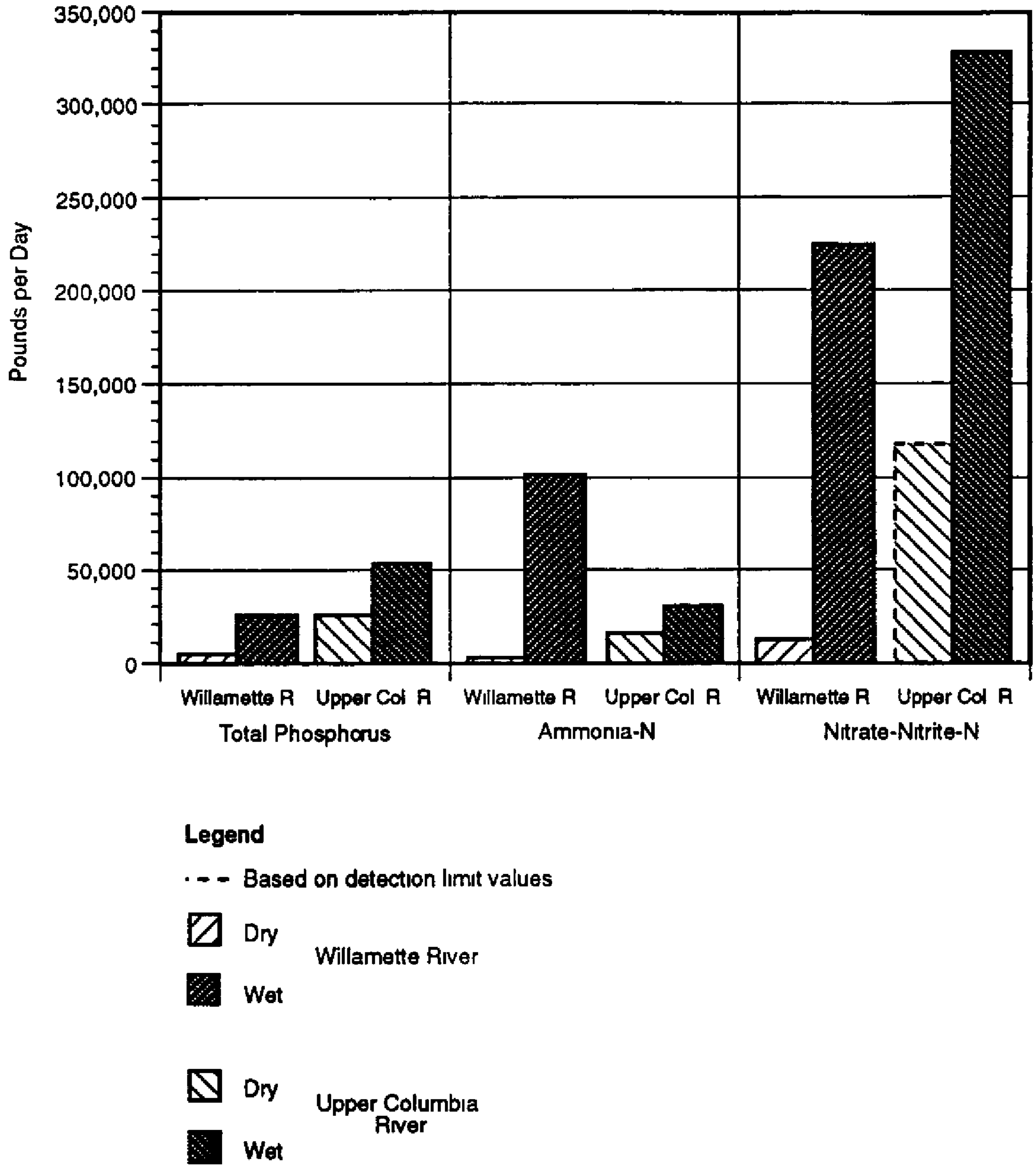


Figure 6. Comparison of Nutrient Loading from the Upper Columbia River and Willamette River

season Estimated loading of ammonia nitrogen was actually greater than that estimated at the Warrendale station due to extremely high concentrations reported during the wet season at the Willamette station Large increases in nitrate-nitrite nitrogen loading were noted during the wet season Loading of nitrate-nitrite nitrogen was very low during the dry season in the Willamette River, and nitrate-nitrite nitrogen was not detected during the dry season at the Warrendale station However, nitrate-nitrite nitrogen loading from the Willamette River was estimated to be a significant portion of the contribution of the upper Columbia River

3.3.3 Summary

The upper Columbia River and tributaries to the lower Columbia River contribute point and non-point source pollution to the lower river. The relative contribution of point and non-point sources to these tributaries has not been determined. Because of the limited amount of water quality monitoring data available for the tributaries of the lower Columbia River, estimates of nutrient and pollutant loading were also limited Based on the results summarized in Tables 23, 25, 26, and 27, the tributaries that contribute the greatest load of nutrients and pollutants to the lower Columbia River are the Sandy River (to river segment 4A and below), the Willamette River (to river segment 3B and below), the Lewis River (to river segment 3A and below), the Kalama River (to river segment 3A and below), and the Cowlitz River (to river segment 2C and below) The upper Columbia River is also a significant source of nutrients, metals, and miscellaneous constituents Although the loading of many constituents from the upper river may be very great due to its relatively larger flow, the Willamette River may be a significant source of some metals, nutrients, and TSS, possibly affecting the quality of the lower Columbia River at and below its confluence with the Willamette The reconnaissance survey sampling design should include at least one station at the mouth of each of these tributaries and at a reference station in the upper reach of the river.

3.4 ATMOSPHERIC POLLUTANT DEPOSITION

The atmospheric contribution of contaminants from both wet (rainfall) and dry (dust fall/impaction) deposition to aquatic environments is generally poorly known. However, recent research on some aquatic environments has determined that atmospheric deposition of some contaminants may be a significant source. For example, atmospheric deposition of mercury has been cited as a major source to some Minnesota lakes (Sorensen et al 1990) Atmospheric nitrogen deposition has been cited as a significant source (20 to 30 percent) to the Chesapeake Bay Estuary (Fisher and Oppenheimer 1991) Holsen et al (1991) demonstrated that urban areas could be considered atmospheric point sources of polychlorinated biphenyls. Atmospheric deposition monitoring (both wet precipitation and dry deposition) is necessary to determine the fate and deposition rate of atmospheric pollutants. Atmospheric pollutant deposition at a particular site will be influenced by nearby point sources (e g , fossil fuel power plants, metal smelters), mobile point sources (e g , automobile exhaust), non-point sources (e g , fugitive dust, forest fires), and by various remote sources (e g , active volcanoes)

To identify pollutant deposition data on the lower Columbia River drainage area, WDOE's Environmental Investigations and Laboratory Services Program was contacted This program manages the acid rain monitoring program in Washington. Presently, little representative atmospheric deposition data are available for the study area. Although deposition studies have been performed, these studies evaluate the impact of a nearby point source (e.g , Centralia Power Plant, Tacoma smelter closure) on deposition quality and therefore do not reflect pollutant deposition in the lower Columbia River basin (Rashin, E , 25 July 1991, personal communication) However, limited data are available on the chemical quality of weekly composited wet precipitation (quantity, specific conductance, pH, Ca, Mg, Na, K, SO_4, Cl, NH_3-N, NO_3-N, and PO_4-P) at the Bull Run Reservoir in the Mt Hood National Forest on the Sandy River, approximately 20 miles east of Portland The Bull Run Reservoir is in a restricted access area and serves as a water supply for the City of Portland The period of record extends from 1980 to present

Recently, a pilot study was performed to assess the relative contribution of atmospheric sources of pollutants to Commencement Bay in Tacoma, WA (PSWQA 1991) This study can provide some hints as to the importance of atmospheric pollutant deposition in the lower Columbia River as well as the tools for further investigations, if warranted. The study concluded that atmospheric metals loading (copper, lead, and zinc) was minor in this highly urbanized area compared to point sources and input from the Puyallup River The atmospheric contribution of polynuclear aromatic hydrocarbons (PAHs) was also determined, but data on point source and tributary loading were not available for comparison. A local aluminum smelter was the largest atmospheric source of PAHs in the area, either from stack emissions or fugitive dust particles from the site The study concluded that the major source of fine-particle aerosol in late fall and winter was wood smoke from residential areas, although the sampling times and locations may not have been adequate to assess the contribution of fine particles from the largest atmospheric point source emission (a local pulp and paper mill).

Based on this study, it is suggested that direct atmospheric pollutant deposition to the river will be negligible, and will generally be deposited on land and washed into the river and its tributaries in stormwater runoff. Therefore, atmospheric pollutant input will be best accounted for through estimates of tributary loading. The relative importance of organic compounds - especially those with a significant human contribution (e g., PCBs, PAHs) - is unknown The relative importance of atmospheric deposition of organic compounds should be evaluated following the results of monitoring efforts to identify elevated levels of these pollutants An initial step may be to compile an atmospheric emissions inventory for the river basin and evaluate the methodology developed for the Commencement Bay study and the data required for the evaluation

3.5 ACCIDENTAL SPILLS

Accidental spills of pollutants to the lower Columbia River and its tributaries represent an additional source of nonpoint pollution Data on spills between 1989 and 1991 in counties adjacent to the river were compiled from the U.S. Coast Guard's National Response Center Database It is important to note that the Coast Guard does not verify the validity of reports or quantities spilled Therefore, the value of this data is as a qualitative indicator of non-point source pollution

Data on all reported spills to the lower Columbia River between 1989 and 1991 are presented in Tables 28 and 29 Figure 7 shows the variability in reporting frequency and in the total quantity of material spilled over the 3 years. The large quantities of materials spilled in 1990 and 1991 were both primarily the result of single, large spill events. While there was a 3 6-fold increase in spill reports in 1991, no such trend was apparent for the quantities of pollutants released Figure 8 shows that no clear trends are discernable within the river segments, either

Tables 30 and 31 present data on spills to tributaries of the lower Columbia River that occurred within the counties adjacent to the river Most of the reported tributary spills are from the Willamette River. The Willamette River accounted for 44, 75, and 71 percent of the total number of spills reported in 1989, 1990, and 1991, respectively.

The two largest oil spills (90,000 and 4,000 gallons) occurred in Youngs Bay and Astoria This evidence suggests a possibility of larger oil and grease concentrations in sediments in those areas than in other areas Similarly, several large spills were reported in the Willamette River and Multnomah Channel. Therefore, depositional areas downstream from the Willamette and Multnomah confluence to the Columbia River could also display elevated oil and grease concentrations

TABLE 28. SPILLS REPORTED IN THE LOWER COLUMBIA RIVER, 1989-1990. (Page 1 of 2)					
River Segment	River Mile	Spill Date	Material	Quantity Spilled in Water	Comments
1-A	12	10-05-90	Oil, Diesel	90,000 gal.[a]	Youngs Bay; vessel ruptured hull.
1-B	13	06-24-90	Oil, Waste; Lubricants	Unknown	Astoria; vessel struck pier.
	13	12-21-90	Gasoline	1 gal.	Astoria; accidental release.
	13	12-21-90	Gasoline	1 gal.	Astoria; accidental release.
	18	09-05-90	Oil, Diesel	Unknown	Tongue Point; estimated 1,000 gal. of diesel in soil and water; unknown origin.
2-A	38-46	01-25-89	Herbicide, Round-up Weed Killer	Unknown	Puget Island; dead frogs reported after herbicide spraying.
2-B	50.5	12-21-90	Gasoline	40 gal.	Vessel sunk.
	53	09-25-89	Fuel, #2 Diesel	15 gal.	Clatskanie; accidental release during vessel offloading.
2-C	67	08-11-89	Coal Tar Pitch	Unknown	Longview; accidental release during vessel offloading.
4-A	105	10-06-89	Gasoline	Unknown	Portland; tanker truck overturned releasing 5,000 gal. onto highway and into storm drain.
	107	02-02-89	Oil, Transformer	2 gal.	Portland; raft ruptured releasing non-PCB oil into river.

TABLE 28. SPILLS REPORTED IN THE LOWER COLUMBIA RIVER, 1989-1990. (Page 2 of 2)					
River Segment	River Mile	Spill Date	Material	Quantity Spilled in Water	Comments
4-A (cont.)	113	06-03-90	Oil, #2 Fuel	30 gal.[a]	Camas/Washougal; fuel line malfunction.
	120	07-05-89	Oil, Lube	1 gal.	Camas Slough; floating dock elevator collapsed.
	120	10-13-89	Oil, Heavy	Unknown	Camas Slough; runoff from remnant oil on ground caused sheen.
	120	11-16-89	Oil, Hydraulic & Compressor	2 ounces[b]	Camas Slough; pump overflowed.
	120	12-10-89	Unknown	Unknown	Camas Slough; sheen of unknown origin.
	120	12-28-89	Oil, Lube	1 gal.	Camas Slough; holding tank overflowed.
	120	06-18-90	Oil, Diesel	Unknown	Troutdale; sheen of unknown origin.
	120	10-15-90	Oil, Diesel	2 tbsp.	Camas Slough; leak in fuel tank.
	120	11-18-90	Oil, Hydraulic	150 gal.[b]	Camas Slough; crane fell into slough.

a Estimated value
b Maximum value

Source: U.S. Coast Guard National Response Center Database

TABLE 29. SPILLS REPORTED IN THE LOWER COLUMBIA RIVER, 1991. (Page 1 of 3)					
River Segment	River Mile	Spill Date	Material	Quantity Spilled in Water	Comments
1-A	1	03-12-91	Oil, lube	Unknown	Ilwaco; accidental vessel discharge.
	1	03-29-91	Oil, hydraulic	Unknown	Ilwaco; ruptured hydraulic line.
	1	04-24-91	Oil, diesel	1 gal.	Ilwaco; fuel tank overfilled.
	1	07-07-91	Oil, misc.	Unknown	Ilwaco; accidental spill from dock.
	11	08-23-91	Oil	Unknown	Warrenton; sheen of unknown origin.
	11	09-04-91	Oil, diesel	14 gal.	Warrenton; hose fitting failed.
	12	01-02-91	Oil, hydraulic	2 gal.	Astoria; hydraulic line failure.
1-B	13	01-11-91	Oil, diesel	4,000 gal.	Astoria; vessel sank.
	13	01-02-91	Oil, diesel	30 gal.	Astoria; vessel sank.
	13	04-17-91	Oil, diesel	Unknown	Astoria; accidental vessel release.
2-A	46	04-25-91	Oil, misc.	Unknown	Cathlamet; vessel sank.
	46	04-25-91	Oil, diesel	1 gal.	Cathlamet; vessel sank.
2-C	62	04-04-91	Oil, diesel	1 gal.	Longview; sheen of unknown origin.
	63	01-10-91	Oil, diesel	10 gal.	Rainier; tug pumped bilge.
	65	07-11-91	Oil, misc.	2 gal.	Longview; equipment failure.

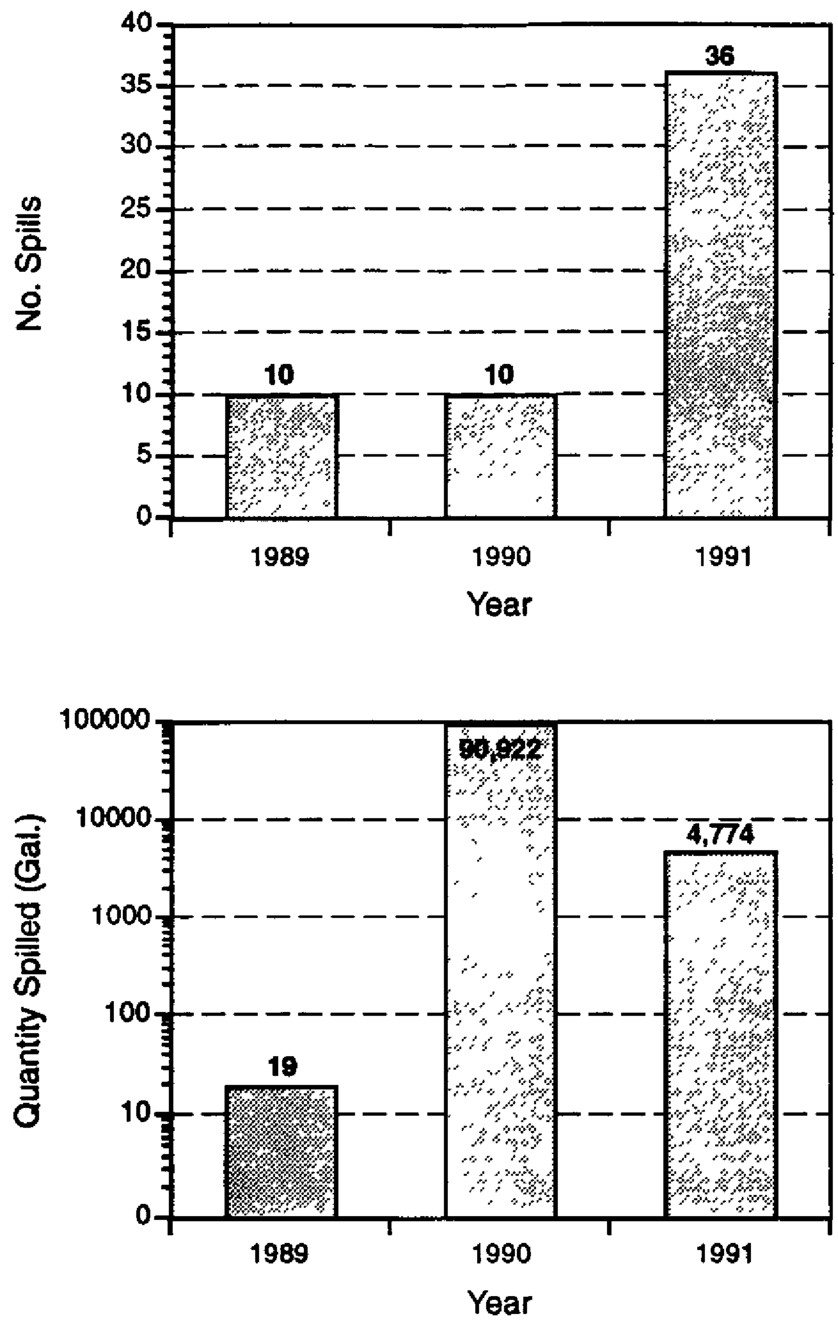
TABLE 29. SPILLS REPORTED IN THE LOWER COLUMBIA RIVER, 1991.
(Page 2 of 3)

River Segment	River Mile	Spill Date	Material	Quantity Spilled in Water	Comments
2-C (cont.)	66	07-30-91	Sodium silicate	500 gal.	Longview; accidental release into storm drain.
	67	01-13-91	Oil, diesel	1 lb.	Longview; accidental vessel release.
	68	11-17-91	Oil, diesel	20 gal.	Longview; fuel tank overfilled.
	70.5	01-01-91	Gasoline	Unknown	Rainier; vessel sank.
3-B	96	01-10-91	Oil	Unknown	Vancouver; sheen of unknown origin.
4-A	103	11-23-91	Oil	Unknown	Vancouver; sheen of unknown origin.
	104	02-13-91	Oil, diesel	50 gal.	Portland; accidental vessel release.
	106	06-14-91	Oil, lube	10 gal.	Vancouver; air compressor leaked into storm drain.
	109	01-17-91	Gasoline	100 gal.	Portland; vessel sank.
	110	01-11-91	Oil	Unknown	Portland; sheen of unknown origin.
	112	09-09-91	Oil, diesel	10 gal.	Camas; truck overturned.
	119	07-31-91	Oil, lube	Unknown	Camas; pump overflowed.
	120	04-07-91	Oil, misc.	1 pint	Camas; sump pump malfunctioned.
	120	06-18-91	Oil, misc.	1 gal.	Camas; accidental release from hose.

TABLE 29. SPILLS REPORTED IN THE LOWER COLUMBIA RIVER, 1991.
(Page 3 of 3)

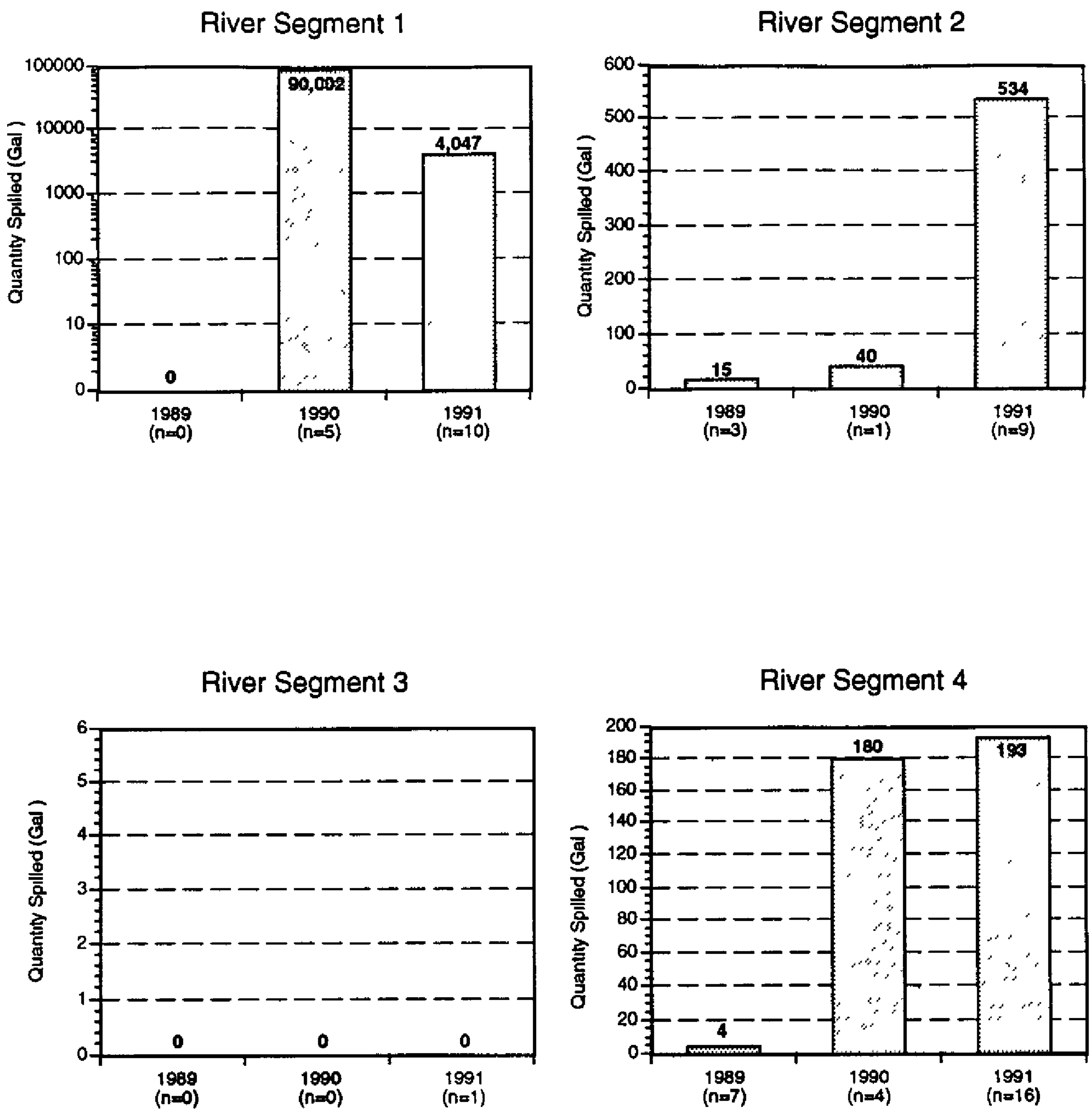
River Segment	River Mile	Spill Date	Material	Quantity Spilled in Water	Comments
4-A (cont.)	120	08-01-91	Oil, misc	1 gal.	Camas; industrial accident.
	120	08-09-91	Oil, misc.	Unknown	Camas; sump pump malfunctioned.
	120	08-15-91	Oil, misc.	1 gal.	Camas; hose ruptured.
	120	10-14-91	Oil, misc	Unknown	Camas; sump pump malfuctioned.
	120	11-18-91	Oil, hydraulic	20 gal.	Camas; industrial accident.
	120	12-01-91	Oil	Unknown	Camas; parking lot runoff caused sheen.
4-B	126	10-24-91	Oil	Unknown	Corbett; sheen of unknown origin.

Source: U.S. Coast Guard National Response Center Database.



Source: U.S. Coast Guard National Response Center Database.

Figure 7. Total Reported Chemical Spills and Quantities Spilled in the Lower Columbia River, 1989-1991.



Source U S. Coast Guard National Response Center Database

Figure 8. Total Annual Reported Chemical Spills by River Segment in the Lower Columbia River, 1989-1991.

TABLE 30. SPILLS REPORTED IN THE TRIBUTARIES* OF THE LOWER COLUMBIA RIVER, 1989-90. (Page 1 of 4)					
River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
1-C	John Day River	07-24-89	Fuel, Diesel #2	Unknown	Astoria; railroad accident.
2-C	Kalama River	02-18-89	Fuel, Diesel #2	Unknown	Kalama; truck overturned releasing 30 gal. on land/water.
3-A	Lewis River	01-11-89	Oil, transformer	10 gal.	Cougar; transformer failure (200 gal. spilled total).
	Multnomah Channel	07-28-89	Fuel, diesel	1000 gal.	Tug overflowed fuel tanks.
	Lewis River	01-08-90	Paint; Oil, misc.	Unknown	La Center; report of ongoing dumping for past 2 years.
	Multnomah Channel	03-07-90	Oil, diesel	4 gal.	St. Helens; release from vessel.
	Multnomah Channel	10-22-90	Oil	Unknown	St. Helens; sheen of unknown origin.
3-B	Willamette River	01-29-89	Oil, diesel #2	Unknown	Portland, near St. Johns Bridge; sheen of unknown origin.
	Ball Creek	02-01-89	Fuel, diesel	Unknown	Truck fuel tank overfilled.
	Willamette River	02-15-89	Oil, lube	1 gal.	Portland; accidental release.

TABLE 30. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1989-90.
(Page 2 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
3-B (cont.)	Willamette River	03-28-89	Oil, heat transfer	Unknown	Portland; pipe fitting leaked.
	Willamette River	04-11-89	Trivalent chromium hydroxide	Unknown	Portland; Pipeline rupted releasing 500 gal. into a storm drain.
	Willamette River	06-30-89	Asphalt/-diesel fuel mixture	16,800 gal.	Portland; pipeline ruptured.
	Willamette River	08-07-89	Fuel, diesel	30 gal.	Portland; equipment failure.
	Willamette River	08-28-89	Gasoline	Unknown	Portland; truck overfilled, releasing 30 gal. onto concrete and into a storm drain.
	Willamette River	12-28-89	Oil, motor	1 gal.	Portland; accidental release.
	Willamette River	02-10-90	Oil, diesel	5 gal.	Portland; sheen of unknown origin.
	Willamette River	02-22-90	Sodium bichromate	72 lbs.	Portland; industrial accident.
	Willamette River	02-22-90	Sodium bichromate	94 lbs.	Portland; industrial accident.
	Willamette River	03-05-90	Gasoline	Unknown	Portland; sheen of unknown origin.

TABLE 30. SPILLS REPORTED IN THE TRIBUTARIES* OF THE LOWER COLUMBIA RIVER, 1989-90.
(Page 3 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
3-B (cont.)	Willamette River	04-29-90	Oil, fuel #6	1 gal.	Portland; barge offloading line malfunctioned.
	Willamette River	09-23-90	Oil, hydraulic	10 gal.	Portland; equipment malfunction.
	Willamette River	10-04-90	Oil, diesel	Unknown	Portland; 10 gal. spilled on land/water after tank overflow.
	Willamette River	10-10-90	Oil, misc.	5 gal.	Portland; accidental release from hose.
	Willamette River	11-06-90	Oil, diesel	Unknown	Portland; fuel tank ruptured releasing 75 gal. to asphalt/storm drain.
	Willamette River	12-19-90	Oil, diesel	Unknown	Portland; truck accident releasing 50 gal. on concrete and into storm drain.
4-A	Blue Creek	02-20-89	Oil, fuel #6	2 gal.	Camas; pipeline valve failure.
	Blue Creek	02-21-89	Oil, fuel #6	5 gal.	Camas; leak in buried pipeline.
	Blue Creek	04-27-89	Oil, fuel #6	5 gal.	Camas; industrial accident.

TABLE 30. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1989-90
(Page 4 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
4-A (cont.)	Blue Creek	06-14-89	Oil, lube	5 gal.	Camas; tank overfilled.
	Blue Creek	11-16-89	Oil, fuel #6	5 gal.	Camas; pressure gauge malfunction releasing an estimated 2300 gal. total.
	Blue Creek	06-07-90	Sodium hydroxide (50%)	Unknown	Camas; sump system failure.
	Bull Run River	09-24-90	Oil, misc.	3 gal.	Sandy; generator failure.

a Search results are only for Washington and Oregon Counties adjacent to the lower Columbia River.

Source: U.S. Coast Guard National Response Center Database

TABLE 31. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1991.
(Page 1 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
1-A	Unspecified	03-11-91	Oil	Unknown	Warrenton; sheen of unknown origin.
1-B	Unspecified	03-05-91	Oil, waste	5 gal.	Astoria; accidental vessel discharge.
2-C	Unspecified	03-11-91	Sodium hydroxide in black liquor	Unknown	Longview; storage tank overturned releasing 14,000 lbs. into sewer.
	Cowlitz River	04-10-91	Sodium chlorate	2,000 gal.	Longview; truck overturned.
3-A	Lewis River	06-26-91	Oil, misc.	Unknown	Ariel; sump pump discharge.
	Scappoose Creek	11-23-91	Unknown	Unknown	Scappoose; green sheen of unknown origin.
3-B	Willamette River (RM 15)	01-04-91	Oil, diesel	Unknown	Portland; vessel sank.
	Willamette River	01-14-91	Sodium dichromate	Unknown	Portland; heat exchanger leaked.
	Willamette River	01-14-91	Oil	Unknown	Portland; sheen of unknown origin.
	Willamette River (RM 7.5)	01-16-91	Gasoline	1 gal.	Portland; pump fell in river.
	Willamette River (RM .5)	02-02-91	Oil, hydraulic	55 gal.	Portland; drum found in river.

TABLE 31. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1991. (Page 2 of 4)					
River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
3-B (cont.)	Willamette River	02-11-91	Oil, misc.	2 gal.	Portland; sheen of unknown origin.
	Willamette River	02-12-91	Oil, diesel	Unknown	Portland; tank overfilled.
	Willamette River	02-16-91	Oil, misc.	1 gal.	Portland; accidental vessel release.
	Willamette River (RM 10)	02-19-91	Oil, diesel	Unknown	Portland; sheen of unknown origin at outfall.
	Willamette River (RM 12)	02-19-91	Oil, diesel	15 gal.	Portland; sheen of unknown origin.
	Willamette River	02-20-91	Oil, transformer	50 gal.	Portland; transformer malfunctioned.
	Williams Creek	02-20-91	Oil, transformer	40 gal.	Portland; transformer malfunctioned.
	Willamette River (RM 11)	03-21-91	Oil, pine	1 gal.	Portland; sheen released from log boom.
	Willamette River (RM 10)	04-08-91	Gasoline	15 gal.	Portland; accidental vessel release.
	Willamette River (RM 9)	04-17-91	Oil, lube	200 gal.	Portland; industrial accident.
	Willamette River	04-22-91	Oil, waste	40 gal.	Portland; hose leaked.

TABLE 31. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1991.
(Page 3 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments
3-B (cont.)	Unspecified	05-06-91	Oil, waste	Unknown	Portland; vandalism
	Willamette River	05-31-91	Oil, diesel	20 gal.	Portland; vessel release.
	Willamette River (RM 5)	06-25-91	Oil	Unknown	Portland; sheen of unknown origin
	Willamette River (RM 7)	08-09-91	Sodium dichromate	25 lbs.	Portland; industrial accident.
	Willamette River	09-12-91	Oil, waste	3 gal.	Portland; sump system overflow.
	Willamette River	09-12-91	Antifreeze	30 gal.	Portland; storage tank release.
	Willamette River	10-20-91	Oil, diesel	50 gal.	Portland; vessel pumped ballast.
	Willamette River	12-17-91	Oil, misc.	8 ounces	Portland; accidental hose release.
	Unspecified	12-27-91	Oil, diesel	10 gal.	Beaverton; accidental release.
	Willamette River (RM 10)	12-28-91	Oil, fuel	3000 gal.	Portland; accidental vessel release.
4-A	Sandy River	06-22-91	Oil, misc.	Unknown	Portland; valve leakage.
	Blue Creek	11-20-91	Oil, misc.	5 gal.	Camas; tank overflow.

TABLE 31. SPILLS REPORTED IN THE TRIBUTARIES[a] OF THE LOWER COLUMBIA RIVER, 1991.
(Page 4 of 4)

River Segment	Tributary Name	Spill Date	Material	Quantity Spilled in Water	Comments

a Data reported are only for Washington and Oregon Counties adjacent to the lower Columbia River.

Source: U.S. Coast Guard National Response Center Database.

4.0 IN-PLACE POLLUTANTS

This section briefly summarizes both established and potential sites that can be characterized as in-place pollutants along the lower Columbia River Specifically, this chapter will address two categories of established in-place pollutants

- State and federal hazardous waste sites
- Landfills

Since nearly all of the hazardous waste sites and landfills in the study area are located on land, rather than in the river, a terrestrial study-area boundary was set before data collection The effect of potentially hazardous sites and landfills on the lower Columbia River depends on several factors, including the toxicity of the contaminant, the media contaminated (e g , surface water, sediment, groundwater, or soil), and the interaction of these media with the river In some cases, surface waters within or directly connected to the river were affected However, in other cases, groundwater was contaminated In the case of groundwater contamination, issues such as the aquifer affected, the direction of groundwater flow, and the velocity of groundwater flow are all significant to the extent the river is influenced by pollutants For this study, a boundary of 1 mile from the shoreline was set as the study area One mile was selected as a conservative distance for potentially noticeable effects on the river, and should provide a comprehensive list of the sites of interest. While any hazardous waste site or landfill within the Columbia River watershed could influence the river's water quality, for this study sites outside of the 1-mile boundary are treated as more diffuse, non-point sources of pollution Lists of hazardous waste sites and landfills within the 1-mile boundary are provided in Tables 32 and 33 Locations of these facilities are shown in Figures 9a through 9d

This section summarizes existing information relevant to actual or potential contamination to the Columbia River from each hazardous waste site or landfill in the study area The following information is reported for each site

- Proximity to the river
- Contaminants of concern

TABLE 32. SUPERFUND AND HAZARDOUS WASTE SITES WITHIN ONE MILE OF THE LOWER COLUMBIA RIVER						
River Segment	River Mile	Site Name	Site ID Number[a]	Nearest City	County	State
2C	58	Ostrander Rock Disposal	1501	Longview	Cowlitz	WA
2C	61-62	Radakovich (Mt Solo) Landfill	1502	Longview	Cowlitz	WA
2C	63	Reynolds Metals	1401	Longview	Cowlitz	WA
2C	65	Weyerhaeuser - Longview	1302	Longview	Cowlitz	WA
2C	68	Longview Fibre	1301	Longview	Cowlitz	WA
4A	103	ALCOA Vancouver Smelter	3103	Vancouver	Clark	WA
4A	103	Columbia Marine Lines	3101	Vancouver	Clark	WA
4A	105	Burlington Northern	3102	Vancouver	Clark	WA
4A	105	Columbia Steel/Joslyn Sludge Pond	804	Portland	Multnomah	OR
4A	105	Port of Vancouver	3104	Vancouver	Clark	WA
4A	106	Malarkey Roofing Co.	802	Portland	Multnomah	OR
4A	108	Allied Plating	803	Portland	Multnomah	OR
4A	108	Frontier Hard Chrome, Inc.	801	Vancouver	Clark	WA
4A	109	Custome Care Cleaners	702	Vancouver	Clark	WA
4A	109.5	Tidewater Barge Lines	701	Vancouver	Clark	WA
4A	110	Nu Way Oil Co.	703	Portland	Multnomah	OR
4A	118	East Multnomah County	806	Troutdale	Multnomah	OR

[a] The Site ID number corresponds to the labels in Figures 9a-9d

TABLE 33 LANDFILLS WITHIN ONE MILE OF THE LOWER COLUMBIA RIVER

River Segment	River Mile	Site Name	Site ID Number[a]	Nearest City	County	State
1B	15	Astoria Landfill	2301	Astoria	Clatsop	OR
2A	41	Wauna Mill Landfills (2)	1801/1802	Wauna	Clatsop	OR
2A	44	Cathlamet Dump	1701	Cathlamet	Wahkiakum	WA
2C	58	Ostrander Rock Landfill	1504	Longview	Cowlitz	WA
2C	60.5	Coal Creek Landfill	1503	Longview	Cowlitz	WA
2C	61-62	Radakovich (Mt. Solo) Landfill	1505	Longview	Cowlitz	WA
2C	67 5	International Paper Landfill	1304	Longview	Cowlitz	WA
2C	68	Longview Fibre Landfill	1305	Longview	Cowlitz	WA
2C	69	Cowlitz County Landfill	1306	Longview	Cowlitz	WA
3A	79	Kalama Municipal Landfill	1101	Kalama	Cowlitz	WA
3B	91	Santosh Landfill	1001	Scapposse	Columbia	OR
4A	104	St. Johns Landfill	805	Portland	Multnomah	OR
4A	104	Boise Cascade Limited Purpose Landfill	3106	Vancouver	Clark	WA
4A	105	City of Vancouver Sludge Ash Landfill	3105	Vancouver	Clark	WA
4A	111	Reidel Landfill	704	Portland	Multnomah	OR
4A	120 5	James River Corp Inert Waste Landfills	601	Camas	Clark	WA
4B	144	Hamilton Island Landfill	101	North Bonneville	Skamania	WA

[a] The Site ID number corresponds to the labels in Figures 9a-9d

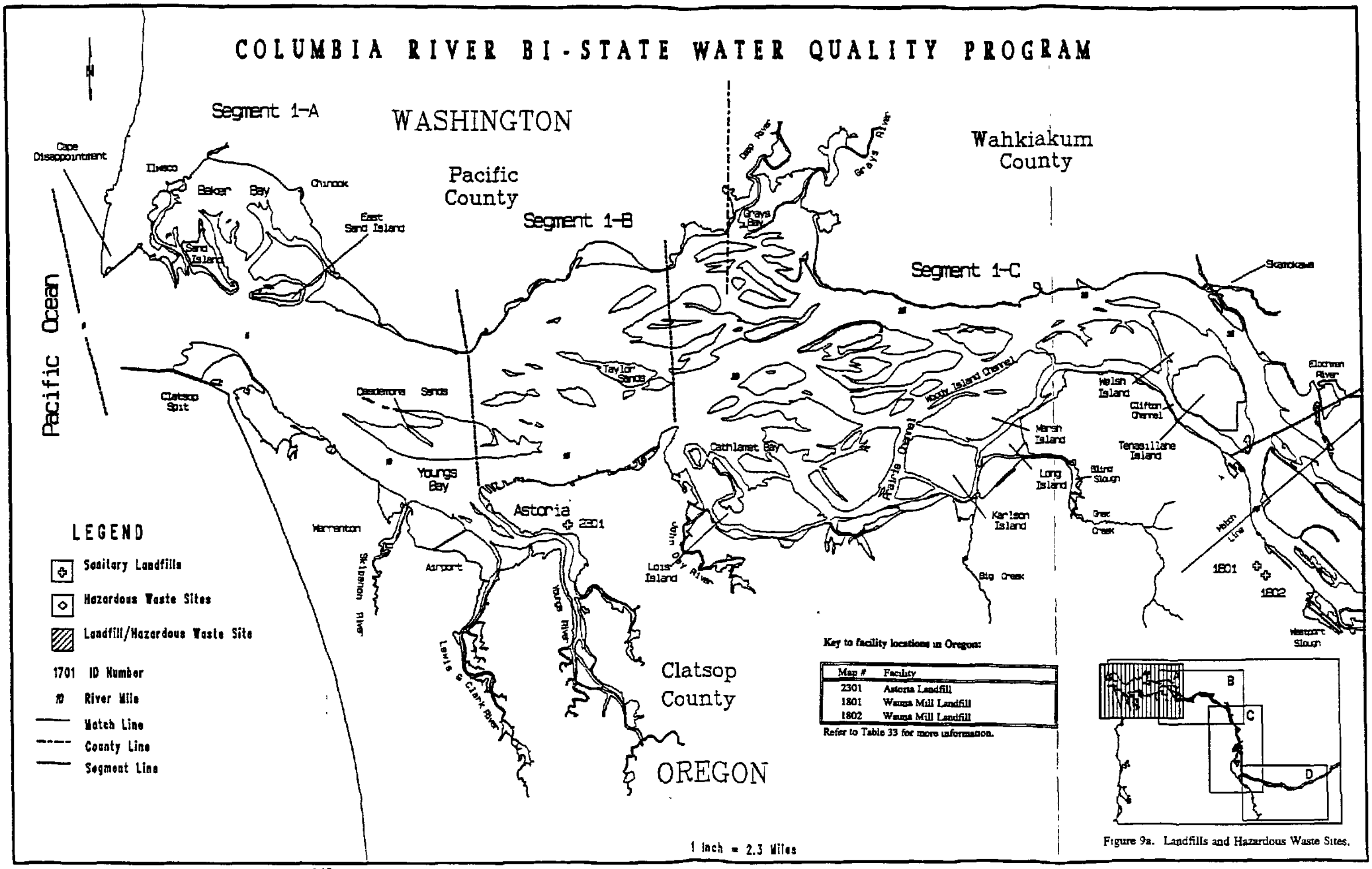
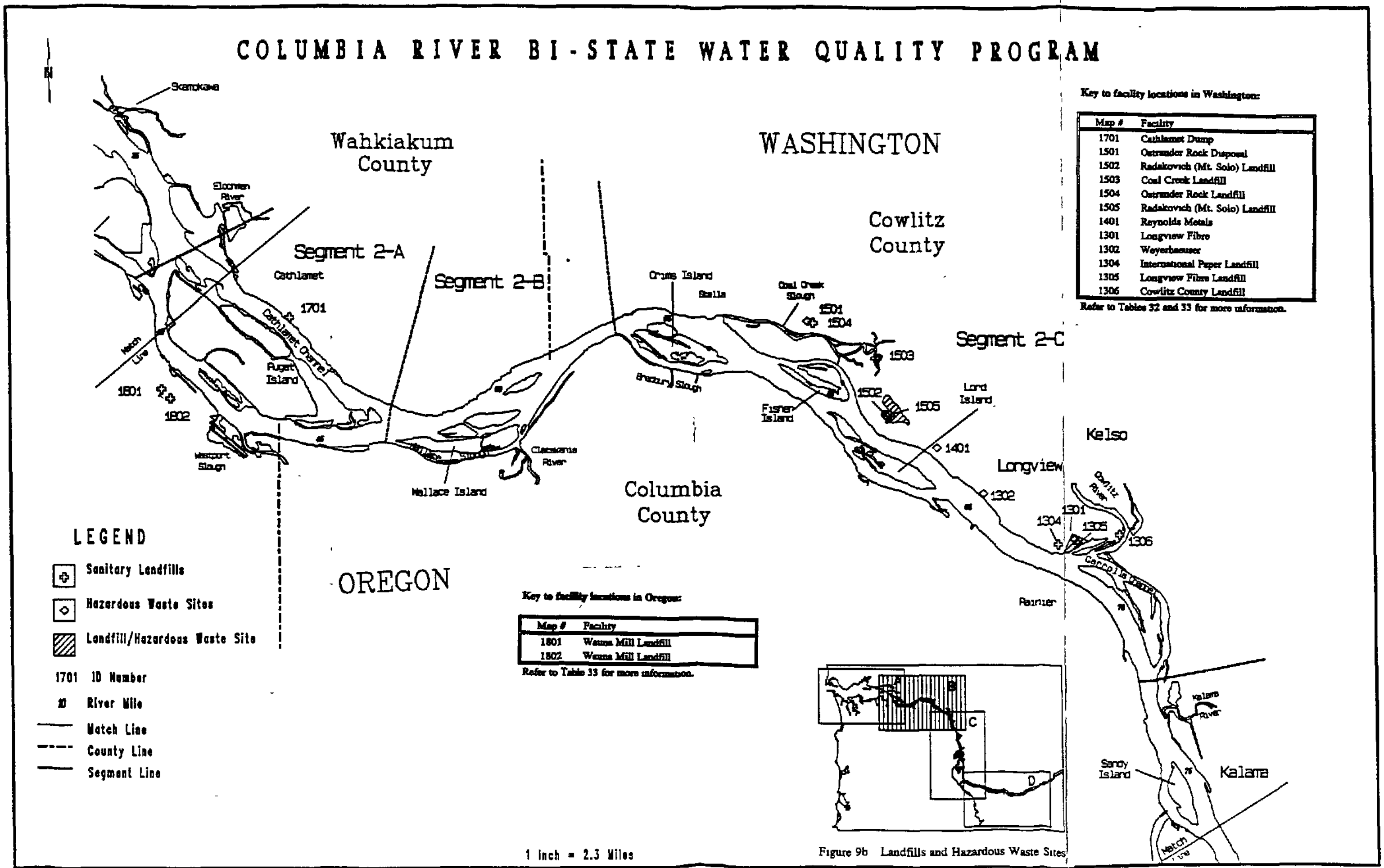


Figure 9a. Landfills and Hazardous Waste Sites.



Key to facility locations in Washington:

Map #	Facility
1701	Cathlamet Dump
1501	Ostrander Rock Disposal
1502	Radakovich (Mt. Solo) Landfill
1503	Coal Creek Landfill
1504	Ostrander Rock Landfill
1505	Radakovich (Mt. Solo) Landfill
1401	Reynolds Metals
1301	Longview Fibre
1302	Weyerhaeuser
1304	International Paper Landfill
1305	Longview Fibre Landfill
1306	Cowlitz County Landfill

Refer to Tables 32 and 33 for more information.

Key to facility locations in Oregon:

Map #	Facility
1801	Wauna Mill Landfill
1802	Wauna Mill Landfill

Refer to Table 33 for more information.

Figure 9b Landfills and Hazardous Waste Sites

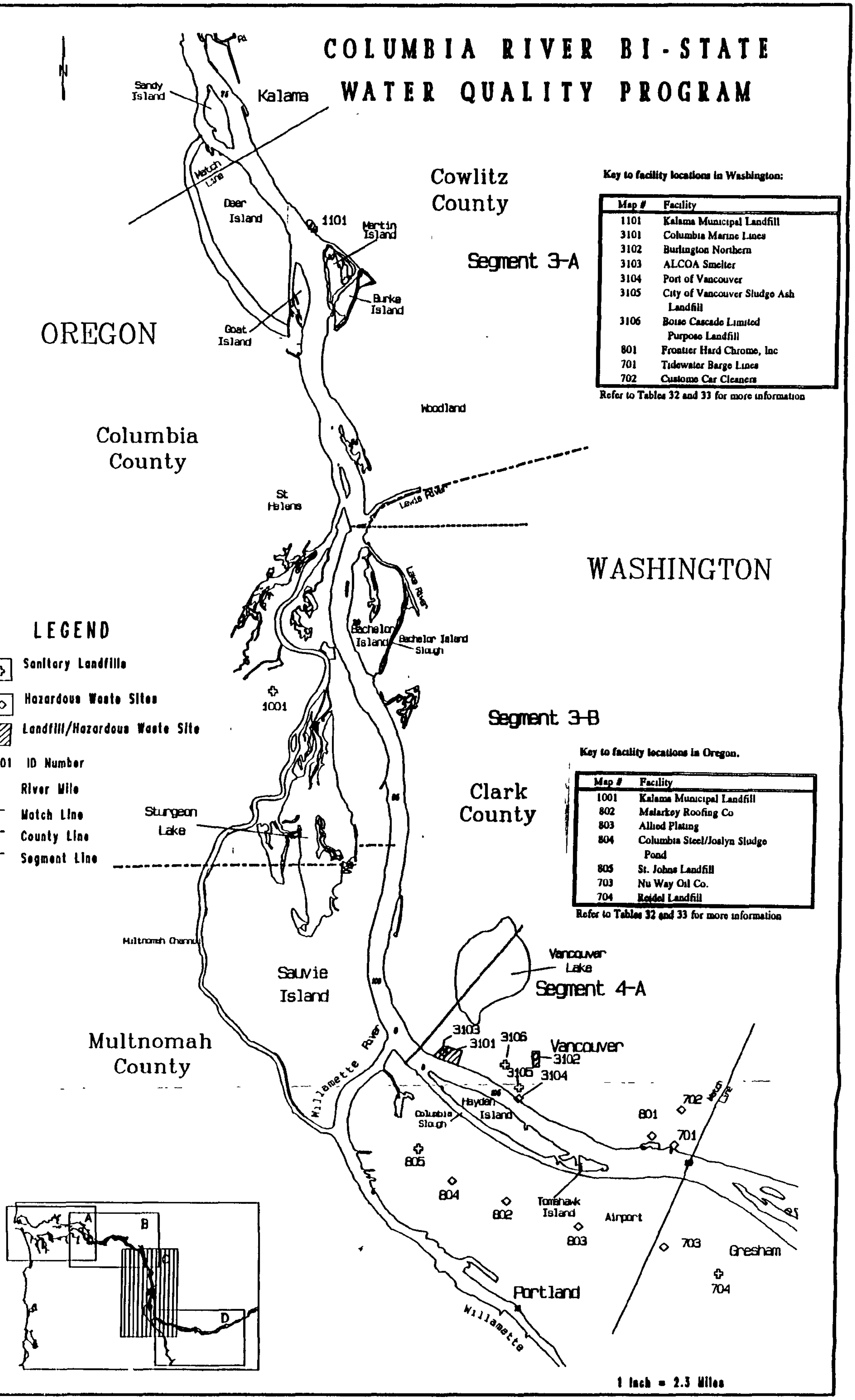
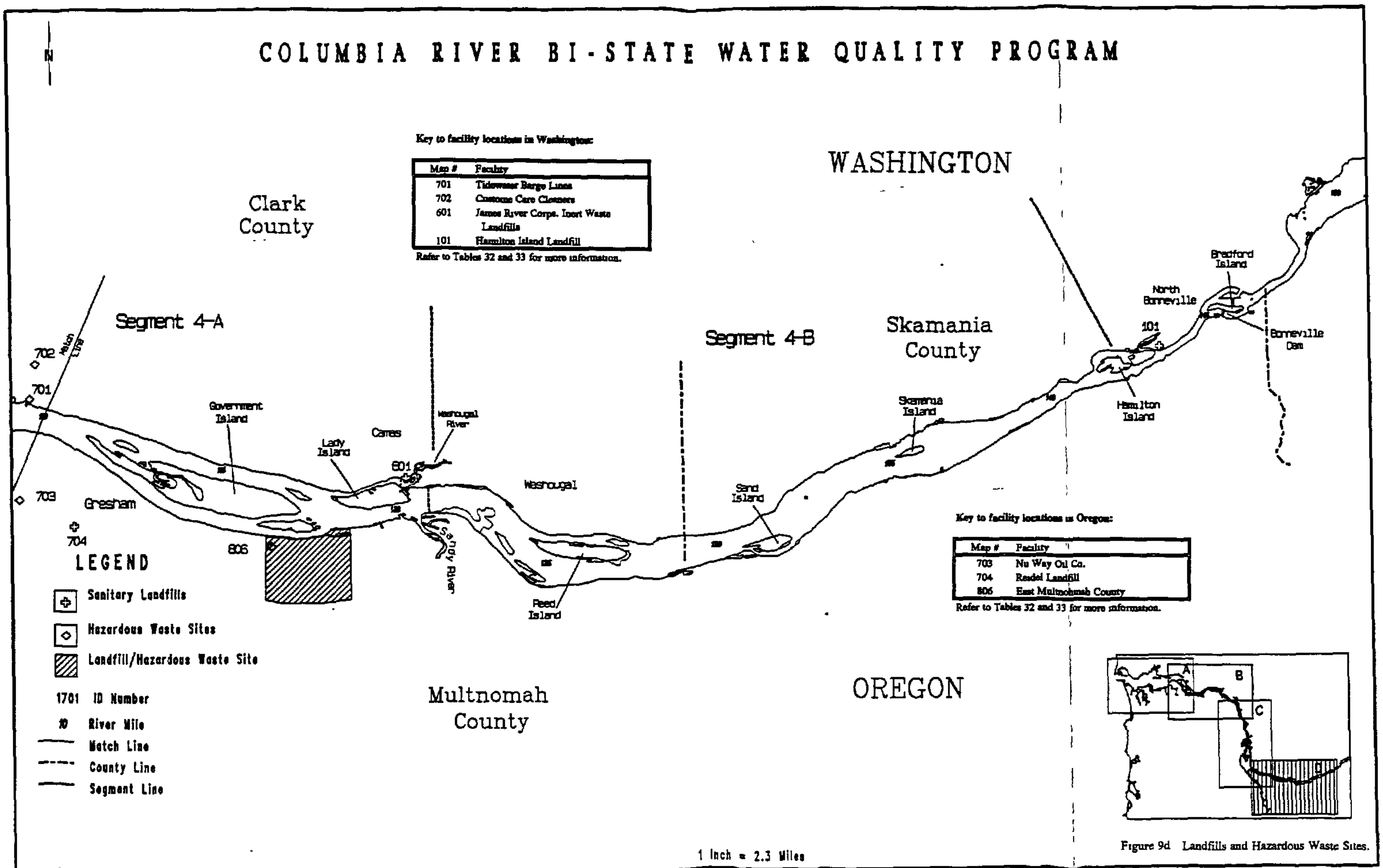


Figure 9c Landfills and Hazardous Waste Sites.

COLUMBIA RIVER BI-STATE WATER QUALITY PROGRAM



Key to facility locations in Washington:

Map #	Facility
701	Tidewater Barge Lines
702	Customs Care Cleaners
601	James River Corps. Inert Waste Landfills
101	Hamilton Island Landfill

Refer to Tables 32 and 33 for more information.

Key to facility locations in Oregon:

Map #	Facility
703	Nu Way Oil Co.
704	Reidel Landfill
806	East Multnomah County

Refer to Tables 32 and 33 for more information.

Figure 9d Landfills and Hazardous Waste Sites.

- Media contaminated (e g., soil, groundwater, or surface water)

- Effect of site contamination on the river (when data are available)

A brief discussion of potentially contaminated sites containing in-place pollutants is also included These potentially contaminated sites are considered qualitative indicators of the presence of in-place pollutants The following are sources of information discussed in this section

- CERCLIS list sites by county

- RCRA notifiers by county

- Septic system construction and repairs by county

- Public marinas and moorage facilities by county.

4.1 DATA COLLECTION AND METHODOLOGY

Data collected for this chapter were gathered from five major sources:

- DEQ files

- WDOE files

- U S. EPA Region X files

- County health district files in Washington

- Personal interviews.

The source for Washington State hazardous waste sites cited in this study is the WDOE Hazardous Sites List (WDOE 1991). Although other sites are under WDOE investigation, the Hazardous Sites List includes those sites considered to warrant the most immediate cleanup attention (Heggen, R , 8 August 1991, personal communication). This inventory lists all sites within Washington that have undergone the Washington Ranking Method (WARM), which assigns a score to a hazardous waste site based on actual or potential contamination to the environment or endangerment to human health. WARM was developed in response to the Washington State Model Toxics Control Act This ranking method evaluates contamination exposure routes through air, surface water, and groundwater according to potential exposure to

- Populations
- Sensitive environments
- Surface water uses (fisheries, drinking water, irrigation)
- Groundwater uses

This ranking method separately evaluates potential effects on humans and the environment, it should not be confused with a human health risk assessment

Oregon State hazardous waste sites were compiled from a database kept by ODEQ's Environmental Cleanup Division ODEQ also adopted a hazardous site ranking system in March 1991 as part of the state's Inventory Ranking Rule (OAR 340-122-460) However, too few sites had been ranked with this method at the time of this study to be useful in our site selection criteria

Superfund sites (federally ranked hazardous waste sites) were obtained from the U S EPA National Priority List (NPL) Sites on the National Priority List have already undergone contamination ranking under the federal ranking system. Federal and state sites are ranked independently to help set respective federal and state program priorities.

Specific information about each hazardous waste site was obtained by review of each respective project file from the U S EPA, WDOE, and ODEQ. Distances from the river were determined by use of site maps or, in some cases, street addresses.

Landfill file information was gathered from ODEQ in Portland for Oregon sites, and the individual county health district offices in Washington for those sites in that state

CERCLIS and RCRA sites were compiled directly from the U S. EPA database listings Septic information was generated from Washington Department of Health annual reports and personal communications with the individual Oregon county health departments. Boating facility information was generated from publications by the Washington State Parks and Recreation Commission and the Oregon State Marine Board

4.2 STATE AND FEDERAL HAZARDOUS WASTE SITES

This section summarizes information about state and federal hazardous waste sites located within 1 mile of the Columbia River shoreline (Table 32). When data were available information is presented on each site's proximity to the river, contaminants of concern, media affected, and the potential of contaminants to reach the river

Four of the five hazardous waste sites in river segment 4-A are adjacent to the Columbia Slough and are located approximately 1 25 miles from the river. These sites are included in this section because of their close proximity to the 1 mile-wide study area along the shoreline Because the Columbia Slough is not a direct subject of this study, the four sites along the slough are evaluated only for their potential to directly affect the river

4.2.1 River Segments 1-A through 2-B

No federal or state sites considered in this study exist in river segments 1-A through 2-B.

4.2.2 River Segment 2-C

4.2.2.1 Ostrander Rock Disposal Site (Longview, Cowlitz County, Washington). The Ostrander Rock disposal site is situated near Longview, WA, approximately 0.25 miles northwest of Coal Creek Slough (Site 1501, Figure 9b) The 40-acre site, which is now closed, consists of a 30-acre landfill, a quarry, and seven settlement/leachate ponds. The site received wood wastes, pulp mill process wastes (including clarifier sludge), construction and demolition debris, and hazardous wastes It is not a RCRA treatment, storage, or disposal facility for hazardous wastes. WDOE assigned the site a rank of 2 (i e , the second highest assessed risk).

The following contaminants were detected in settling pond sediments:

- Naphthalene
- Pentachlorophenol
- 1,1,2 Trichloroethane

Other substances mentioned in the files, but for which no toxicity data were available, are these

- Manganese
- Isopropanol
- Trifluoroethane

A 1986 study (Ecology and Environment 1987) found no evidence of groundwater or slough contamination However, potentially affected media are considered to be groundwater, surface water, and soil No data were available on contaminant loading potential to the Columbia River

4.2.2.2 Radakovich Landfill (also called Mt. Solo Landfill, Longview, Cowlitz County, Washington). The Radakovich Landfill is located in Longview, approximately 0 25 miles north of the Columbia River and adjacent to a small slough (Site 1502, Figure 9b) It is active and receives industrial and other non-municipal solid waste from various sources in Cowlitz County It is not a RCRA treatment, storage, or disposal facility. WDOE assigned the site an overall rank of 1 (i.e , highest assessed risk) Surface water contamination is the highest concern at the site, but groundwater contamination is also an issue

The following on the contaminants of concern for this site:

- Arsenic
- Cadmium
- Mercury.

Toluene has also been identified in landfill sludge/leachate Contaminants have been detected by regular surface water, groundwater, sediment, and soil monitoring at the site No data were available on contaminant loading potential to the Columbia River

4 2.2.3 Reynolds Metals Company (Longview, Cowlitz County, Washington). This 433-acre active site is adjacent to the Columbia River, approximately 2 miles west of Longview (Site 1401, Figure 9b). It is a RCRA-registered large quantity hazardous waste generator. WDOE assigned the site an overall rank of 5 (i.e., the lowest assessed risk). The major concern at the site is leachate from a spent potliner pile The contaminated potliner pile was removed during 1989–1990, but some contaminated soils along and groundwater have been reported Run-on/runoff controls have now been established at the site

The following are contaminants of concern at the site

- Fluoride
- Cyanide

No data were available on potential contaminant loading to the Columbia River

4 2.2.4 ***Weyerhaeuser Company (Longview, Cowlitz County, Washington).*** The Weyerhaeuser site is located 100–500 ft from the Columbia River in Longview (Site 1302, Figure 9b) The site formerly housed a chlor-alkali plant that utilized a mercury cell process, and is a RCRA-registered large quantity hazardous waste generator. Mercury-laden wastes were discharged directly into the Columbia River from 1956–1970. After 1970, these sludges were put in unlined pits, contaminating soil and, potentially, groundwater. WDOE assigned an overall rank of 1 to the site (i e , the highest assessed risk category).

The contaminant of concern is:

- Mercury

Mercury has been detected in both soils and groundwater monitoring wells. Some groundwater mercury data exceeded the primary drinking water MCL by a factor of ten (EMCON Northwest 1988) No data were available on contaminant loading to the Columbia River.

4.2.2.5 ***Longview Fibre (Longview, Cowlitz County, Washington).*** Longview Fibre is a 300-acre pulp and paper facility located at the Cowlitz River confluence to the Columbia River (Site 1301, Figure 9b). It is a RCRA-registered large quantity hazardous waste generator WDOE assigned a hazardous ranking score of 5 to the site (i e , the lowest assessed risk score) WDOE also classified the status of this site as unlikely to ever change The most important potential pathway for environmental contamination from the site is groundwater A closed landfill, containing mostly boiler fly ash has been the focus of concern on the site The landfill is covered with soil and has run-on/runoff controls.

The following are the main compounds of concern·

- Lead
- Chromium
- Barium
- Arsenic

These metals have shown up in groundwater well monitoring data Because surface water is diverted at the landfill, it is not considered a likely pathway of contamination No data were available on contaminant loading potential to the Columbia River

4.2.3 River Segments 3-A and 3B

No federal or state sites considered in this study exist in either river segments 3-A or 3-B

4.2.4 River Segment 4-A

4.2.4.1 ALCOA - Vancouver Smelter (Vancouver, Clark County, Washington). The ALCOA Company is adjacent to the Columbia River (Site 3103, Figure 9c), approximately 2 miles east of Vancouver ALCOA is a federal Superfund site, with the U S EPA designated as the lead regulatory agency Spent potlining and reclaimed alumina insulation wastes produced from the aluminum reduction process have been the focus of most attention at the site According to monitoring studies performed in 1986-87, a contaminant plume emanating from the waste pile is moving directly to the Columbia River (Hart-Crowser 1988).

The following are the principal contaminants of concern

- Cyanide
- Fluoride

Estimates of cyanide and fluoride loading rates from ALCOA have also been calculated (Hart-Crowser 1988) A loading rate of approximately 0 0004 lbs of free cyanide per day is estimated from groundwater contamination to the Columbia River. The maximum value of free cyanide detected at any groundwater well on the site was 1.1 ppm, compared to the U S EPA revised ambient water criteria of 3.77 ppm A loading rate of 1 5 pounds per day of fluoride was calculated as entering the river from contaminated groundwater at the site The largest groundwater concentration detected was 134 ppm, over 30 times greater than the U S EPA's drinking water standard of 4.0 ppm for fluoride.

4 2.4.2 Columbia Marine Lines (Vancouver, Clark County, Washington). Columbia Marine Lines is a former barge waste disposal site adjacent to the Columbia River in Vancouver (Site 3101, Figure 9c) The 2.5-acre contaminated site has been documented to contain compounds associated with petroleum hydrocarbons and industrial organic solvents in the groundwater During 1985, a hydrocarbon recovery system was installed to pump and treat water from the shallow aquifer Files indicate 500 gallons of hydrocarbons have been recovered by April 1986 WDOE assigned an overall rank of 5 to the site (i e., the lowest assessed risk)

The following are pollutants of concern at the site

- Benzene
- Ethylbenzene
- Toluene
- Naphthalene
- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- Cyanide.

Groundwater contamination is considered the most likely contamination pathway Although groundwater studies reveal the potential for shallow groundwater to reach the river, no estimates of loading to the Columbia River have been made. No surface water contamination has been documented.

4.2.4.3 Burlington Northern Railyard (Vancouver, Clark County, Washington). The Burlington Northern Railway facility is located approximately 0.9 miles north of the Columbia River in Vancouver (Site 3102, Figure 9c). WDOE assigned an overall rank of 1 (i e., the highest assessed risk) to the site. The site is an active railyard with a variety of waste management units, including an oil-water separator, old landfills, a drum storage area, an equalization tank, waste piles, and contaminated soils at the site

The following substances have been confirmed at the site currently or in the past:

- Lead
- Acetone

- 2-Methyl Naphthalene
- PCB
- Pesticides
- Chromium
- Cadmium
- Cyclohexane
- Fluoranthene
- Pyrene
- Chrysene
- Acetone
- Toluene
- Naphthalene
- Phenanthrene
- Fluorene
- Diesel (Fuel Oil/Hydraulic Lube Oil)

The two landfills on-site are reportedly unlined, covered with contaminated soil, and have no run-on/runoff controls. There are over 60 drums and containers on the site, some of which are deteriorating or leaking

The major pollutants of concern at the site are these:

- Lead
- Acetate
- PCBs
- Chromium

Surface water is treated on-site and discharged to the Vancouver city sewer system The sludge is disposed of in a solid waste landfill In a 1990 site inspection report, WDOE considered surface water treatment as sufficient During 1990 groundwater sampling, detectable levels of chromium, copper, zinc, lead, and arsenic were measured, but not at significant levels Several volatile organics were also detected in groundwater samples, but all were well below MCLs for drinking water, and not significantly different from background levels

4.2.4.4 Columbia Steel/Joslyn Sludge Pond (Portland, Multnomah County, Oregon). The Columbia Steel/Joslyn Sludge Pond site is adjacent to the Columbia Slough in Portland (Site 804, Figure 9c). The site formerly housed a pentachlorophenol treatment plant for the treatment of telephone poles. The primary areas of concern are the old waste ponds and chemical/waste storage areas

The following are the principal contaminants of concern at the site·

- Pentachlorophenol
- Creosote
- Diesel

Groundwater, surface water, and soil were documented as affected in an ODEQ preliminary assessment of the site for the U S. EPA (1989) The major concern documented in the preliminary assessment was offsite migration of contaminants and negative effects on sensitive wetlands and wetland-dependent flora and fauna.

No data were available on contaminant loading potential to the Columbia River

4.2.4.5 Port of Vancouver (Vancouver, Clark County, Washington). The port is adjacent to the Columbia River in Vancouver (Site 3104, Figure 9c). WDOE assigned the site a rank of 1 (i e , the highest assessed risk). Over the years, unknown quantities of copper ore concentrate had been spilled into the river The ore concentrate contained copper, lead, arsenic, and cadmium Because of these spills, surface water and sediment contamination were the primary concern Groundwater contamination has been reported as not probable given the hydraulic relationship between the river and aquifer.

The following are the primary contaminants of concern for the site:

- Lead
- Arsenic
- Cadmium
- Copper

In 1990, the port conducted dredging activities to remove and dispose of the contaminated sediments. A verification sampling study (Century West Engineers 1990) indicated compliance with the overall cleanup objective of 1300 ppm copper in sediments, except for a few isolated areas beneath the outer dock, where concentrations up to 19,100 ppm were measured. Remedial action is considered complete under the WDOE action order.

4.2.4.6 ***Malarkey Roofing Co. (Portland, Multnomah County, Oregon).*** The Herbert Malarkey Roofing Company produces asphaltic-based roofing shingles, and is adjacent to the Columbia River Slough in Portland (Site 802, Figure 9c) The site is separated from the slough by a 20-foot-high dike Previous remedial action on the site consisted of excavating contaminated soils from one area

The following contaminants have been found on the site

□	PCBs	(Water, Soil)
□	Cyanide	(Water, Soil)
□	Toluene	(Water)
□	Lead Compounds	(Water, Soil)
□	Arsenic Compounds	(Water, Soil)
□	Mercury	(Surface water, Groundwater, Soil)
□	Zinc	(Surface Water, Soil)
□	Semivolatiles	(Soil).

The remedial investigation at the site characterized and documented heavy metal contamination (Reidel 1990) Results from EP Toxicity tests from these studies in soils found the following metals above EP Toxicity Criteria.

- □ Lead
- □ Zinc

No significant surface water or groundwater contamination was found (Reidel 1990) Other metals detected in soil at levels below EP Toxicity criteria and semivolatiles include these

- □ Arsenic
- □ Cadmium
- □ Chromium
- □ Mercury
- □ Cyanide
- □ Pyrene
- □ Bis(2-ethylhexyl)phthalate.

No data were available on potential contaminant loading to the Columbia River.

4.2.4.7 ***Allied Plating (Portland, Multnomah County, Oregon).*** From 1957 to 1983, the Allied Plating site was the location of automobile bumper plating operations using a soft chrome process This Superfund site is located approximately 1,000 ft south of the Columbia Slough in Portland (Site 803, Figure 9c) The treatment process involved dipping the bumpers sequentially in copper, nickel, and chrome Rinsate from these operations were discharged through a pipe to the north part of the property, which drained to the slough.

The following contaminants have been identified at the site:

- Chromium
- Copper
- Nickel
- Zinc
- Iron
- Arsenic
- Barium
- Cadmium
- Lead
- Mercury
- Beryllium
- Cyanide
- Sulfates
- Chlorides
- Phenols
- Radioactivity
- Methylene chloride.

The dominant contaminants of concern among these are the transition metals, which include the following

- Chromium
- Copper
- Nickel
- Zinc
- Iron.

The primary media affected by these contaminants at the site are groundwater and soil Although groundwater is the most likely route for contaminant transport to the slough and river, data are insufficient to estimate transport rates or quantities to the river.

4 2 4 8 Frontier Hard Chrome (Vancouver, Clark County, Washington) This half-acre Superfund site is located approximately 0 5 miles north of the Columbia River in Vancouver (Site 801, Figure 9c) The property has been the location of various chrome-plating activities since 1958 Until 1975, chromium plating wastes were discharged into the City of Vancouver's sanitary sewer system From 1967-1983, Frontier Hard Chrome discharged chromium plating wastes into a drywell behind their facility

Results from remedial investigations (U S EPA 1987) indicate the contaminant of concern at the site to be

- Chromium

High levels of chromium were detected in groundwater and soil. Groundwater flow is primarily to the river While monitoring determined that chromium contamination was reaching the river via groundwater, a river impact model determined no measurable increase of contamination to the Columbia River could be detected Actual sampling and analyses of river water were not conducted

4.2.4 9 Custom Care Cleaners (formerly Griffey Cleaners, Vancouver, Clark County, Washington). The site is located east of downtown Vancouver, approximately 1 2 miles north of the Columbia River (Site 702, Figure 9c) The site formerly contained a buried drum that leaked spent stoddard solvent to the surrounding subsoil The quantity of solvent spilled is unknown, but was conservatively estimated at 520 gallons, cumulatively, over ten years The contaminant boundary has been estimated to extend to a depth of 10-15 ft. Groundwater depth at the site is estimated as approximately 100 ft The soil is characterized as highly permeable with a hydraulic conductivity of $> 10^{-3}$ cm/sec

The following contaminants of concern were found in the site soil:

- Acetone
- Chlorobenzene
- Ethylbenzene
- Toluene
- Xylene

The buried drum has now been removed, and the current operation no longer discharges spent solvent For run-on/runoff control, a temporary liner and pea gravel have been placed over the site of the excavated drum

WDOE has assigned a rank of 5 (i e , lowest assessed risk) to the site Because of the relatively small quantity of contaminants and the site's relative distance from the river, its significant effects on the river are considered improbable

4.2.4 10 Tidewater Barge Lines, Inc. (Vancouver, Clark County, Washington). The Tidewater Barge Lines is a tugboat/barge repair and service yard adjacent to the Columbia River in Vancouver (Site 701, Figure 9c). WDOE assigned the site a rank of 1 (i.e , the highest assessed risk) The focus of attention at the site was the 200-foot-diameter waste fuel pond constructed between 1968 and 1971. During 1986 and 1987, the pond water was passed through activated carbon and released to the river with WDOE approval. In 1988, the contaminated soils from the pond bottom were removed and disposed of in the Lakeside Reclamation Landfill at Beaverton, OR.

The following are contaminants of concern at the site:

- Oil and Grease
- Heavy Metals

In 1988, the remaining soils contained approximately 0 2 percent oil and grease, compared to values of 6 to 12 percent in the removed soils Groundwater had seeped into the excavation pit and contained 2 ppm of oil and gas No data were available on contaminant loading potential to the Columbia River

4.2.4.11 Nu Way Oil Company (Portland, Multnomah County, Oregon). The 5-acre Nu Way Oil site is located adjacent to the Columbia Slough in Portland (Site 703, Figure 9c) The site is a former used motor oil re-refinery that operated from 1935 to 1987. However, between 1980 and 1987, the facility only dewatered used motor oil and sold it to other re-refineries The main areas of concern on the site are the sludge pond, clay waste piles, and areas oiled for dust control

The following compounds were detected on-site in past investigations.

☐	1,1,1-Trichloroethane	(Groundwater, Sediment)
☐	Bromomethane	(Surface Water, Sediment)
☐	Chloromethane	(Sediment)
☐	Dichloroethane	(Sediment)
☐	Dichloroethene	(Sediment)
☐	Methyl ethyl ketone	(Sediment)
☐	1,1,2-Trichloroethene	(Sediment)
☐	O-Xylene	(Sediment)
☐	Ethyl benzene	(Sediment)
☐	Methyl isobutyl ketone	(Sediment)
☐	Toluene	(Surface Water, Groundwater, Sediment)
☐	Tetrachloroethene	(Groundwater, Sediment)
☐	2-Methylnaphthalene	(Surface Water, Groundwater, Sediment)
☐	Phenanthrene	(Surface Water, Sediment)
☐	Naphthalene	(Surface Water, Groundwater, Sediment)
☐	Phenol	(Surface Water, Groundwater, Sediment)
☐	Arochlor 1260	(Surface Water, Sediment)
☐	Arochlor 1242	(Surface Water, Sediment)
☐	Pentachlorophenol	(Surface Water)
☐	O-Cresol	(Surface Water)
☐	2,4-Dimethylphenol	(Surface Water, groundwater)
☐	p-Cresol	(Surface Water)
☐	Bis(2-chloroethyl)ether	(Surface Water)
☐	Antimony	(Surface Water, Soil)
☐	Arsenic	(Surface Water, Soil)
☐	Cadmium	(Surface Water, Soil)
☐	Chromium	(Surface Water, Soil)
☐	Copper	(Surface Water, Soil)
☐	Lead	(Surface Water, Soil)
☐	Nickel	(Surface Water, Soil)
☐	Selenium	(Surface Water, Soil)
☐	Thallium	(Surface Water, Soil)
☐	Zinc	(Surface Water, Soil)
☐	Cyanide	(Surface Water)
☐	Silver	(Soil)
☐	Mercury	(Soil)

- Beryllium (Soil)
- Methylene chloride (Groundwater)
- 1 1-Dichloroethane (Groundwater)
- 1,1-Dichloroethene (Groundwater)
- Trans-1,2-dichloroethane (Groundwater)
- Chloroform (Groundwater)
- Carbon tetrachloride (Groundwater)
- Trichloroethene (Groundwater)
- 4-Methyl-2-pentanone (Groundwater)
- Xylenes--Total (Groundwater)
- 4-Methylphenol (Groundwater)
- Bis(2-ethylhexyl)phthalate (Groundwater).

Contaminants from this site are considered likely to enter the Columbia Slough However, the slough discharges mainly to the Willamette River Therefore, significant effects from this site directly to the river are considered unlikely

4 2.4.12 East Multnomah County (Portland Area, Multnomah County, Oregon). The East Multnomah County Study regional investigation is an approximately 2 5-square-mile site adjacent to the Columbia River and Columbia Slough (Site 806, Figure 9d) This site differs from the others, because the source of its contamination is unknown Groundwater contamination from trichloroethylene (TCE) was first documented at the Boeing Portland facility in 1986 The ODEQ is currently investigating two other facilities (Cascade Corporation and Swift Adhesives) in the area with known TCE contamination Because the contaminated area serves as a backup drinking water supply to Portland, the ODEQ began this regional groundwater investigation All investigations have involved groundwater and have been on-going since the mid-1980s

The following are primary contaminants of concern at the site:

- Tetrachloroethylene (PCE)
- TCE.

Both PCE and TCE are considered "probable human carcinogens" by the U S EPA High concentrations of TCEs in ODEQ test wells have spurred the closure of some private wells No data were available on potential contaminant loading to the Columbia River

4.2.5 River Segment 4-B

No federal or state sites considered in this study exist in river segment 4–B

4.3 LANDFILLS ALONG THE COLUMBIA RIVER

This section summarizes information about landfills within 1 mile of the lower Columbia River shoreline Information was gathered from ODEQ for Oregon sites and from county health district offices for Washington sites When available, data are presented on a landfill's potential effects on river

4.3.1 River Segment 1-A

No landfills considered in this study exist in river segment 1–A.

4.3.2 River Segment 1-B

4.3.2.1 Astoria Landfill (Astoria, Clatsop County, Oregon). The Astoria Landfill is a closed, unlined garbage landfill located east of the city just under 1 mile from the Columbia River (Site 2301, Figure 9a) The closure permit requires a leachate surface collection system and quarterly groundwater and surface water monitoring In July 1989, groundwater and surface water analyses detected no primary drinking water standards violations Secondary drinking water standards were exceeded for the following contaminants of concern

- Iron
- Manganese.

Overall impacts to groundwater and surface water at this site were considered insignificant (Greenwood, S , 21 December 1989, personal communication). Direct effects on the Columbia River are also considered insignificant because site topography directs runoff toward the Youngs River

4.3.3 River Segment 1-C

No landfills considered in this study exist in river segment 1–C

4.3.4 River Segment 2-A

4.3.4.1 James River Industrial Waste Landfill (Wauna, Clatsop County, Oregon). This site (Site 1801, Figure 9b) consists of a number of unlined landfills on James River property

- An inactive primary waste landfill
- An inactive lime waste landfill
- Two active secondary waste landfills
- An inactive emergency sludge diversion landfill.

These landfills are grouped because they operate under the same ODEQ solid waste disposal site closure permit The inactive landfills have been proposed for closure. No significant effects on groundwater or surface water quality are on file, but no monitoring wells exist near the Columbia River No data were available on contaminants of concern or potential contaminant loading to the river

4.3.4.2 James River II Industrial Waste Landfill (Wauna, Clatsop County, Oregon). This lined landfill receives sludge, lime waste, wood mill and log deck debris, fiber rejects, and general nonputrescible mill trash from the Wauna Mill site It is located approximately 3000 ft from and 150 to 200 ft above the river (Site 1802, Figure 9b) Downgradient water quality has not been affected by this site (Albright, R , 11 July 1988, personal communication), although periodic monitoring is still required to detect any new changes, should they occur No data were available on contaminants of concern.

4.3.4.3 Cathlamet Dumping Site (Cathlamet, Wahkiakum County, Washington). The Cathlamet Dumping site is a closed municipal landfill facility (Site 1701, Figure 9b). No summary or data were available in health district files to interpret potential contaminants of concern or potential transport of these contaminants to the Columbia River.

4.3.5 River Segment 2-B

No landfills considered in this study exist in river segment 2-B

4.3.6 River Segment 2-C

4.3.6.1 Ostrander Rock Landfills (Longview, Cowlitz County, Washington). The Ostrander Rock Disposal Site (Site 1504, Figure 9b) is also a confirmed Washington State hazardous waste site ranked under the WARM See Section 4 2 2 1 of this report for the contaminants of concern and affected media at this site

4.3 6.2 Coal Creek Landfill (Longview, Cowlitz County, Washington). This former county landfill operated from 1965 to 1975, receiving primarily municipal, commercial, and some industrial waste The diked site is located near the confluence of Coal Creek to the Columbia River (Site 1503, Figure 9b). A potential hazardous waste site preliminary assessment concluded that potential groundwater contamination was unlikely given the low permeability of site soils Potential surface water contamination was also considered minimal because of the presence of the dike. No monitoring data were available for this site. However, since Weyerhaeuser was known to dispose of chromium waste at this site, a potential contaminant of concern is

- Chromium

No data were available on the potential for chromium contamination loading to the Columbia River

4.3.6 3 Radakovich (Mt. Solo) Landfill (Longview, Cowlitz County, Washington). The Mt Solo Inc Landfill site (Site 1505, Figure 9b) is also a confirmed Washington State hazardous waste site ranked under WARM. See Section 4 2 2.2 of this report for the contaminants of concern and affected media at this site.

4 3.6.4 International Paper Landfill (Longview, Cowlitz County, Washington). The International Paper woodwaste landfill is located approximately 0.5 miles from the Columbia River in Longview (Site 1304, Figure 9b). It receives only wood waste consisting of log deck debris (bark and soil) from the International Paper log storage site. Landfill closure plans are currently being proposed Results from 1988 and 1989 groundwater monitoring studies revealed no increase between downgradient wells and background levels of any water quality parameters Groundwater seepage velocity at the site was calculated to be approximately 15 to 22 ft/year Evidence does not suggest significant effects on the Columbia River from the landfill.

4.3.6.5 Longview Fibre Landfill (Longview, Cowlitz County, Washington). The Longview Fibre Landfill site (Site 1305, Figure 4b) is also a confirmed Washington State hazardous waste site ranked under the WARM See Section 4 2 2 5 of this report for the contaminants of concern and affected media at this site

4 3.6.6 Cowlitz County Municipal Landfill (Longview, Cowlitz County, Washington). The approximately 55-acre landfill is at the confluence of the Cowlitz River to the Columbia River (Site 1306, Figure 9b) A statistical evaluation of groundwater monitoring data was conducted for 1983 and 1990 (CH2M Hill 1990) Although no primary drinking water standards were exceeded, secondary standards were exceeded for the following contaminants of concern

- Iron
- Manganese

Concentrations of total dissolved solids showed an increasing trend in monitoring wells, in addition to chloride, COD, total organic carbon, and electrical conductivity These increases may have been due to the unlined leachate lagoon. The lagoon was lined in 1990, and these contaminant trends will diminish if the lagoon was the pollutant source. No data were available on contaminant loading potential to the Columbia River

4.3.7 River Segment 3-A

4.3.7.1 Kalama Municipal Landfill (Kalama, Cowlitz County, Washington). The site operated as a county municipal landfill between 1962 and 1968 It was closed by the Cowlitz County Health Department because of its location in a Columbia River backwater area (Site 1101, Figure 9c) The site has been covered and planted with grass and trees. Limited site information was available in health department files The only available source, a draft Potential Hazardous Waste Site Preliminary Assessment (U S. EPA 1985), indicated no records of hazardous materials at the site While leachate from the site could potentially affect groundwater or surface water, the landfill has no leachate collection or monitoring system.

4.3.8 River Segment 3-B

4.3.8.1 Santosh Landfill (Scappoose, Columbia County, Oregon). The Santosh Landfill (Site 1001, Figure 9c) is a 60-acre unlined site that closed in September 1983. The site served as the primary municipal landfill for Columbia County and accepted large amounts of clarifier sludge from the Boise Cascade Paper Mill in St. Helens Because the landfill is covered with gravelly silt loam and is separated from the Multnomah Channel by a dike, the potential pollutant transport is mainly through groundwater Groundwater testing revealed that no primary drinking water standards were violated, but some secondary standards were (Downs, M , 14 February 1986, personal communication)

The following chemicals were detected in groundwater monitoring wells.

- Iron
- Chlorine
- Sulfate
- Ammonia.

Information does not exist on potential loading to the downgradient Multnomah Channel and Columbia River

4.3.9 River Segment 4-A

4.3.9 1 St. Johns Municipal Landfill (Portland, Multnomah County, Oregon). The St Johns Landfill occupies approximately 255 acres near the confluence of the Willamette River to the Columbia River (Site 805, Figure 9c) It began operation in 1939 and is currently in the process of closing Over the years, the landfill received many types of wastes, including some now considered unacceptable in unlined landfills Given the proximity of the landfill to other potentially major pollution contributors, distinguishing the sole effects of the landfill to the surrounding area has been impossible. However, water quality investigations of the Columbia Slough, Smith Lake, and Bybee Lake indicate the following contaminants concern:

- Iron
- Manganese
- Total Phosphorus
- Total Nitrogen
- Un-ionized Ammonia
- Copper
- Cadmium
- Zinc
- Lead

Current data are inadequate to calculate loading to the Columbia River

4.3.9 2 Boise Cascade Limited Purpose Landfill (Vancouver, Clark County, Washington). The Boise Cascade Limited purpose landfill is a new lined landfill located approximately 0 5 miles from the river (Site 3106, Figure 9c) Since the landfill is fully lined, no significant effects on the river are likely No groundwater or surface water monitoring data were available in the files

4 3 9.3 City of Vancouver Sludge Ash Landfill (Vancouver, Clark County, Washington). This landfill (Site 3105, Figure 9c) receives waste ash produced by the WWTP Although the leachate is contaminated with heavy metals—including lead, copper, and zinc—laboratory analyses have shown leachate levels to be low or near detection limits for these same chemicals To date, groundwater or surface water monitoring has not been conducted at the site Therefore, no estimates are available of potential loading to the Columbia River

4.3.9.4 Reidel Demolition Landfill (Portland, Multnomah County, Oregon). This demolition landfill is located near the Columbia Slough in northern Portland (Site 704, Figure 9d) It received only demolition and construction debris, such as soil, rock, bricks concrete wood, or plastic containers The facility is closing, and a liner was installed in 1991 Monitoring results have revealed no significant groundwater impacts No data were available on contaminant loading to the Columbia River

4.3.9.5 James River Corp. Camas Mill Inert Waste Landfill (Camas, Clark County, Washington). The James River Corporation operates an inert waste landfill in Camas, WA (Site 601, Figure 9d). The site stores mostly hog fuel boiler ash and small amounts of concrete debris By definition, an inert waste landfill does not generate harmful leachate, so is not considered likely to adversely affect the Columbia River

4.3.10 River Segment 4-B

4.3.10 1 Hamilton Island Landfill (Bonneville, Skamania County, Washington). The Hamilton Island Landfill is located on a peninsula just downstream of the Bonneville Dam (Site 101, Figure 9d) The site was used as both a soil borrow area and a disposal area during the construction of the Bonneville Dam second powerhouse. Demolition debris from the original site of North Bonneville was also placed in the landfill

During a recent site inspection (U S COE 1990), the following contaminants of concern were detected above the U S EPA criteria for aquatic life in surface waters.

- Cadmium
- Copper
- Chromium
- Lead
- Zinc
- Benzoic Acid
- Toluene.

Even though no background Columbia River surface water was collected for comparison against these results, the U.S. COE reported that expected degradation of river water quality from the site was unlikely due to tremendous dilution

4.4 POTENTIAL SITES OF IN-PLACE POLLUTANTS

4.4.1 CERCLIS and RCRA Sites

The CERCLIS list inventories sites that, at one time, were thought to have a potential for releasing hazardous substances into the environment. It is important to note that sites are never removed from the CERCLIS list, even after further investigations indicate no further action is warranted If a site on the CERCLIS list is determined to represent a long-term threat to public health or the environment, it is elevated to the NPL for clean-up action The RCRA list is even more general, inventorying sites that generate, transport, treat, store, dispose of, burn or blend hazardous materials Because a site on the RCRA list does not necessarily release hazardous materials into the environment, the CERCLIS and RCRA lists are qualitative indicators of potential contamination, but nothing more The CERCLIS and RCRA sites in the study area are listed in Table 34. Not surprisingly, Cowlitz, Clark and Multnomah counties have the most CERCLIS and RCRA sites—they are the counties with the most industrialization and hazardous waste sites.

4 4.2 Septic Systems

Septic systems connected hydrologically to the lower Columbia River represent a potential vector for sewage contamination Leaking septic systems can contaminate groundwater, which can, in turn, enter the river For this reason, information on both new septic system construction permits and repair permits are presented in Table 35 for counties adjacent to the river While construction of a septic system does not imply contamination, it does provide informa-

TABLE 34 CERCLIS AND RCRA SITES IN COUNTIES ADJACENT TO THE LOWER COLUMBIA RIVER

County	State	CERCLIC List Sites	Total RCRA Notifiers List Sites
Clatsop County	OR	5	45
Columbia County	OR	9	34
Multnomah County	OR	129	1237
Hood River County	OR	4	32
Pacific County	WA	3	11
Wahkiakum County	WA	0	7
Cowlitz County	WA	19	120
Clark County	WA	36	187
Skamania County	WA	1	11

TABLE 35 SEPTIC SYSTEM CONSTRUCTION PERMITS AND REPAIRS IN COUNTIES ADJACENT TO THE LOWER COLUMBIA RIVER				
County	State	Year	Construction Permits	Repair Permits
Hood River	OR	1990 1989	62 62	45 49
Columbia	OR	1990 1989	116 108	131 109
Multnomah	OR	1990 1989	180 168	246 205
Clatsop	OR	1990 1989	93 90	76 63
Pacific	WA	1990 1989	257 196	141 122
Cowlitz-Wahkiakum	WA	1990 1989	14 112	8 98
Clark-Skamania	WA	1990 1989	1390 752	154 261

tion on how quickly the number of systems are increasing. Likewise, the number of repair permits issued does not necessarily imply groundwater contamination, either. For example, some counties include septic system verifications, voluntary replacements, and improvements in this category However, the number of repair permits does provide additional qualitative information about the potential of contamination via septic system leaks

The potential effects of contamination to the river from leaking septic systems depends on the volume released, the ability of the leachate to reach the river, and the distance to the river Based on these considerations, septic tank leaks are not considered a likely source of significant contamination to the lower Columbia River Although no information was available on the geographic distribution of the failing septic systems within each county, housing is sparse along much of the river Therefore, it is expected that septic tank leaks near the river are sparse, as well It is possible, that leaks could cause localized problems in those areas with dense, non-sewered development

4.4.3 Public Marinas and Mooring Areas

Given the predominant use of antifouling paints on boat hulls, marinas and other boat mooring areas where vessels are regularly maintained, these areas are considered potential sources of tributyltin contamination to aquatic sediments. Table 36 lists public marinas and mooring facilities. The presence of a marina does not imply the presence of tributyltin contamination, but rather the potential.

4.5 SUMMARY

There are 17 hazardous waste and Superfund sites within 1 mile of the lower Columbia River (see Table 32). All of these sites fall within only two of the river segments: 2-C (the Longview area) and 4-A (the Portland/Vancouver area). Contaminants of concern are highly variable depending on the activity associated with the site (Table 37) Although surface water and groundwater contamination are frequently documented or suspected, estimates of actual pollutant loading rates to the river from these sites exist only for one site (ALCOA) Without these actual pollutant loading estimates to the river, data characterizing site contamination provides only qualitative information useful in designing the sampling plan and positioning sampling stations

The 18 landfills within 1 mile of the lower Columbia River occur primarily within river segments 2-C (the Longview are) and 4-A (the Portland/Vancouver area) (Table 33). Data from many of these landfills have identified contaminants of concern and the associated media

TABLE 36. PUBLIC MARINAS AND MOORAGE FACILITIES IN COUNTIES ADJACENT TO THE LOWER COLUMBIA RIVER		
County	State	Facility Name
Clatsop County	OR	Hammond Mooring Basin West Mooring Basin Tide Boat Ramp
Columbia County	OR	Rainier Marina Scipios Goble Landfing North Sand Island Sand Island Marine Park St Helens Marina Columbia View Park
Multnomah County	OR	Gary and Flag Island Moorage Rooster Rock State Park Hayden Bay Moorage Tomahawk Bay Moorage Pier 99 Marine Center Sundance Moorage McCuddy's Marina Donaldson Marina Government Island Dock Bartletts Landing Coverts Landing
Hood River County	OR	None
Pacific County	WA	Ilwaco Marina
Wahkiakum County	WA	Elochman Slough Marina
Cowlitz County	WA	Kalama Marine Park
Clark County	WA	Port of Camas - Washougal
Skamania County	WA	Beacon Rock State Park

TABLE 37. HAZARDOUS WASTE SITES ADJACENT TO THE LOWER COLUMBIA RIVER (Page 1 of 2)					
River Segment	Facility	City	State	Pollutants of Concern	Media Contaminated
2C	Longview Fibre	Longview	WA	Priority pollutant metals	Groundwater, surface water (P), soil (P), sediment (P)
	Ostrander Rock Disposal	Longview	WA	Priority pollutant metals (S), non-halogenated solvents (S), conventional inorganic contaminants (S)	Groundwater, surface water (P), soil (P)
	Radakovich Landfill	Longview	WA	Other metals, phenolic compounds, dioxin, conventional inorganic contaminants, base/neutral compounds, priority pollutant metals (S)	Groundwater, surface water, soil (P)
	Reynolds Metals	Longview	WA	PCBs, conventional organic contaminants, conventional inorganic contaminants	Groundwater, surface water, soil, sediment
	Weyerhaeuser-Longview	Longview	WA	Priority pollutant metals, other metals	Groundwater, soil
4A	Allied Plating	Portland	OR	Heavy metals	Groundwater, soil
	Columbia Steel/Joslyn Sludge Pond	Portland	OR	Creosote, PCP, THP	Groundwater, soil
	Malarkey Roofing Co.	Portland	OR	Lead, zinc	Soil
	Nu Way Oil Company	Portland	OR	PCBs, VOCs, heavy metals, petroleum hydrocarbons	Groundwater, soil
	East Multnomah County	Troutdale	OR	DCE, PCE, TCA, TCE	Groundwater, surface water, soil
	ALCOA (Vancouver smelter)	Vancouver	WA	Halogenate organic compounds, PCBs, conventional inorganic contaminants, base/neutral organics	Water, sediment
	Burlington Northern	Vancouver	WA	Priority pollutant metals, PCBs, pesticides, petroleum products (S), non-halogenated solvents, PAHs, base/neutral organics.	Soil, groundwater (P)
	Columbia Marine Lines	Vancouver	WA	Petroleum products	Groundwater, soil (P)

TABLE 37. HAZARDOUS WASTE SITES ADJACENT TO THE LOWER COLUMBIA RIVER
(Page 2 of 2)

River Segment	Facility	City	State	Pollutants of Concern	Media Contaminated
4A (cont.)	Frontier Hard Chrome	Vancouver	WA	Priority pollutant metals	Groundwater, soil
	Griffey (Custom Care) Cleaners	Vancouver	WA	Halogenated organic compounds, petroleum products, non-halogenated solvents	Soil, groundwater (P), surface water (P)
	Port of Vancouver	Vancouver	WA	Halogenated organic compounds, priority pollutant metals, petroleum products (S), conventional organic contaminants (S)	Sediment, groundwater (P)
	Tidewater Barge Lines	Vancouver	WA	Non-halogenated solvents, priority pollutant metals (S)	Sediment, groundwater (P)

(S) Suspected
(P) Potential

contaminated (Table 38) In Longview, several landfills are also classified as hazardous waste sites Again, even though there is no quantitative data on pollution loading rates, the existing data do provide qualitative information useful in forming a sampling plan.

Indicators used to identify other potential in-place pollutant sites revealed several trends Data from CERCLIS and RCRA site listings indicate that the counties bordering river segments 2-C (the Longview area) and 4-A (the Portland/Vancouver area) may have the highest potential for future hazardous waste contamination because they have the most sites listed. The following are the counties with the most construction and repair permits for septic systems in the study area:

- Multnomah County
- Clark and Skamania Counties
- Columbia County.

Multnomah, Columbia, and Clatsop counties have the most public marinas and mooring facilities

TABLE 38. LANDFILLS ADJACENT TO THE LOWER COLUMBIA RIVER (Page 1 of 2)					
River Segment	Facility	City	State	Pollutants of Concern	Media Contaminated
1B	Astoria Landfill	Astoria	OR	Iron, manganese	Groundwater
2A	James River II Industrial Waste Landfill	Wauna	OR	NA	NA
	James River Industrial Landfill	Wauna	OR	NA	NA
	Cathlamet Municipal Dump	Cathlamet	WA	NA	NA
2C	Ostrander Rock Disposal Site	Longview	WA	Priority pollutant metals (S), non-halogenated solvents (S), conventional inorganic contaminants (S)	Groundwater (P), surface water (P), soil (P)
	Coal Creek Disposal Site	Longview	WA	Chromium	NA
	Radakovich (Mt Solo) Landfill	Longview	WA	Metals, phenolic compounds, dioxin, conventional organic contaminants, base/neutral compounds, priority metal pollutants (S)	Groundwater, surface water, soil (P)
	International Paper Woodwaste Landfill	Longview	WA	None	None
	Longview Fibre Landfill	Longview	WA	Priority pollutant metals	Groundwater, surface water (P), soil (P), sediment (P)
	Cowlitz County Municipal Landfill	Longview	WA	Iron, manganese	Groundwater
	Kalama Municipal Landfill	Kalama	WA	NA	Groundwater (P), surface water (P)
	Santosh Landfill	Scappoose	OR	Iron, chlorine, sulfate, ammonia	Groundwater

TABLE 38. LANDFILLS ADJACENT TO THE LOWER COLUMBIA RIVER (Page 2 of 2)					
River Segment	Facility	City	State	Pollutants of Concern	Media Contaminated
4A	Boise Cascade Limited Purpose Landfill	Vancouver	WA	None	NA
	St Johns Landfill	Portland	OR	Iron, manganese, phosphorus, nitrogen, ammonia, copper, cadmium, zinc, lead	Surface water, groundwater
	City of Vancouver Sludge Ash Landfill	Vancouver	WA	NA	NA
	Reidel Demolition Landfill	Portland	OR	None	None
	James River Corp Inert Waste Landfill	Camas	WA	None	None
4B	Hamilton Island Landfill	North Bonneville	WA	Cadmium, copper, chromium, lead, zinc, benzoic acid, toluene	Surface water, groundwater, soil

NA No data available
(S) Suspected
(P) Potential

5.0 CONCLUSIONS

This report has provided a characterization and inventory of pollutants that potentially enter the lower Columbia River, including the pollutants that enter the lower river from the upstream reach The following is a synthesis of the information presented in this report Also included is a description of the data gaps identified during this study These gaps prevent identification of the most significant sources of the many types of pollutants identified in this study This section also makes explicit recommendations for filling these data gaps and provides recommendations made for design of the reconnaissance survey, conducted on the lower Columbia River during October 1991

5.1 RELATIVE IMPORTANCE OF POLLUTANT SOURCES

Pollutant loading estimates were made from a number of sources including NPDES-permitted point sources and non-point sources Non-point sources include runoff from forest, agricultural, residential, and urban lands as well as CSOs from urban stormwater/wastewater collection systems Other non-point sources are atmospheric pollutant deposition and accidental chemical spills An additional source of pollutants, classified as in-place pollutants, were evaluated for pollutant loading to the river The in-place pollutants considered were considered to be septic tank discharges, landfills, and hazardous waste sites

Few data were available for estimation of pollutant loading to the lower Columbia River from these sources with the exception of NPDES-permitted point sources and pollutant loading from the upper Columbia River and tributaries to the lower river Data were available only for certain pollutants For point sources, data were most complete for wastewater discharge, BOD, and TSS For estimates of tributary loading, data were most complete for discharge volumes, TSS, metals, and other inorganic constituents including nutrients. Therefore, limited specific comparisons are possible between point sources and tributary loading data.

Because the upper Columbia River and tributaries to the lower Columbia River contain pollutants from point, non-point, and in-place sources, these rivers integrate the pollutant loading from these sources within their basins Tributaries that drain extensive areas of developed agricultural, forest, and urban lands (e g , the Willamette River) are likely significant sources of pollutants to the lower Columbia River. Although specific information is not available at this time, non-point and in-place pollutants within these large drainage basins may be more relevant to pollutant loading to the lower Columbia River, especially persistent toxic pollutants, than is non-point and in-place pollutant loading from nearshore areas along the river.

5.1.1 Wastewater

The estimated wastewater contribution of various NPDES-permitted facility types is compared in Figure 10. Wastewater discharge from the pulp and paper industry accounts for about half of the direct point source discharge of wastewater to the lower Columbia River. The pulp and paper industry and major domestic point sources account for over 80 percent of the wastewater discharged to the river. The next largest source is major chemical industry discharges, which account for less than 8 percent.

Figure 10 also includes a comparison of NPDES-permitted point source wastewater discharge, with total discharge of the five largest lower Columbia River tributaries, and the discharge of the upper Columbia River to the lower Columbia River measured at Warrendale, OR below Bonneville Dam. This figure indicates that annual average NPDES-permitted point source wastewater discharge (500 MGD) is less than 1.7 percent of the tributary discharges to the lower Columbia River (30,000 MGD) and 0.4 percent of the upper Columbia River discharge (120,000 MGD).

5.1.2 Total Suspended Solids

The estimated TSS contribution of various NPDES-permitted point sources is presented in Figure 11. Direct point source loading from the pulp and paper industry contributes approximately 76 percent of the point source TSS load to the lower Columbia River. The pulp and paper industry and the major domestic point sources account for 99 percent of the direct point source TSS load to the lower Columbia River. However, comparison with TSS loading to the lower Columbia River from the Willamette River and the upper Columbia River demonstrates that the upper river is the most significant source of TSS to the lower Columbia River (18,700,000 lb/day). Annual average direct point source discharge of TSS was estimated at 140,000 lb/day.

5.1.3 Biochemical Oxygen Demand

BOD loading from various direct NPDES-permitted point sources is presented in Figure 12. The pulp and paper industry discharges the largest amount (66 percent) of BOD. The second largest discharge is from major domestic facilities (32 percent). Together, these two sources account for 98 percent of the NPDES-permitted BOD loading directly to the lower Columbia

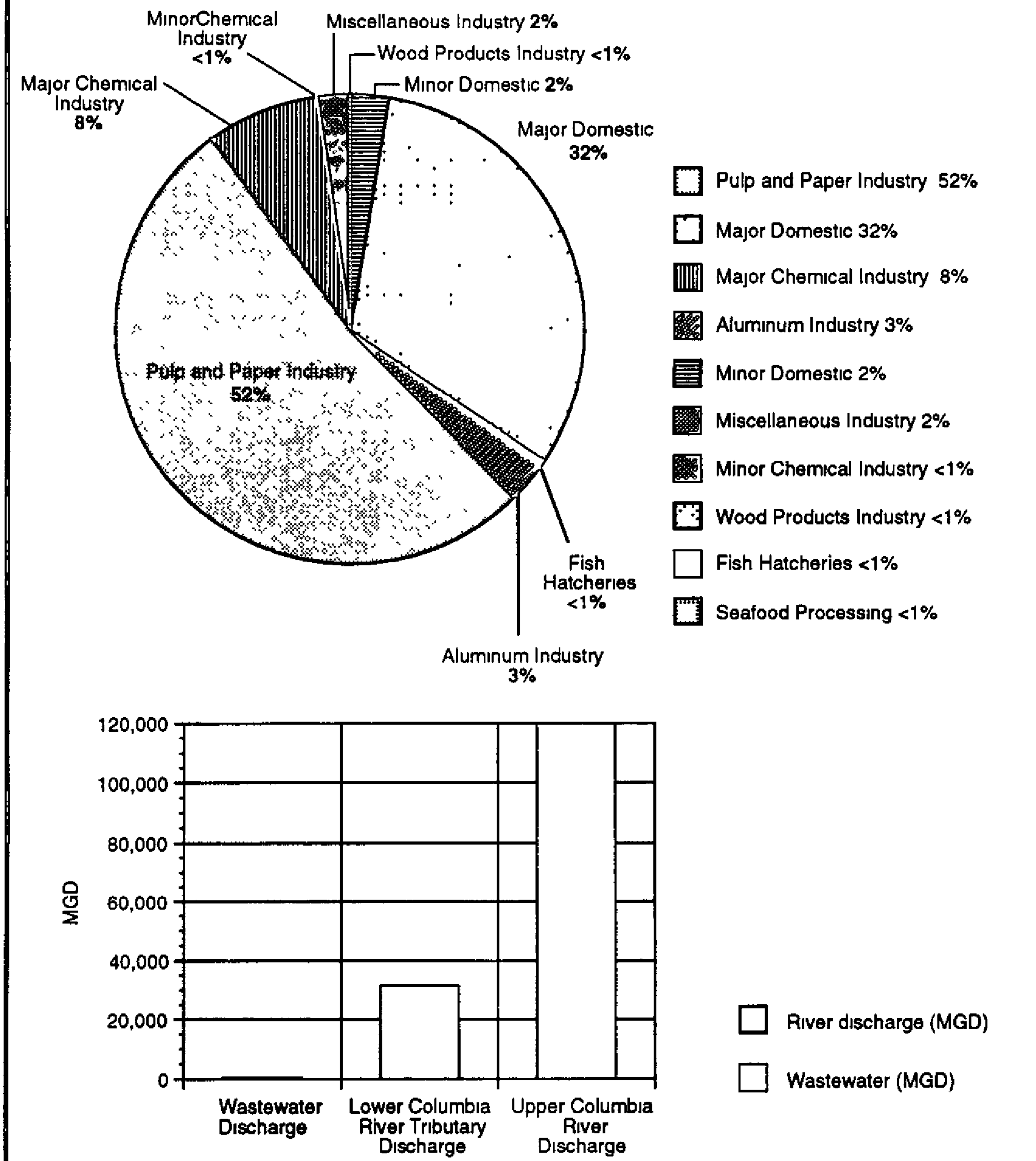


Figure 10. Relative Percent Contribution of Point Source Wastewater Discharge to the Lower Columbia River and Flow from Tributaries and the Upper Columbia River

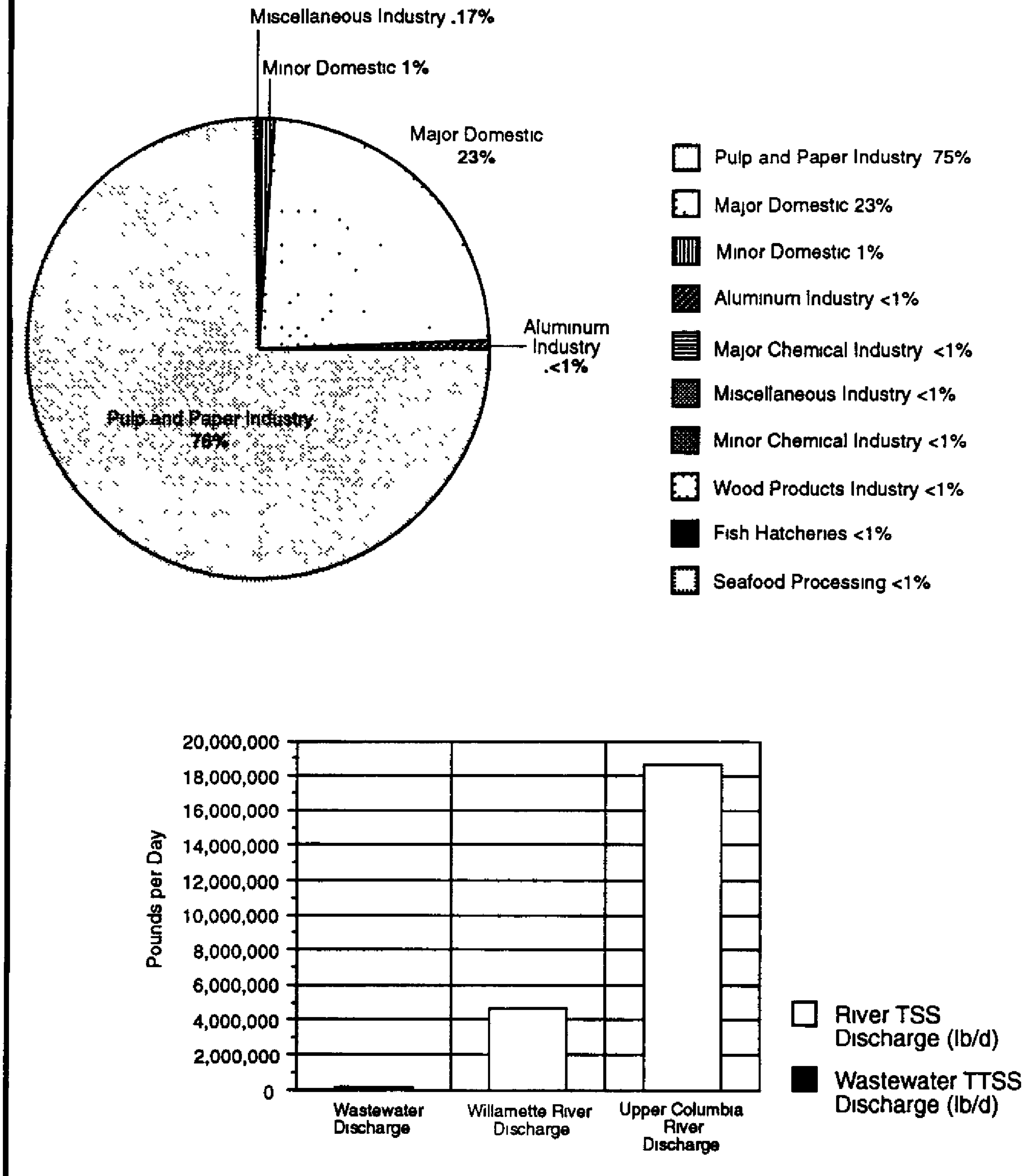


Figure 11. Relative Percent Contribution of TSS from Point Sources to the Lower Columbia River and from Tributaries and the Upper Columbia River

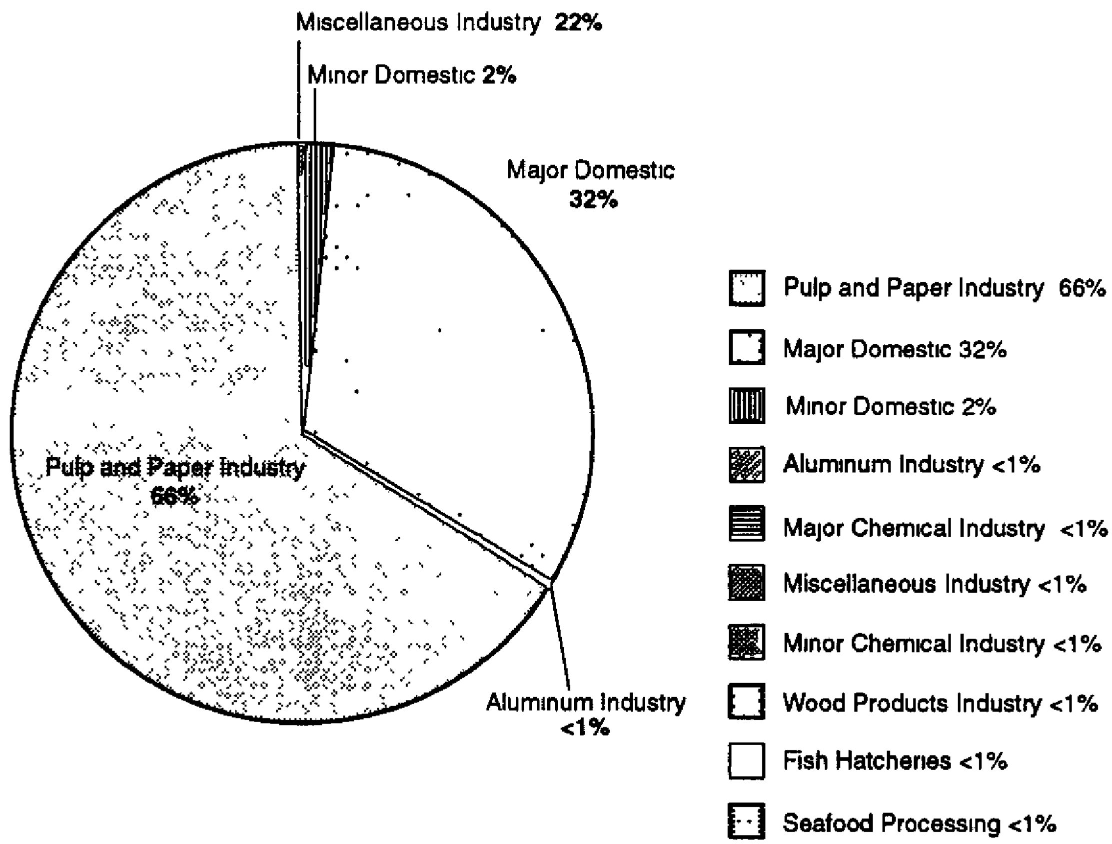


Figure 12. Relative Percent Contribution of BOD from Point Sources to the Lower Columbia River below Bonneville Dam

River No data on BOD for the tributaries was available and therefore, no comparison of point source BOD loading with tributaries is possible

5 1.4 Bacteria

Data on the concentration of fecal coliform bacteria were identified for direct NPDES-permitted point sources only No data were identified on direct estimation of pathogenic organisms from the various pollutant sources In general, only treated sanitary/domestic wastewater discharges are required to regularly determine the concentration of fecal coliform bacteria in effluent While occasional, elevated concentrations of fecal coliform bacteria occur, on a seasonal average these concentrations are typically within their NPDES permit limits A few samples of the treated process wastewater from the Weyerhaeuser Paper Co (Longview) pulp and paper mill and the final effluent from the City of St Helens WWTP (which treats the primary treated wastewater from the Boise Cascade pulp and paper mill) had elevated concentrations of fecal coliform bacteria NPDES permit effluent limits did not apply to these sources, and the significance of their presence is not presently known The strain of bacteria detected in pulp and paper mills secondary effluent may be *Klebsiella pneumoniae*, which is not of fecal origin (Matthews, L., 5 May 1992, personal communication) It is possible that the association of fecal coliform bacteria in pulp and paper mill wastewater is a false indication of the presence of human pathogenic bacteria

5.1 5 Metals and Other Mineral Elements

Although data for metals and other mineral elements (e g , boron and fluoride) were limited, some comparisons between permitted point sources, the Willamette River, and loading from the upper Columbia River can be made Estimated aluminum loading from the Willamette River in 1989 was 7,590 lb/day while estimated aluminum loading to river segments 2C, 3A, and 4A from permitted point sources was estimated at 24, 73, and 47 lb/day, respectively Estimated loading of iron from the Willamette River was 11,200 lb/day and 110,000 lb/day from the upper Columbia River. Estimated iron loading to river segment 4A from permitted point sources was 155 lb/day. Although point source loading of sodium to river segment 3A was estimated at 3,642 lb/day, sodium loading from the Willamette River alone was estimated at 852,000 lb/day. Fluoride loading from point sources was estimated at 895 lb/day, while loading estimated for the upper Columbia River was over 200,000 lb/day

Few data are available for metals that commonly occur in trace concentrations in the natural environment because the concentration of these metals are often below the analytical detection limits used in their analysis. These common trace metals are arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, and zinc These metals are typically undetected, with the exception of copper, in water samples from the

Willamette River and the Warrendale NASQUAN stations. Thus, the relative contribution of these metals remains uncertain, although it is possible that point sources are a significant source For example, the loading of zinc from the Willamette River (based on detected concentrations) was 556 lb/day, while estimated zinc loading from direct permitted point sources to river segment 4A was 70 lb/day However, a great deal of uncertainty surrounds estimates of metals loading from tributaries and the upper river because of the uncertain quality of the NASQUAN data (Windom et al 1991) and the lack of data on bedload transport of contaminants. Non-point sources such as urban runoff, atmospheric deposition, and in-place pollutants may also be a significant source, but at present no loading data are available for comparison

5.1.6 Nutrients

Estimates of direct point source loading of nutrients was generally inadequate for determining the relative importance of the various sources to nutrient loading to the lower Columbia River This is due to the lack of nutrient loading information from major domestic point sources and pulp and paper industry facilities, non-point sources, and in-place pollutants. Estimated loading of total phosphorus, ammonia nitrogen, and nitrate-nitrite nitrogen from the Willamette River was 14,500, 51,800, and 118,000 lb/day, respectively. Nutrient loading from point sources was available from only two chemical facilities Ammonia nitrogen loading was estimated at 57 lb/day and total phosphorus loading was estimated at 2 6 lb/day Although nutrient loading from the Willamette River and the upper Columbia River is large, data are needed on the significant point source discharges, stormwater runoff directly to the river, and septic tank nutrient contributions to adequately determine the relative significance of these sources

5.1.7 Organic Pollutants

Even less data are available for the evaluation of the relative importance of organic pollutant loading to the lower Columbia River. No data are available from the major tributaries, and organic pollutant loading estimates from point sources are incomplete. Although limited data are available on petroleum spills to the river and its tributaries, the information suggests that a few large accidents account for most of the quantities reported. Organic pollutants of anthropogenic origins (e g , pesticides, U S. EPA priority organic pollutants, dioxins, and petroleum products) likely pose serious environmental concerns. However, lack of data on these pollutant sources prevents determining their relative importance at this time.

5.2 DATA GAPS

An attempt was made to inventory and characterize the pollutant sources and pollutant loading to the lower Columbia River below Bonneville Dam Information was identified for point and non-point sources of pollutants including municipal, industrial, and agricultural point source discharges, loading from tributaries and the upper Columbia river, in-place pollutants (hazardous waste sites and landfills), accidental spills, and atmospheric deposition Land use in the counties that border the Columbia River below Bonneville Dam was also summarized, and the types of pollutants associated with those uses were described However, data gaps prevented an adequate assessment of pollutant loading to the river This section discusses these gaps and recommends general measures for gathering the information and the relative contribution of specific pollutants of concern from the pollution sources

5.2.1 Point Sources of Pollution

The regulatory permit process for point sources is designed to ensure that after wastewater is initially diluted in a defined mixing zone, water quality criteria will not be violated NPDES-permitted discharges are required only to monitor pollutant variables that will most likely cause receiving water criteria to be violated. Therefore, some permitted dischargers may monitor fluoride, boron, antimony, and benzo(a)pyrene while other dischargers may monitor only BOD and TSS However, for the purpose of assessing pollutant loading and eventually modeling a variety of chemicals and elements, a loading estimate is needed for each pollutant from each point source For this study, loading data were most complete for wastewater discharge, BOD, and TSS Data were inadequate for assessing the relative contribution of nutrients, metals, and organic compounds from the various point sources

5.2.2 Land Use

For this study, land-use data were presented by county and the type of pollutants associated with each land-use classification were identified Close analysis of the sources and quantities of pollutants entering the lower Columbia River below the Bonneville Dam suggests that much of the non-point source pollution entering the river does so indirectly via large tributaries Therefore, information on land use within the larger drainage areas may be more relevant than the land-use information on counties bordering the lower river. The land-use information available was too general for an assessment of the relative proportion of land-use types in the area immediately adjacent to the river.

5 2.3 Urban Stormwater and Combined Sewer Overflow Runoff

No data were identified on contaminant loading from urban stormwater and CSOs Some data are expected from the City of Portland and Multnomah County after stormwater NPDES permit applications have been submitted Other data may become available from idustrial and port facilities along the river

5.2.4 Tributary Pollutant Loading

Tributary loading, including the input of pollutants from the upper Columbia river, includes point, non-point, and in-place pollutants The limited data available indicates that tributaries may be a significant source of some pollutants, but several difficulties prevented more precise determination of the relative importance of tributary pollutant loading Although tributary pollutant data were identified, this information was generally incomplete for BOD and organic compounds No data were available on pollutants associated with bedload transport More data were available on metals, nutrients, and TSS, but recent work has cast doubt on the accuracy of the USGS NASQUAN metals data (Windom et al. 1991) used in this report to estimate loading from the upper Columbia River Reported metals concentrations could be as much as ten times or more too high Data interpretation was further complicated because of inconsistencies between flow monitoring stations and water quality monitoring stations.

5.2.5 Atmospheric Pollutant Deposition

Studies of the relative contribution of some atmospheric pollutants in other areas of the country indicate that atomspheric sources of some pollutants (e.g., mecury, nitrogen, and PCBs) may be important To evaluate the relative importance of atmospheric pollutant deposition to the lower Columbia River, atmospheric deposition data are needed based on samples collected within the drainage area Atmospheric deposition of pollutants is presently measured at only one location in the lower Columbia River basin near the City of Portland However, these data are limited to concentrations of calcium, magnesium, sodium, potassium, sulfate, chloride, and inorganic nutrients. Presently, the relative contribution of atmospheric pollutants, especially mercury or organic compounds, cannot be assessed. However, because tributaries capture much of the pollutant loading from atmospheric sources, tributary monitoring may account for much of the indirect atmospheric pollutant load to the river

5.2.6 In-Place Pollutants

Few loading data were available for assessing the potential pollutant loading due to in-place pollutants An estimate is needed of loading due to hazardous waste sites and landfills Although data characterizing the actual contamination of landfills and hazardous wastes were essentially adequate, sparse data were available addressing the soil hydraulic conductivity and groundwater flow rates necessary to calculate loading rates.

5.3 RECOMMENDATIONS

The following are recommendations that provided guidance in the design of the reconnaissance survey of the river conducted in August 1991 and recommendations for further studies that will improve the information base necessary for assessing the relative importance of each pollutant source To reasonably assess the relative importance of each specific source of pollutants to the lower Columbia River, a list of pollutants of concern should be developed Such a list should assist in the initial design of a reconnaissance survey of the lower Columbia River This list should include the pollutant monitoring parameters required in NPDES permits of the direct point source discharges and pollutants identified here for tributary loading (especially the metals identified above), land use, and in-place pollutants This list should also include the trace metals identified above, nutrients, and organic pollutants, including U S EPA priority pollutants and commonly used pesticides This list should not be exclusive, but instead should be augmented with data from characteristic pollutants already identified in the river and persistent toxic pollutants discharged historically.

For the design of the sampling survey, the following points should be considered:

- Locations of major municipal and industrial point source discharges

- Locations of major tributary discharges, including the input of water from the upper Columbia River Tributaries of concern include the Willamette, Sandy, Kalama, Cowlitz, and Lewis rivers.

- Locations of large urban areas where stormwater and CSO concerns have been identified. These include the Portland/Vancouver and Longview areas.

- Locations of concentrated sources of in-place pollutants. These include the areas of Portland/Vancouver and Longview

Sediment and sampling areas should be located in depositional areas, both upstream and downstream of these concentrated sources of pollutants in order to evaluate the effect of these sources on sediment quality. Water quality sampling stations should be located in a similar manner. Water quality and sediment quality samples should also be collected within the major tributaries and from the upper river reach below Bonneville Dam in order to make a preliminary assessment of the influence of pollutant loading from these sources

After the initial reconnaissance survey of pollutant levels in the lower Columbia River, a final list of pollutants of concern should be developed based on the presence and concentrations of pollutants measured in the reconnaissance survey The final list may be expanded and some pollutants eliminated depending on the outcome and interpretation of the results of the reconnaissance survey

Based on the revised list of pollutants of concern, a methodology for estimating pollutant loading from each source should be developed for each pollutant. Both field sampling and dry lab estimation techniques (including mathematical screening models) should be considered A more accurate and complete estimation of the relative importance of the various sources of pollutants of concern to the lower Columbia River will aid decision-makers, including the public, in allocating resources to planning and implementing strategies to reduce the threat of degradation of the lower Columbia River

The following are specific recommendations for assessing the relative contribution of pollutants from the sources described above

5 3 1 Point Sources

Based on a list of pollutants of concern, monthly monitoring of the effluent of the major facilities should be performed Minor facilities should be monitored on a random design stratified by season (wet and dry). Consistent field and laboratory protocols should be adopted by both states along with analytical method detection limits appropriate for an accurate determination of pollutant loading from point sources The sampling design should allow for the estimation of the statistical uncertainty of the calculated pollutant loading.

5.3.2 Land Use

Because much of the non-point pollution is contributed by tributary confluences (point locations) along the mainstem of the river, the land use of each drainage basin could be targeted for an assessment. Analysis of pollutant sources from tributary basins should first focus on the largest drainage basins, especially those of the Willamette, Cowlitz, and upper Columbia rivers.

The drainage areas along the lower Columbia River, outside of large tributary drainage basins, should be assessed for the potential quantity and quality of runoff from nearshore land-use types Attention should focus on urban and agricultural land uses along the river. Based on estimates of pollutant loading from diffuse sources along the river, the significance of these sources and the feasibility of incorporating these data into a numerical model can be determined

5 3.3 Urban Stormwater and Combined Sewer Overflow Runoff

The importance of pollutant loading from these sources should be included in the general assessment of land use along the river recommended in Section 5 3.2

5.3.4 Tributaries

For tributary discharges, a list of pollutants of concern and river flows should be monitored monthly at locations near the mouths of the major tributaries, yet far enough upstream to avoid tidal influences. The tributaries to be monitored should be identified in order to account for approximately 80 percent or more of the flow to the lower Columbia River below the Bonneville Dam and greater than 80 percent of the pollutant loading The contribution of pollutants from the upper Columbia River should also be monitored regularly Smaller tributaries should be monitored based on a random design stratified by season (wet and dry) Field and laboratory protocols should be consistent with those recommended for point source monitoring to facilitate comparison of the estimates of loading from point sources and tributaries An assessment of sediment bed load transport of contaminants should also be performed

5.3.5 Atmospheric Pollutant Deposition

Monitoring tributaries would record much of the loading due to this source To assess the potential atmospheric pollutant loading to the river from local sources (industrial and residential) and mobile point sources (automobiles and trucks), the deposition model used to evaluate atmospheric pollutant sources to Commencement Bay (PSWQA 1991) could be used as a screening level model. A heavily industrialized and urbanized area of the river (e g , the Portland/Vancouver area) should be selected for this study. A network of atmospheric deposition stations could also be established to evaluate the mass deposition rate directly to the river and to the drainage basins of the tributaries

5.3.6 In-Place Pollutants

A screening model approach should be used to determine the potential impacts of surface and groundwater transport of in-place pollutants to the lower Columbia River The Portland/Vancouver area could be considered the pilot study area, because it is currently in the focus of a large groundwater flow process study and is the location of 16 landfills and hazardous waste sites in the study area

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APPENDIX A

APPENDIX A

NPDES PERMIT LIMITS FOR MAJOR DOMESTIC FACILITIES

FACILITY	Outfall	Flow (MGD) Av. Dry Weather	BOD Monthly Avg. (mg/L)	BOD Weekly Avg. (mg/L)	BOD Monthly Avg. (lbs/d)	BOD Weekly Avg. (lbs/d)	BOD Daily max. (lbs)	TSS Monthly Avg (mg/L)	TSS Weekly Avg. (mg/L)	TSS Monthly Avg (lbs/d)	TSS Weekly Avg. (lbs/d)	TSS Daily Max (lbs)
OREGON												
City of Astoria	OO1	4.0	30	45	1050	1576	2100	30	45	1050	1576	2100
City of St Helens	OO1 OO2				12800		19600			26862		50057
City of Portland	OO1 *	100	30	45	25000	37500	50000	30	45	25000	37500	50000
	OO2	100	30	45	25000	37500	50000	30	45	25000	37500	50000
City of Gresham												
May 1 - Oct 31	OO1	10.0	20	30	1668	2502	3336	20	30	1668	2502	3336
Nov 1 - April 30	OO1	10 0	30	45	2502	3753	5004	30	45	2502	3753	5004
After attainment of	OO1	15.0	20	30	2502	3753	5004	20	30	2502	3753	5004
operational level of new treatment plant expansion	OO1	15.0	30	45	3753	5630	7506	30	45	3753	5630	7506
WASHINGTON												
Cowlitz County WWTP		15.0	25 ***	40	3128 **	5004 **		30	45	2500	3750	
Salmon Creek WWTP		2.0	30	45	500	750		30	45	500	750	
City of Vancouver WWTP (Westside)		12 0	30	45	3000	4500		30	45	3000	4500	
City of Vancouver WWTP (Eastside)		4 0	30	45	1000	1500		30	45	1000	1500	

* - Special condition when flow > 100 MGD
% removal may be less than 85% and monthly avg.
BOD & TSS not to exceed 50,000 lbs/d or
100,000 lbs daily max

** - Carbonaceous BOD (5 day)
*** - Daily maximum

APPENDIX A

NPDES PERMIT LIMITS FOR MAJOR DOMESTIC FACILITIES

FACILITY	Outfall	Fecal Coliform Monthly Avg. (col./100 ml)	Fecal Coliform Weekly Avg	pH	% Removal BOD&TSS	TCDD Annual Avg (lb/d)	TCDD 3-day Max (lb/d)	AOX Annual Avg (lb/ADT)	AOX 3-day Max. (lb/ADT)
OREGON									
City of Astoria	OO1	200	400	6 0-9.0					
City of St. Helens	OO1			5.0-9.0		0 00000088 **	0.0000014 **	3 0 ***	3.8 ***
	OO2	200	400 *						
City of Portland	OO1 *	200	400	6 0-9 0	85				
	OO2	200	400	6 0-9 0					
City of Gresham									
May 1 - Oct 31	OO1	200	400	6 0-9 0					
Nov 1 - April 30	OO1	200	400	6.0-9 0					
After attainment of	OO1	200	400	6.0-9.0	85				
operational level of new	OO1	200	400	6.0-9 0	85				
treatment plant expansion									
WASHINGTON									
Cowlitz County WWTP		200	400	6.0-9.0	85				
Salmon Creek WWTP		200	400	6.0-9 0	85				
City of Vancouver WWTP (Westside)		200	400	6.0-9.0	85				
City of Vancouver WWTP (Eastside)		200	400	6 0-9.0	85				

* Daily maximum
** Effective Nov 5, 1993
*** - Effective Nov. 15, 1995

APPENDIX B

NPDES PERMIT MONITORING
REQUIREMENTS FOR MAJOR
DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	Flow frequency	Flow type	Temperature frequency	Temperature type	pH frequency	pH type	Residual chlorine frequency	Residual chlorine type	Quantity of Cl Used
OREGON										
City of Astoria	001	daily	cont			3/wk	grab	5/wk	grab	daily
	Inf.	daily	cont.			3/wk	grab			
City of St. Helens	001	daily		daily	grab	daily	grab	daily	24-h comp.	
	002									
	003	daily		daily	grab	daily	grab	daily		
City of Portland	001	daily				daily	grab	daily	24-h Comp	daily
	002									
	Infl	daily				daily	grab			
City of Gresham	001	daily				daily	grab	daily	grab	daily
	inf.					daily	grab			
WASHINGTON										
Cowlitz Co.	raw sewage					daily	grab			
	final eff.	daily	cont.			daily	grab	daily	grab	
Salmon Creek	Raw sewage			daily	grab	daily	grab			
	Influent	daily	cont.							
	Final effluent					daily	grab	daily	grab	
	Secondary effluent									
City of Vancouver (West side)	Raw sewage			daily	grab	daily	grab			
	Final Eff.					daily	grab	daily	grab	
	Eff.	daily	cont.							
City of Vancouver (East side)	Raw sewage			daily	grab	daily	grab			
	Final eff.					daily	grab	daily	grab	
	Influent	daily	cont.							
	Secondary eff.									

NPDES PERMIT MONITORING
REQUIREMENTS FOR MAJOR
DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	DO frequency	DO type	BOD frequency	BOD type	TSS frequency	TSS type	Avg % Removal	Fecal Coliform frequency	Fecal Coliform type
OREGON										
City of Astoria	OO1			weekly	composite	weekly	composite	weekly	monthly	grab
	Inf.			weekly	composite	weekly	composite			
City of St. Helens	OO1			daily	24-h Comp.	daily	24-h Comp			
	OO2								weekly	grab
	OO3			daily	24-h Comp	daily	24-h Comp			
City of Portland	OO1			daily	24-h Comp	daily	24-h Comp	monthly	daily	grab
	OO2									
	Infl			daily	24-h Comp.	daily	24-h Comp			
City of Gresham	OO1			3/wk	composite	3/wk	composite	3/wk	2/wk	grab
	inf.			3/wk	composite	3/wk	composite			
WASHINGTON										
Cowlitz Co.	raw sewage	daily	grab	weekly	24-h Comp	daily	24-h Comp			
	final eff.	daily	grab			daily	24-h Comp		5/wk	grab
Salmon Creek	Raw sewage	daily	grab	2/wk	24-h Comp	2/wk	24-h Comp			
	Influent									
	Final effluent			2/wk	24-h Comp.	2/wk	24-h Comp		3/wk	grab
	Secondary effluent	daily	grab							
City of Vancouver (West side)	Raw sewage	daily	grab	daily	24-h Comp	daily	24-h Comp			
	Final Eff.	daily	grab	daily	24-h Comp.	daily	24-h Comp			
	Eff.								daily	grab
City of Vancouver (East side)	Raw sewage	daily	grab	2/wk	24-h Comp	2/wk	24-h Comp			
	Final eff.			2/wk	24-h Comp	2/wk	24-h Comp		3/wk	grab
	Influent									
	Secondary eff	daily	grab							

NPDES PERMIT MONITORING REQUIREMENTS FOR MAJOR DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	CBOD frequency	CBOD type	Settleable Solids frequency	Settleable Solids type	Acute & Chronic Bioassay	Dilution Study	Sediment & Biota Study	Sludge Disposal Study
OREGON									
City of Astoria	001								Y
	Inf.								
City of St. Helens	001	monthly	24-h Comp			Y	Y	Y	Y
	002								
	003	monthly	24-h Comp.						
City of Portland	001					Y	Y		Y
	002								
	Infl.								
City of Gresham	001								Y
	inf.								
WASHINGTON									
Cowlitz Co	raw sewage	daily	24-h Comp						
	final eff.	daily	24-h Comp						
Salmon Creek	Raw sewage			5/wk	grab				
	Influent								
	Final effluent								
	Secondary effluent								
City of Vancouver (West side)	Raw sewage			daily	grab				
	Final Eff.								
	Eff.								
City of Vancouver (East side)	Raw sewage			5/wk	grab				
	Final eff.								
	Influent								
	Secondary eff								

NPDES PERMIT MONITORING REQUIREMENTS FOR MAJOR DOMESTIC FACILITIES

APPENDIX B

		Color		AOX		TCDD, TCDF		Chloroform		Total Phenols	
FACILITY	Outfall	frequency	type	frequency	type	frequency	type	frequency	type	frequency	type
OREGON											
City of Astoria	001 Inf.										
City of St. Helens	001 002 003	weekly	grab	monthly	3-d comp	quarterly	3-d comp	quarterly	grab		
City of Portland	001 002 Infl					quarterly	24-h comp.			monthly	24-h comp
City of Gresham	001 inf.									2/year	grab
WASHINGTON											
Cowlitz Co.	raw sewage final eff.										
Salmon Creek	Raw sewage Influent Final effluent Secondary effluent										
City of Vancouver (West side)	Raw sewage Final Eff. Eff.										
City of Vancouver (East side)	Raw sewage Final eff. Influent Secondary eff										

NPDES PERMIT MONITORING REQUIREMENTS FOR MAJOR DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	Total Toxic Organics frequency	Total Toxic Organics type	EPA priority pollutants *		Copper frequency	Copper type	Cadmium frequency	Cadmium type
OREGON									
City of Astoria	OO1								
	Inf.								
City of St. Helens	OO1	quarterly	24-h Comp.			quarterly	24-h Comp.	quarterly	24-h Comp.
	OO2								
	OO3	quarterly	24-h Comp.			quarterly	24-h Comp.	quarterly	24-h Comp.
City of Portland	OO1			quarterly	composite	monthly	24-h Comp	monthly	24-h Comp.
	OO2								
	Infl			quarterly	composite				
City of Gresham	OO1					2/year	grab		
	inf.								
WASHINGTON									
Cowlitz Co	raw sewage								
	final eff.								
Salmon Creek	Raw sewage								
	Influent								
	Final effluent								
	Secondary effluent								
City of Vancouver (West side)	Raw sewage								
	Final Eff.								
	Eff.								
City of Vancouver (East side)	Raw sewage								
	Final eff.								
	Influent								
	Secondary eff.								

* As specified in 40 CFR 122 Table II, appendix D

NPDES PERMIT MONITORING REQUIREMENTS FOR MAJOR DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	Nickel		Lead		Zinc		Silver	
		frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
City of Astoria	001								
	Inf.								
City of St. Helens	001	quarterly	24-h Comp.	quarterly	24-h Comp.	quarterly	24-h Comp.	quarterly	24-h Comp
	002								
	003	quarterly	24-h Comp.	quarterly	24-h Comp	quarterly	24-h Comp.	quarterly	24-h Comp.
City of Portland	001	monthly	24-h Comp	monthly	24-h Comp.	monthly	24-h comp	monthly	24-h Comp
	002								
	Infl.								
City of Gresham	001			2/year	grab	2/year	grab		
	inf.								
WASHINGTON									
Cowlitz Co	raw sewage								
	final eff.								
Salmon Creek	Raw sewage								
	Influent								
	Final effluent								
	Secondary effluent								
City of Vancouver (West side)	Raw sewage								
	Final Eff.								
	Eff.								
City of Vancouver (East side)	Raw sewage								
	Final eff.								
	Influent								
	Secondary eff.								

NPDES PERMIT MONITORING
REQUIREMENTS FOR MAJOR
DOMESTIC FACILITIES

APPENDIX B

		Arsenic		Chromium		Mercury		Cyanide	
FACILITY	Outfall	frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
City of Astoria	001								
	Inf.								
City of St. Helens	001	quarterly	24-h Comp.	quarterly	24-h Comp	quarterly	24-h Comp.	quarterly	24-h Comp.
	002								
	003	quarterly	24-h Comp.	quarterly	24-h Comp.	quarterly	24-h Comp.	quarterly	24-h Comp.
City of Portland	001	monthly	24-h Comp.	monthly	24-h Comp.	monthly	24-h Comp.	monthly	24-h Comp.
	002								
	Infl.								
City of Gresham	001	2/year	grab	2/year	grab			2/year	grab
	inf								
WASHINGTON									
Cowlitz Co.	raw sewage								
	final eff.								
Salmon Creek	Raw sewage								
	Influent								
	Final effluent								
	Secondary effluent								
City of Vancouver (West side)	Raw sewage								
	Final Eff.								
	Eff.								
City of Vancouver (East side)	Raw sewage								
	Final eff.								
	Influent								
	Secondary eff.								

NPDES PERMIT MONITORING
REQUIREMENTS FOR MAJOR
DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	Barium frequency	Barium type	Boron frequency	Boron type	Fluoride frequency	Fluoride type	Iron frequency	Iron type	Manganese frequency	Manganese type
OREGON											
City of Astoria	OO1										
	Inf.										
City of St. Helens	OO1										
	OO2										
	OO3										
City of Portland	OO1										
	OO2										
	Infl.										
City of Gresham	OO1	2/year	grab	2/year	grab	2/year	grab	2/year	grab	2/year	grab
	inf.										
WASHINGTON											
Cowlitz Co.	raw sewage										
	final eff.										
Salmon Creek	Raw sewage										
	Influent										
	Final effluent										
	Secondary effluent										
City of Vancouver (West side)	Raw sewage										
	Final Eff.										
	Eff.										
City of Vancouver (East side)	Raw sewage										
	Final eff.										
	Influent										
	Secondary eff.										

NPDES PERMIT MONITORING
REQUIREMENTS FOR MAJOR
DOMESTIC FACILITIES

APPENDIX B

FACILITY	Outfall	Thorium 232 frequency	Thorium 232 type	Total phosphourus frequency	Total phosphourus type	Nitrate-nitrite nitrogen frequency	Nitrate-nitrite nitrogen type	Total kjeldahl nitrogen frequency	Total kjeldahl nitrogen type
OREGON									
City of Astoria	001								
	Inf.								
City of St. Helens	001								
	002								
	003								
City of Portland	001	quarterly	24-h Comp.	weekly *	composite	weekly *	composite	weekly *	composite
	002								
	Infl								
City of Gresham	001								
	inf								
WASHINGTON									
Cowlitz Co.	raw sewage								
	final eff.								
Salmon Creek	Raw sewage								
	Influent								
	Final effluent								
	Secondary effluent								
City of Vancouver (West side)	Raw sewage								
	Final Eff.								
	Eff.								
City of Vancouver (East side)	Raw sewage								
	Final eff.								
	Influent								
	Secondary eff								

* Monitored May through October only

APPENDIX C

APPENDIX C

NPDES PERMIT LIMITS FOR
MINOR DOMESTIC FACILITES

FACILITY	Outfall	Flow (MGD) Avg. dry weather flow	Monthly Avg. Flow	daily Max.	BOD Monthly Avg. (mg/L)	Weekly Avg. (mg/L)	Monthly Avg. (lbs)	Daily Avg. (mg/L)	Daily Max. (mg/L)	Weekly Avg. (lbs)	Daily Max. (lbs)
OREGON											
City of Warrenton	OO1	0 45			30	34	112			169	225
City of Rainier	May-Oct	0 5			20	30	83			125	166
	Nov-Apr				30	45	125			188	250
Riverwood Mobile	May-Oct	0 013			20		2 2				4 4
Home Park (Magar)	Nov-Apr				30		3 3				6 6
U S Army Corps of Eng.	OO1	0.2			30	45	50			75	100
WASHINGTON											
Town of Ilwaco			0 45		30	45	112			169	
Ft Columbia State P.			0.005		30	45	1.25			1.88	
Town of Cathlamet			0 2		30	45	50			75	
Stella WWTP				0.0035				30	45		1.13
Town of Kalama			0 4		30	45	100			150	
City of Camas			2.33		30	45	583			875	
City of No Bonneville			0.125		30	45	32			47	

APPENDIX C

NPDES PERMIT LIMITS FOR
MINOR DOMESTIC FACILITES

FACILITY	Outfall	TSS Monthly Avg (mg/L)	Weekly Avg. (mg/L)	Monthly Avg. (lbs)	Weekly Avg (lbs)	Daily Max (lbs)	Daily Avg (mg/L)	Daily Max (mg/L)	BOD&TSS Removal Efficiency %	pH	Fecal Coliform Mo Avg. (col/100ml)	Mo Avg	Daily Avg	Daily Max.
OREGON														
City of Warrenton	OO1	50	80	188	300	375				6.0-9.0	200	400		
City of Rainier	May-Oct	20	30	83	125	166				6 0-9 0	200	400		
	Nov-Apr	30	45	125	188	250				6.0-9 0	200	400		
Riverwood Mobile	May-Oct	20		2 2		4 4				6 0-9 0	200	400		
Home Park (Magar)	Nov-Apr	30		3 3		6 6				6 0-9 0	200	400		
U S. Army Corps of Eng.	OO1	30	45	50	75	100				6 0-9 0	200	400		
WASHINGTON														
Town of Ilwaco		30	45	112	169					6 0-9 0	200	400		
Ft Columbia State P		30	45	1.25	1 88					6 0-9 0	200	400		
Town of Cathlamet		75	110	125	183					6 0-9 0	200	400		
Stella WWTP						1 13	30	45		6.0-9 0			200	400
Town of Kalama		30	45	100	150					6 0-9 0	200	400		
City of Camas		30	45	583	875					6 0-9.0	200			
City of No. Bonneville		30	45	32	47					6 0-9 0	200	400		

APPENDIX D

APPENDIX D

NPDES MONITORING
REQUIREMENTS FOR
MINOR DOMESTIC FACILITIES

FACILITY		Flow		BOD		TSS		Fecal Coliform		pH	
		frequency	type	frequency	type	frequency	type	frequency	type	frequency	type
OREGON											
City of	inf	daily		quarterly	composite	quarterly	composite			3/wk	grab
Warrenton	eff	daily		quarterly	composite	quarterly	composite	quarterly	composite	3/wk	grab
City of	inf			2/wk	composite	2/wk	composite			3/wk	grab
Rainier	eff	daily	continuous	2/wk	composite	2/wk	composite	monthly	grab	3/wk	grab
Riverwood	inf			monthly	grab	monthly	grab			weekly	grab
Mobile Home Park	eff	every other day		monthly	grab	monthly	grab	monthly	grab	weekly	grab
U S Army	inf			weekly	24-h comp	weekly	24-h comp			5/wk	grab
Corps of Eng	eff	5/wk	continuous	weekly	24-h comp	weekly	24-h comp	2/mo	grab	5/wk	grab
WASHINGTON											
Town of Ilwaco	inf			weekly	24-h comp	weekly	24-h comp			5/wk	grab
	eff	daily	continuous	weekly	24-h comp	weekly	24-h comp	weekly	grab	5/wk	grab
Ft. Columbia	inf			monthly	8-h comp	1/mo	8-h comp			3/wk	grab
State Park	eff	daily	estimated	monthly	8-h comp	1/mo	8-h comp	1/mo	grab	3/wk	grab
Town of	inf			bi-mo	grab	bi-mo	grab			5/wk	grab
Cathlamet	eff			bi-mo	grab	bi-mo	grab	bi-mo	grab	5/wk	grab
Stella WWTP	inf			quarterly	24-h comp	quarterly	24-h comp			3/wk	grab
	eff			quarterly	24-h comp	quarterly	24-h comp	2/mo	grab	3/wk	grab
Town of	inf			weekly	24-h comp	weekly	24-h comp			daily	grab
Kalama	eff	daily	continuous	weekly	24-h comp	weekly	24-h comp	weekly	grab	daily	grab
City of	inf			weekly	24-h comp	weekly	24-h comp			daily	grab
Camas	eff	daily	continuous	weekly	24-h comp	weekly	24-h comp	weekly	grab	daily	grab
City of	inf			weekly	24-h comp	weekly	24-h comp			5/wk	grab
North Bonneville	eff	daily	continuous	weekly	24-h comp	weekly	24-h comp	weekly	grab	5/wk	grab

APPENDIX D

NPDES MONITORING
REQUIREMENTS FOR
MINOR DOMESTIC FACILITIES

FACILITY		Chlroine use		Chlorine Residual		Sludge	Sludge	Temperature		DO		Settleable solids	
		frequency	type	frequency	type	Report	Monitor	freq	type	freq	type	freq	type
OREGON													
City of	inf												
Warrenton	eff	daily		daily	grab	Y	N						
City of	inf												
Rainier	eff	daily		daily	grab	Y	Y						
Riverwood	inf												
Mobile Home Park	eff	every other day		every other day		Y	N						
U S Army	inf												
Corps of Eng	eff	5/wk		5/wk	grab	N	N						
WASHINGTON													
Town of Ilwaco	inf					Y	N	5/wk	grab	5/wk	grab	5/wk	grab
	eff			daily	grab					5/wk	grab	5/wk	grab
Ft Columbia	inf					Y	N						
State Park	eff									3/wk	grab	3/wk	grab
Town of	inf					N	N	5/wk	grab				
Cathlamet	eff			5/wk	grab			5/wk	grab				
Stella WWTP	inf					N	N						
	eff			daily	grab							daily	grab
Town of	inf							daily	grab	daily	grab	daily	grab
Kalama	eff			daily	grab	N	N			daily	grab	daily	grab
City of	inf							daily	grab	daily	grab	daily	grab
Camas	eff			daily	grab	N	N			daily	grab	daily	grab
City of	inf							daily	grab	5/wk	grab	5/wk	grab
North Bonneville	eff			daily	grab	N	N			5/wk	grab	5/wk	grab

APPENDIX E

APPENDIX E

NPDES PERMIT LIMITS FOR
ALUMINUM INDUSTRIES

FACILITY	outfall	Flow mo. av. (MGD)	Flow weekly av. (MGD)	BOD mo av (lb/d)	BOD mo av. (mg/L)	BOD weekly av. (lb/d)	BOD weekly av (mg/L)	BOD daily max. (lb/d)	BOD daily max (mg/L)
OREGON									
Reynolds Metals Co	OO1								
(Troutdale)	OO2			25	30			50	45
WASHINGTON									
Reynolds Metals Co.	OO1	0.22	0 32	31	25	90	45		
(Longview) 1st 6 mo	OO2A								
after 6 mo.	OO2A								
1st 6 mo.	OO2B								
after 6 mo	OO2B								
ALCOA	OO1								
Vancouver	OO2				25		45		

APPENDIX E

NPDES PERMIT LIMITS FOR ALUMINUM INDUSTRIES

FACILITY	outfall	TSS mo av (lb/d)	mo. av (mg/L)	weekly av (lb/d)	weekly av (mg/L)	daily max (lb/d)	daily max (mg/L)
OREGON							
Reynolds Metals Co	OO1	1134				2268	
(Troutdale)	OO2	25	30			50	45
WASHINGTON							
Reynolds Metals Co.	OO1	38	30	90	45		
(Longview) 1st 6 mo	OO2A	925				2030	
after 6 mo	OO2A	925				2030	
1st 6 mo	OO2B						
after 6 mo	OO2B						
ALCOA	OO1	400				760	
Vancouver	OO2		30		45		

APPENDIX E

NPDES PERMIT LIMITS FOR ALUMINUM INDUSTRIES

FACILITY	outfall	Total cyanide (CN) mo. av. (lb/d)	weekly av. (lb/d)	daily max (lb/d)	daily max. (mg/L)	Oil and grease mo av (lb/d)	weekly av (lb/d)	daily max (lb/d)
OREGON								
Reynolds Metals Co	001	0 9		1 9		10		
(Troutdale)	002							
WASHINGTON								
Reynolds Metals Co.	001							
(Longview) 1st 6 mo.	002A					175	425	
after 6 mo.	002A				0 11	175	425	
1st 6 mo.	002B	5.8		13.2				
after 6 mo.	002B							
ALCOA	001	0 15		0.4		70		150
Vancouver	002							

APPENDIX E

NPDES PERMIT LIMITS FOR ALUMINUM INDUSTRIES

FACILITY		outfall	Fecal coliform mo. av. col /100 ml	Fecal coliform weekly av. col /100 ml	pH	Fluoride mo. av (lb/d)	Fluoride daily max. (lb/d)	Aluminum mo av (lb/d)	Aluminum daily max (lb/d)	Benzo(a)pyrene mo av (lb/d)	Benzo(a)pyrene daily max (lb/d)
OREGON											
Reynolds Metals Co		OO1			6 0 - 9 0	102 23	487 91	9 18	97 69	0 025	0 054
(Troutdale)		OO2	200		6 0 - 9 0						
WASHINGTON											
Reynolds Metals Co.		OO1	200	400	6 8 - 8.5						
(Longview)	1st 6 mo	OO2A			6 0 - 9.0	608	1315	52	116	0 05	0 1
	after 6 mo	OO2A				475	1075	52	116	0 05	0 1
	1st 6 mo	OO2B								0 05	0 1
	after 6 mo	OO2B								0 05	0 1
ALCOA		OO1			6 0 - 9.0	100	200	35	80	0 002	0 004
Vancouver		OO2	200	400	6 0 - 9 0						

APPENDIX E

NPDES PERMIT LIMITS FOR
ALUMINUM INDUSTRIES

FACILITY	outfall	Salmonid bioassay	Antimony mo av (lb/d)	Antimony daily max (lb/d)	Chromium mo av. (lb/d)	Chromium daily max (lb/d)	Nickel mo av (lb/d)	Nickel daily max (lb/d)	Zinc mo av (lb/d)	Zinc daily max (lb/d)	Res Cl (mg/L)	Temp criteria
OREGON												
Reynolds Metals Co	OO1											
(Troutdale)	OO2		0 98	2 21			0 42	0 63				
WASHINGTON												
Reynolds Metals Co	OO1										0 1 - 1 0	
(Longview) 1st 6 mo	OO2A	Y	9 8	21 8			2 8	5				Y
after 6 mo	OO2A		4	9.1			1 7	2 6				
1st 6 mo	OO2B											
after 6 mo.	OO2B											
ALCOA	OO1	Y	2	3	0 8	1 5	2.4	3 4	1 8	3 9		Y
Vancouver	OO2										0 1 - 1.0	

APPENDIX F

APPENDIX F

NPDES PERMIT MONITORING REQUIREMENTS FOR ALUMINUM INDUSTRIES

FACILITY		Flow		Temperature		pH		BOD	
	outfall	frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
Reynolds Metals Co.	OO1	daily	meter			3/week	24-h comp.		
(Troutdale)	OO2	daily	meter			daily	grab	2/month	grab
WASHINGTON									
Reynolds Metals Co	OO1	continuous				daily	grab	weekly	24-h comp.
(Longview)	OO2A	continuous		continuous		continuous			
	OO2B	continuous							
	OO3					weekly	grab		
	OO3					monthly	grab		
	OO5					weekly	grab		
	OO5					monthly	grab		
ALCOA	OO1	continuous		continuous		continuous		2/week	24-h comp.
(Vancouver)	OO2	continuous				weekly	grab		

NPDES PERMIT MONITORING REQUIREMENTS FOR ALUMINUM INDUSTRIES

FACILITY	outfall	TSS frequency	TSS type	Oil and grease frequency	Oil and grease type	Total cyanide (CN) frequency	Total cyanide (CN) type	Free CN frequency	Free CN type
OREGON									
Reynolds Metals Co. (Troutdale)	OO1	3/week	24-h comp	3/week	24-h comp.	3/week	24-h comp		
	OO2	2/month	grab						
WASHINGTON									
Reynolds Metals Co. (Longview)	OO1	weekly	24-h comp						
	OO2A	daily	24-h comp.	daily	grab	daily	24-h comp.	daily	24-h comp
	OO2B					daily	24-h comp	daily	24-h comp.
	OO3			weekly	grab			weekly	grab
	OO3			monthly	grab			monthly	grab
	OO5			weekly	grab			weekly	grab
	OO5			monthly	grab			monthly	grab
ALCOA (Vancouver)	OO1	daily	24-h comp.	daily	grab	daily	grab		
	OO2	daily	24-h comp.						

**NPDES PERMIT MONITORING
REQUIREMENTS FOR
ALUMINUM INDUSTRIES**

FACILITY		Residual Cl		Fecal Coliform		Fluoride		Aluminum	
	outfall	frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>									
Reynolds Metals Co.	OO1					weekly	24-h comp.	weekly	24-h comp.
(Troutdale)	OO2	daily	grab	weekly	grab				
<u>WASHINGTON</u>									
Reynolds Metals Co.	OO1	daily	grab	weekly	grab				
(Longview)	OO2A					daily	24-h comp.	daily	24-h comp.
	OO2B					daily	24-h comp.	daily	24-h comp.
	OO3					weekly	grab		
	OO3					monthly	grab		
	OO5					weekly	grab		
	OO5					monthly	grab		
ALCOA	OO1	daily	grab	weekly	grab	daily	24-h comp.	daily	24-h comp.
(Vancouver)	OO2								

NPDES PERMIT MONITORING REQUIREMENTS FOR ALUMINUM INDUSTRIES

FACILITY	outfall	Benzo(a)pyrene frequency	Benzo(a)pyrene type	Bioassay frequency	Bioassay type	Mixing Zone study	Antimony frequency	Antimony type
OREGON								
Reynolds Metals Co.	OO1	weekly	24-h comp	quarterly	24-h comp.		weekly	24-h comp
(Troutdale)	OO2							
WASHINGTON								
Reynolds Metals Co	OO1							
(Longview)	OO2A			semi-annual		Y	daily	24-h comp
	OO2B							
	OO3							
	OO3							
	OO5							
	OO5							
ALCOA	OO1	daily	comp.	quarterly		Y	2/week	24-h comp.
(Vancouver)	OO2							

APPENDIX F

NPDES PERMIT MONITORING REQUIREMENTS FOR ALUMINUM INDUSTRIES

FACILITY		Cadmium		Copper		Chromium		Lead	
	outfall	frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>									
Reynolds Metals Co.	OO1								
(Troutdale)	OO2								
<u>WASHINGTON</u>									
Reynolds Metals Co.	OO1								
(Longview)	OO2A								
	OO2B								
	OO3	weekly	grab	weekly	grab			weekly	grab
	OO3								
	OO5	weekly	grab	weekly	grab			weekly	grab
	OO5								
ALCOA	OO1					2/week	24-h comp.		
(Vancouver)	OO2								

NPDES PERMIT MONITORING
REQUIREMENTS FOR
ALUMINUM INDUSTRIES

FACILITY	outfall	Nickel frequency	Nickel type	Zinc frequency	Zinc type	Sediment studies	Particulate studies
OREGON							
Reynolds Metals Co	OO1	weekly	24-h comp.				
(Troutdale)	OO2						
WASHINGTON							
Reynolds Metals Co.	OO1						
(Longview)	OO2A	daily	24-h comp.			Y	Y
	OO2B						
	OO3			weekly	grab		
	OO3						
	OO5			weekly	grab		
	OO5						
ALCOA	OO1	daily	24-h comp.	daily	24-h comp.	Y	Y
(Vancouver)	OO2						

APPENDIX G

APPENDIX G

NPDES PERMIT LIMITS FOR
PULP AND PAPER MILLS

FACILITY	Outfall	BOD				TSS			
		mo. av. (lb/d)	daily max (lb/d)	mo. av. (mg/L)	daily max. (mg/L)	mo. av. (lb/d)	daily max (lb/d)	mo. av. (mg/L)	daily max (mg/L)
OREGON									
James River II, Inc.	OO1	11000	22000			18600	37200		
(Wauna)	OO2/OO3/OO4					24791	46083		
WASHINGTON									
Boise Cascade Corp	OO1	3400	6550			4700	8800		
(Vancouver)									
Weyerhaeuser	OO1/OO2 *	26800	51000			46600	87700		
(Longview)	OO1/OO2 **	31100	59100			54800	103000		
	OO5	70	125	20	30	70	125	20	30
	Cl plant					189	503		
Longview Fibre Co.	OO1	10800	40200						
	treated sewage	38	90	30	45	38	90	30	45
	OO2								
James River II, Inc.	OO1	29250	56000			47250	88300		
(Camas)	OO2								
	treated sewage								

* Before startup of the Norpack III paper machine

** After startup of the Norpack III paper machine

NPDES PERMIT LIMITS FOR
PULP AND PAPER MILLS

FACILITY	Outfall	Oil and grease		Residual Chlorine			Copper	
		daily av. (mg/L)	daily max. (mg/L)	mo av. (lb/d)	daily max. (lb/d)	range (mg/L)	mo av (lb/d)	daily max. (lb/d)
<u>OREGON</u>								
James River II, Inc.	OO1							
(Wauna)	OO2/OO3/OO4							
<u>WASHINGTON</u>								
Boise Cascade Corp	OO1							
(Vancouver)								
Weyerhaeuser	OO1/OO2 *							
(Longview)	OO1/OO2 **							
	OO5					0 1 - 3.0		
	Cl plant						4.1	10.2
Longview Fibre Co.	OO1							
	treated sewage	10	15			0.1 - 4.0		
	OO2							
James River II, Inc.	OO1							
(Camas)	OO2							
	treated sewage							

* Before startup of the Norpack III paper machine

** After startup of the Norpack III paper machine

APPENDIX G

NPDES PERMIT LIMITS FOR
PULP AND PAPER MILLS

FACILITY	Outfall	Lead		Nickel		pH	Fecal Coliform	
		mo. av. (lb/d)	daily max. (lb/d)	mo. av. (lb/d)	daily max. (lb/d)		mo. av. (col /100 ml)	daily max. (col./100 ml)
OREGON								
James River II, Inc.	OO1					5.0 - 9 0		
(Wauna)	OO2/OO3/OO4					5.0 - 9 0		
WASHINGTON								
Boise Cascade Corp	OO1					5.0 - 9 0		
(Vancouver)								
Weyerhaeuser	OO1/OO2 *					5.0 - 9.0		
(Longview)	OO1/OO2 **							
	OO5					6.0 - 8 5	200	400
	Cl plant	2	5	3.1	8.2			
Longview Fibre Co.	OO1					5 4 - 9 0		
	treated sewage					6 0 - 9 0	200	400
	OO2					6 0 - 9.0		
James River II, Inc.	OO1					5.0 - 8.5		
(Camas)	OO2					6.0 - 9.5		
	treated sewage						200	400

* Before startup of the Norpack III paper machine

** After startup of the Norpack III paper machine

NPDES PERMIT LIMITS FOR
PULP AND PAPER MILLS

FACILITY	Outfall	TCDD annual av. (lb/d)	TCDD 3-d max. (lb/d)	AOX annual av (lb/ADT)	AOX mo. av. (lb/ADT)	Temp (deg F)	Salmonid bioassay
OREGON							
James River II, Inc. (Wauna)	OO1 OO2/OO3/OO4	6.80E-07	1.40E-06	3	3.8	33	
WASHINGTON							
Boise Cascade Corp (Vancouver)	OO1						Y
Weyerhaeuser (Longview)	OO1/OO2 * OO1/OO2 ** OO5 Cl plant	1 10E-06	1.80E-06	3	3 9		Y
Longview Fibre Co.	OO1 treated sewage OO2	4.60E-07	7 60E-07	3	3.9		
James River II, Inc. (Camas)	OO1 OO2 treated sewage	1 80E-06	2.90E-06	3	3.9		Y

* Before startup of the Norpack III paper machine
** After startup of the Norpack III paper machine

APPENDIX H

APPENDIX H

NPDES PERMIT MONITORING REQUIREMENTS FOR PULP AND PAPER MILLS

FACILITY	Outfall	Flow frequency	Flow type	BOD frequency	BOD type	TSS frequency	TSS type	Residual Chlorine frequency	Residual Chlorine type
<u>OREGON</u>									
James River II, Inc.	OO1	daily		daily	24-h comp	daily	24-h comp		
(Wauna)	OO2/OO3/OO4	weekly	estimate	weekly	grab	weekly	grab		
<u>WASHINGTON</u>									
Boise Cascade Corp.	OO1	continuous		5/week	24-h comp.	5/week	24-h comp		
(Vancouver)									
Weyerhaeuser	OO1/OO2 a	continuous		daily	24-h comp	daily	24-h comp		
(Longview)	OO1/OO2 b	continuous		daily	24-h comp	daily	24-h comp.		
	OO5	continuous						5/week	grab
	Cl plant	continuous						continuous	
Longview Fibre Co	OO1	continuous		daily	24-h comp	daily	24-h comp		
	treated sewage	continuous		weekly	grab	weekly	grab		
	OO2								
James River II, Inc.	OO1	continuous		daily	24-h comp.	daily	24-h comp.		
(Camas)	OO2	continuous							
	treated sewage								

a Before startup of the Norpack III paper machine

b After startup of the Norpack III paper machine

APPENDIX H

NPDES PERMIT MONITORING REQUIREMENTS FOR PULP AND PAPER MILLS

FACILITY	Outfall	Oil and grease frequency	Oil and grease type	Copper frequency	Copper type	Lead frequency	Lead type
OREGON							
James River II, Inc. (Wauna)	001						
	002/003/004						
WASHINGTON							
Boise Cascade Corp (Vancouver)	001						
Weyerhaeuser (Longview)	001/002 a						
	001/002 b						
	005						
	Cl plant			2/year	composite	2/year	composite
Longview Fibre Co.	001						
	treated sewage						
	002	weekly	grab				
James River II, Inc. (Camas)	001						
	002						
	treated sewage						

a Before startup of the Norpack III paper machine
b After startup of the Norpack III paper machine

APPENDIX H

NPDES PERMIT MONITORING REQUIREMENTS FOR PULP AND PAPER MILLS

FACILITY	Outfall	Nickel frequency	Nickel type	pH frequency	pH type	Fecal Coliform frequency	Fecal Coliform type	Temperature frequency	Temperature type
<u>OREGON</u>									
James River II, Inc.	001			daily	grab			daily	grab
(Wauna)	002/003/004			daily	grab				
<u>WASHINGTON</u>									
Boise Cascade Corp (Vancouver)	001			continuous				continuous	
Weyerhaeuser	001/002 a			continuous		annual	grab	continuous	
(Longview)	001/002 b			continuous		annual	grab	continuous	
	005			daily	grab	weekly	grab		
	Cl plant	2/year	composite						
Longview Fibre Co.	001			continuous				continuous	
	treated sewage			daily	grab	weekly	grab		
	002			weekly	grab				
James River II, Inc.	001			continuous				continuous	
(Camas)	002			continuous					
	treated sewage					quarterly	grab		

a Before startup of the Norpack III paper machine

b After startup of the Norpack III paper machine

APPENDIX H

NPDES PERMIT MONITORING REQUIREMENTS FOR PULP AND PAPER MILLS

FACILITY	Outfall	TCDD - TCDF frequency	TCDD - TCDF type	AOX frequency	AOX type	Salmonid bioassay frequency	Salmonid bioassay type
OREGON							
James River II, Inc (Wauna)	OO1 OO2/OO3/OO4	quarterly	3-d comp	monthly	3-d comp	quarterly	24-h comp
WASHINGTON							
Boise Cascade Corp (Vancouver)	OO1					quarterly	
Weyerhaeuser (Longview)	OO1/OO2 a OO1/OO2 b OO5 Cl plant	quarterly	24-h comp	weekly	24-h comp	quarterly	
Longview Fibre Co.	OO1 treated sewage OO2	quarterly	24-h comp.	weekly	24-h comp	quarterly	
James River II, Inc. (Camas)	OO1 OO2 treated sewage	quarterly	24-h comp	weekly	24-h comp	quarterly	

a Before startup of the Norpack III paper machine

b After startup of the Norpack III paper machine

APPENDIX I

APPENDIX I

NPDES PERMIT LIMITS FOR WOOD
PRODUCTS INDUSTRIES

FACILITY	Outfall	Flow mo. av. (MGD)	Flow daily max. (MGD)	Temp. (daily max.) (deg. F)	Flow x Temp. daily max.	res. Cl (mg/L)	Oil & Grease mo. av. (mg/L)	Oil & Grease daily av. (mg/L)	Oil & Grease daily max. (mg/L)
<u>OREGON</u>									
Astoria Plywood Corp.		as low as practicable					no visible discharge		
Boise Cascade-St. Helens veneer mill			0.5	150	25	0.5			
James River II, Inc Sundial chip reloading facility							10		15
<u>WASHINGTON</u>									
International Paper Co.	001	0.25							
	Draft-004		0.432					15	
Fort Vancouver Plywood	001			85			10		15
	002			85			10		15
	003						no visible sheen		
Columbia Vista Corp.							10		15

NPDES PERMIT LIMITS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	pH	BOD and TSS					Fecal Coliform	
			monthly average		weekly average		daily max.	mo. av.	weekly av.
			(mg/L)	(lb/d)	(mg/L)	(lb/d)	(mg/L)	(col./100 ml)	(col./100 ml)
OREGON									
Astoria Plywood Corp.		6.0 - 9.0							
Boise Cascade-St Helens veneer mill		6.0 - 9.0							
James River II, Inc Sundial chip reloading facility									
WASHINGTON									
International Paper Co.	001	6.5 - 8.5	30	62	45	94		200	400
	Draft-004	6.0 - 9.0					30		
Fort Vancouver Plywood	001	6.0 - 9.0							
	002	6.0 - 9.0							
	003								
Columbia Vista Corp.		6.0 - 9.0							

NPDES PERMIT LIMITS FOR WOOD
PRODUCTS INDUSTRIES

FACILITY	Outfall	Set. Solids daily max (ml/L)	Nitrate-N daily max. (mg/L)	Total PAH daily max. (ug/L)	Pentachlorophenol daily max. (ug/L)	Total Rec Metals Toxicity Units	Floating Solids
OREGON							
Astoria Plywood Corp.							no visible discharge
Boise Cascade-St. Helens veneer mill							
James River II, Inc Sundial chip reloading facility							
WASHINGTON							
International Paper Co.	001						
	Draft-004		10	2.2	13		
Fort Vancouver Plywood	001	0.1					
	002	0.1					
	003	0.1					
Columbia Vista Corp					10	1	

APPENDIX J

APPENDIX J

NPDES PERMIT MONITORING REQUIREMENTS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	Flow		Temperature		pH	
		frequency	type	frequency	type	frequency	type
OREGON							
Astoria Plywood Corp	visual observation of debris, oil and grease, and floating solids						
Boise Cascade-St. Helens veneer mill		monthly		monthly		monthly	grab
James River II, Inc Sundial chip reloading facility		daily					
WASHINGTON							
International Paper Co	001	none given					
	Draft - 004	continuous				2/week	grab
Fort Vancouver Plywood	001	daily	weir	weekly	grab	weekly	grab
	002	daily	weir	weekly	grab	weekly	grab
	003	daily	weir				
Columbia Vista Corp		weekly	estimate			weekly	grab

APPENDIX J

NPDES PERMIT MONITORING REQUIREMENTS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	Residual chlorine		Oil and grease		BOD	
		frequency	type	frequency	type	frequency	type
OREGON							
Astoria Plywood Corp	visual observation						
Boise Cascade-St Helens veneer mill		monthly	grab				
James River II, Inc Sundial chip reloading facility				weekly	grab		
WASHINGTON							
International Paper Co.	001 Draft - 004			weekly	grab	2/week	grab
Fort Vancouver Plywood	001 002 003			weekly weekly daily	grab grab visual		
Columbia Vista Corp.				weekly	grab		

APPENDIX J

NPDES PERMIT MONITORING REQUIREMENTS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	TSS		Fecal Coliform		Total organic carbon	
		frequency	type	frequency	type	frequency	type
<u>OREGON</u>							
Astoria Plywood Corp	visual observation						
Boise Cascade-St. Helens veneer mill							
James River II, Inc Sundial chip reloading facility							
<u>WASHINGTON</u>							
International Paper Co.	001			2/month	grab		
	Draft - 004	2/week	grab			2/week	grab
Fort Vancouver Plywood	001 002 003						
Columbia Vista Corp.							

NPDES PERMIT MONITORING REQUIREMENTS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	Nitrate-N		Pentaclorophenol		Total PAH	
		frequency	type	frequency	type	frequency	type
<u>OREGON</u>							
Astoria Plywood Corp	visual observation						
Boise Cascade-St Helens veneer mill							
James River II, Inc Sundial chip reloading facility							
<u>WASHINGTON</u>							
International Paper Co.	001 Draft - 004	weekly	grab	weekly	grab	weekly	grab
Fort Vancouver Plywood	001 002 003						
Columbia Vista Corp.				yearly	grab		

APPENDIX J

NPDES PERMIT MONITORING REQUIREMENTS FOR WOOD PRODUCTS INDUSTRIES

FACILITY	Outfall	Phenol		Settleable Solids		Total recoverable metals Cu, Cd, Cr, Zn	
		frequency	type	frequency	type	frequency	type
OREGON							
Astoria Plywood Corp	visual observation						
Boise Cascade-St Helens veneer mill							
James River II, Inc Sundial chip reloading facility							
WASHINGTON							
International Paper Co	OO1 Draft - OO4						
Fort Vancouver Plywood	OO1 OO2 OO3	monthly monthly	grab grab	weekly weekly weekly	grab grab grab		
Columbia Vista Corp						monthly	grab

APPENDIX K

APPENDIX K

NPDES PERMIT LIMITS
FOR SEAFOOD
PROCESSING FACILITIES

FACILITY	Flow		TSS		Oil and grease		BOD	pH	Temperature daily max. deg. F
	(MGD)	daily max (MGD)	mo. av (lbs)	daily max. (lbs)	mo av. (lbs)	daily max (lbs)			
OREGON									
Facilities under general permit 0900-J			depends on product		depends on product				
Bioproducts, Inc	0.52							6 0 - 9 0	
WASHINGTON									
Jessie's Ilwaco Fish Co		0.31	depends on product		depends on product		depends on product	6 5 - 8 5	65
Chinook Packing Co		0 23	depends on product		depends on product			6 0 - 9 0	65

APPENDIX L

APPENDIX L

NPDES MONITORING
REQUIREMENTS FOR SEAFOOD
PROCESSING FACILITIES

FACILITY	Flow		TSS		Oil and grease		BOD	
	frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>								
Facilities under general permit 0900-J			monthly	composite	monthly	composite		
Bioproducts, Inc.	daily	estimate						
<u>WASHINGTON</u>								
Jessie's Ilwaco Fish Co	daily	metered	monthly	composite	monthly	grab	weekly	composite
Chinook Packing Co.	daily	metered	monthly	composite	monthly	grab	weekly	composite

APPENDIX L

NPDES MONITORING REQUIREMENTS FOR SEAFOOD PROCESSING FACILITIES

FACILITY	pH		Temperature		Fecal Coliform		Total Phosphorus		Ammonia-N	
	frequency	type	frequency	type	frequency	type	frequency	type	frequency	type
OREGON										
Facilities under general permit 0900-J										
Bioproducts, Inc	monthly	?								
WASHINGTON										
Jessie's Ilwaco Fish Co	monthly	grab	daily	grab	weekly	grab				
Chinook Packing Co	monthly	grab	daily	grab	weekly	grab	monthly	composite	monthly	composite

APPENDIX M

APPENDIX M

NPDES PERMIT LIMITS FOR POWER GENERATING FACILITIES

	Outfall	Flow (MGD)	Sodium mo avg (mg/L)	Sodium daily max. (mg/L)	Res chlorine (mg/L)	Sulfate mo avg. (mg/L)	Sulfate daily max (mg/L)	Boron mo avg (mg/L)	Boron daily max (mg/L)	Aluminum mo avg (mg/L)	Aluminum daily max (mg/L)	Heat daily avg BTU/hr
Trojan Nuclear Power Plant	001	64 3	25	100	0 1	240	824	0 1	1	0 5	0 8	7900000
	002											
	003											
	004											
	005											
	006											
Beaver Generating Plant	001	1 44			0.2-0 5							

APPENDIX M

NPDES PERMIT LIMITS FOR POWER GENERATING FACILITIES

	Outfall	Temperature			pH	BOD				TSS			
		mo avg delta C	daily max delta C	max F		mo avg (mg/L)	daily max (mg/L)	mo avg (lb/d)	daily max (lb/d)	mo avg (mg/L)	daily max (mg/L)	mo avg (lb/d)	daily max (lb/d)
Trojan Nuclear Power Plant	OO1	5 6	8 9		6 0-9 0								
	OO2					20	30	12 5	25	20	30	12 5	25
	OO3												
	OO4												
	OO5											15	50
	OO6											15	50
Beaver Generating Plant	OO1			100	6 0-9 0					15	30		

APPENDIX M

NPDES PERMIT LIMITS FOR POWER GENERATING FACILITIES

	Outfall	Copper mo avg (mg/L)	Copper daily max (mg/L)	Copper mo avg (lb/d)	Copper daily max (lb/d)	Iron mo avg (mg/L)	Iron daily max (mg/L)	Iron mo avg (lb/d)	Iron daily max (lb/d)
Trojan Nuclear Power Plant	001								
	002								
	003								
	004	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	005								
	006								
Beaver Generating Plant	001		1.0				1.0		

APPENDIX N

APPENDIX N

NPDES MONITORING REQUIREMENTS FOR POWER GENERATING FACILITIES

FACILITY	Outfall	Flow		pH		Temperature		Heat		Chlorine Residual	
		frequency	type	frequency	type	frequency	type	frequency	type	frequency	type
Trojan Nuclear Power Plant	OO1	daily		continuous		continuous		continuous		continuous	
	OO2	continuous		daily	grab					daily	grab
	OO3	daily									
	OO4	daily	estimate								
	OO5	daily									
	OO6										
Beaver Generating Plant	OO1	continuous		1/wk	grab	continuous				continuous	

APPENDIX N

NPDES MONITORING REQUIREMENTS FOR POWER GENERATING FACILITIES

FACILITY	Outfall	Fecal Coliform		BOD		TSS		Sodium, Sulfate Aluminum, Boron		Total Dissolved Solids	
		frequency	type	frequency	type	frequency	type	frequency	type	frequency	type
Trojan Nuclear Power Plant	001							2/mo	24-h comp	weekly	24-h comp
	002	monthly	grab	weekly	24-h comp	weekly	24-h comp				
	003					monthly	24-h comp				
	004										
	005					weekly	grab				
	006					2/mo	grab				
Beaver Generating Plant	001					1/wk	24-h comp				

APPENDIX N

NPDES MONITORING REQUIREMENTS FOR POWER GENERATING FACILITIES

FACILITY	Outfall	Total Copper & Iron		Oil & Grease	
		frequency	type	frequency	type
Trojan Nuclear Power Plant	OO1				
	OO2				
	OO3				
	OO4	monthly	grab		
	OO5				
	OO6			2/mo	grab
Beaver Generating Plant	OO1	1/mo	24-h comp	1/wk	grab

APPENDIX O

APPENDIX O

NPDES PERMIT LIMITS
FOR CHEMICAL INDUSTRIES

	Outfall	pH	Temp. daily max. F	Total Organic Solvents daily max.	Toxicity (Accute Salmonid Bioassay)	Flow daily avg (MGD)	Flow daily max.	BOD daily average (mg/L)	BOD daily average (lbs)	BOD daily maximum (mg/L)	BOD daily maximum (lbs)
<u>OREGON</u>											
<u>major</u>											
Chevron Chemical Co	OO1A	6 0-9.0	30 degrees F above intake temperature				25				
	OO2B										
<u>WASHINGTON</u>											
<u>major</u>											
Kalama Chemical, Inc *	OO1	6 0-9.0	86								
	OO2	6 0-9 0					0.225	30	37	77	99
<u>minor</u>											
GATX Terminals Corp.	OO1 **	6.0-9.0	85	1.4	<20% mortality in 100% effluent						
	OO1***	6.0-9 0	85	1 4	<20% mortality in 100% effluent						
Virginia Chemicals	OO1A		-			1 0	1 5				
	OO1B					1.0	1 5				

* Additional limits for 56 volatile and semi-volatile organic compounds
** Process wastewater and cooling water combined
*** Process wastewater only

APPENDIX O

NPDES PERMIT LIMITS
FOR CHEMICAL INDUSTRIES

	Outfall	TSS				Oil & Grease		Cu			
		daily average		daily maximum		daily average		daily average		daily maximum	
		(mg/L)	(lbs)	(mg/L)	(lbs)	(mg/L)	(lbs)	(mg/L)	(lbs)	(mg/L)	(lbs)
<u>OREGON</u>											
<u>major</u>											
Chevron Chemical Co.	OO1A						10				
	OO2B										
<u>WASHINGTON</u>											
<u>major</u>											
Kalama Chemical, Inc *	OO1										
	OO2	41	52	132	169	10	15	0 165	0 348	0 384	0 812
<u>minor</u>											
GATX Terminals Corp.	OO1 **										
	OO1***										
Virginia Chemicals	OO1A										
	OO1B										

APPENDIX O

NPDES PERMIT LIMITS
FOR CHEMICAL INDUSTRIES

	Outfall	Zn		Ni		Total P		Ammonia-N				
		daily avg (mg/L)	daily max (lbs)	daily avg. (lbs)	daily max. (lbs)	daily avg. (mg/L)	daily max (mg/L)	mo avg (mg/L)	daily avg (mg/L)	daily max (mg/L)	mo avg (lb/d)	daily max (lb/d)
<u>OREGON</u>												
<u>major</u>												
Chevron Chemical Co.	OO1A							2		4		
	OO2B										229	449
<u>WASHINGTON</u>												
<u>major</u>												
Kalama Chemical, Inc. *	OO1											
	OO2	0 252	0 627	0 025	0 483	5	8		15	30		
<u>minor</u>												
GATX Terminals Corp	OO1 **											
	OO1***											
Virginia Chemicals	OO1A											
	OO1B		1.25									

NPDES PERMIT LIMITS
FOR CHEMICAL INDUSTRIES

	Outfall	Organic -N mo. avg. (mg/L)	daily max. (mg/L)	mo. avg. (lb/d)	daily max (lb/d)
OREGON					
major					
Chevron Chemical Co.	OO1A	2	4		
	OO2B			368	688
WASHINGTON					
major					
Kalama Chemical, Inc *	OO1				
	OO2				
minor					
GATX Terminals Corp.	OO1 **				
	OO1***				
Virginia Chemicals	OO1A				
	OO1B				

APPENDIX P

APPENDIX P

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Flow		Temperature		pH		Toxicity	
		frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>									
<u>major</u>									
Chevron Chemical Co	001	daily		daily		daily	continuous		
	002	daily							
<u>WASHINGTON</u>									
<u>major</u>									
Kalama Chemical, Inc	001		continuous		continuous		continuous		
	002		continuous			24-h comp	daily		
<u>minor</u>									
GATX Terminals Corp	001A	1/discharge	measured	1/discharge	grab	1/discharge	grab	3/yr	grab
	001B	1/discharge	measured	1/discharge	grab	1/discharge	grab	1/discharge	grab
Virginia Chemicals, Inc (Hoecht-Celanese)	001A	continuous		continuous		weekly	grab		
	001B	continuous		continuous		weekly	grab		

APPENDIX P

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Total Organic Solvents		BOD		TSS		Oil & Grease	
		frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
major									
Chevron Chemical Co	001							weekly	grab
	002								
WASHINGTON									
major									
Kalama Chemical, Inc	001								
	002			daily	24-h comp	daily	24-h comp	weekly	grab
minor									
GATX Terminals Corp.	001A	monthly	grab						
	001B	1/discharge	grab						
Virginia Chemicals, Inc. (Hoecht-Celanese)	001A								
	001B								

APPENDIX P

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Copper		Nickel		Zinc		Total Phosphorous	
		frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
major									
Chevron Chemical Co	001								
	002								
WASHINGTON									
major									
Kalama Chemical, Inc	001								
	002	1/wk	24-h comp	1/wk	24-h comp	1/wk	24-h comp	1/wk	24-h comp
minor									
GATX Terminals Corp.	001A								
	001B								
Virginia Chemicals, Inc. (Hoecht-Celanese)	001A								
	001B					weekly	24-h comp		

APPENDIX P

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Ammonia-N		Organic -N		Total Phenols		Cyanide	
		frequency	type	frequency	type	frequency	type	frequency	type
OREGON									
major									
Chevron Chemical Co	001	2/week	24-h comp	2/wk	24-h comp				
	002	2/week	24-h comp.	2/wk	24-h comp				
WASHINGTON									
major									
Kalama Chemical, Inc	001								
	002	1/wk	grab			1/wk	grab	1/mo	grab
minor									
GATX Terminals Corp.	001A								
	001B								
Virginia Chemicals, Inc (Hoecht-Celanese)	001A								
	001B								

APPENDIX P

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Magnesium		Cobalt		Arsenic		Chromium	
		frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>									
<u>major</u>									
Chevron Chemical Co	001								
	002								
<u>WASHINGTON</u>									
<u>major</u>									
Kalama Chemical, Inc	001								
	002	1/qt.	24-h comp	quarterly	24-h comp	quarterly	24-h comp	quarterly	24-h comp
<u>minor</u>									
GATX Terminals Corp.	001A								
	001B								
Virginia Chemicals, Inc. (Hoecht-Celanese)	001A								
	001B								

NPDES MONITORING REQUIREMENTS FOR CHEMICAL INDUSTRIES

	Outfall	Lead		Cadmium		Tin		Volatile & Semivolatile Organic Compounds	
		frequency	type	frequency	type	frequency	type	frequency	type
<u>OREGON</u>									
<u>major</u>									
Chevron Chemical Co	001								
	002								
<u>WASHINGTON</u>									
<u>major</u>									
Kalama Chemical, Inc.	001								
	002	quarterly	24-h comp	quarterly	24-h comp	quarterly	24-h comp	quarterly	grab for
<u>minor</u>									
GATX Terminals Corp.	001A								
	001B								
Virginia Chemicals, Inc. (Hoecht-Celanese)	001A								
	001B								

APPENDIX Q

APPENDIX Q

NPDES PERMIT LIMITS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY	Outfall	Flow		Temperature		pH	Oil and grease	
		daily av. (MGD)	daily max (MGD)	daily av. (deg F)	daily max. (deg F)		daily av. (mg/L)	daily max. (mg/L)
WASHINGTON								
Pendleton Woolen Mills	001	1	1.25			6.0 - 9.0	10	15
	004a					6.0 - 9.0	no visible sheen	
	005a					6.0 - 9.0	no visible sheen	
	006a					6.0 - 9.0	no visible sheen	
Great Western Malting			9.9		56			
Ideal Basic Industries Co., Inc. (Holnam Inc.)			0.0049		60			
Northwest Packing Co.		0.016	0.087	85	100	6.0 - 9.0		

a - Outfall to Gibbons Creek

NPDES PERMIT LIMITS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY	Outfall	BOD		TSS		Total Chromium		Phenol	
		daily av. (lbs)	daily max. (lbs)	daily av. (lbs)	daily max. (lbs)	daily av. (lbs)	daily max. (lbs)	daily av. (lbs)	daily max. (lbs)
WASHINGTON									
Pendleton Woolen Mills	OO1 OO4a OO5a OO6a	204	409	321	642	1.3	2.6	1.3	2.6
Great Western Malting									
Ideal Basic Industries Co., Inc. (Holnam Inc.)									
Northwest Packing Co.									

a - Outfall to Gibbons Creek

NPDES PERMIT LIMITS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY	Outfall	Sulfide		Toxicity	COD		Dieldrin	
		daily av. (lbs)	daily max. (lbs)		daily av. (lbs)	daily max. (lbs)	daily av. (ug/L)	daily max ((ug/L)
WASHINGTON								
Pendleton Woolen Mills	OO1 OO4a OO5a OO6a	2 6	5.1	Y	1487	2975	0.038	0 1
Great Western Malting								
Ideal Basic Industries Co., Inc (Holnam Inc.)								
Northwest Packing Co.								

a - Outfall to Gibbons Creek

APPENDIX R

NPDES PERMIT MONITORING REQUIREMENTS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY		Flow		Temperature		pH		Oil and grease	
	Outfall	frequency	type	frequency	type	frequency	type	frequency	type
WASHINGTON									
Pendleton Woolen Mills	OO1	continuous		weekly	grab	continuous		weekly	grab
	OO4a					weekly	grab	monthly	grab
	OO5a					monthly	grab	monthly	grab
	OO6a					monthly	grab	monthly	grab
Great Western Malting		continuous		continuous					
Ideal Basic Industries Co., Inc. (Holnam Inc.)		continuous		monthly	grab				
Northwest Packing Co.		continuous		daily	grab	daily	grab		

a - Outfall to Gibbons Creek.

NPDES PERMIT MONITORING REQUIREMENTS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY		BOD		COD		TSS	
	Outfall	frequency	type	frequency	type	frequency	type
<u>WASHINGTON</u>							
Pendleton Woolen Mills	OO1 OO4a OO5a OO6a	weekly	24-h comp.	2/week	24-h comp.	2/week	24-h comp.
Great Western Malting							
Ideal Basic Industries Co., Inc. (Holnam Inc.)							
Northwest Packing Co.							

a - Outfall to Gibbons Creek.

APPENDIX R

**NPDES PERMIT MONITORING
REQUIREMENTS FOR MISCELLANEOUS
INDUSTRIAL FACILITIES**

FACILITY	Outfall	Total Chromium		Phenol		Sulfide	
		frequency	type	frequency	type	frequency	type
<u>WASHINGTON</u>							
Pendleton Woolen Mills	001	monthly	24-h comp	weekly	24-h comp.	weekly	24-h comp
	004a						
	005a						
	006a						
Great Western Malting							
Ideal Basic Industries Co., Inc. (Holnam Inc.)							
Northwest Packing Co.							

a - Outfall to Gibbons Creek.

NPDES PERMIT MONITORING REQUIREMENTS FOR MISCELLANEOUS INDUSTRIAL FACILITIES

FACILITY		Toxicity		EPA priority pollutants - b		Dieldrin - c	
	Outfall	frequency	type	frequency	type	frequency	type
WASHINGTON							
Pendleton Woolen Mills	OO1 OO4a OO5a OO6a	monthly	24-h comp.	yearly	24-h comp	weekly	24-h comp
Great Western Malting							
Ideal Basic Industries Co., Inc. (Holnam Inc.)							
Northwest Packing Co.							

a - Outfall to Gibbons Creek.

b - Measured only if effluent contains discharge of treated groundwater.

c - Pollutants defined as part of 40 CFR Part 401.15.

APPENDIX S

APPENDIX S

NPDES PERMIT LIMITS FOR FISH HATCHERIES.

FACILITY	FLOW	SETTLEABLE SOLIDS				Total Suspended Solids					pH
	daily av. (MGD)	mo. av. (ml/L)	daily av (ml/L)	daily max (ml/L)	clean-up (ml/L)	daily av. (lb/d)	daily max (lb/d)	mo av (mg/L)	daily max (mg/L)	clean-up (mg/L)	
<u>OREGON</u>											
ALL FACILITIES		0 1			0 2			5	10	15	6 0-9.0
Gnat Creek											
Big Creek											
Prescott Ponds											
Wahkeena Ponds											
<u>WASHINGTON</u>											
Vancouver Trout Hatchery	4 05		0.1a	0 2a	3 3a	1240a	1630a		15a		

a - Based on net values above intake water concentration

APPENDIX T

APPENDIX T

NPDES PERMIT MONITORING REQUIREMENTS
FOR FISH HATCHERIES

FACILITY	Flow		Settleable Solids		TSS	
	frequency	type	frequency	type	frequency	type
OREGON						
All facilities						
normal operations	weekly	estimate	weekly	composite	weekly	composite
clean-up operations			weekly	composite	weekly	composite
WASHINGTON						
Vancouver Trout Hatchery						
normal operations	weekly	daily total	weekly	grab		
clean-up operations					daily	grab

APPENDIX U

APPENDIX U

APPENDIX CDT
RAINFALL DATA (1989, 1990, AND HISTORICAL) FOR THE LOWER COLUMBIA RIVER

MONTH	ASTORIA 1989	ASTORIA 1990	ASTORIA HISTORICAL	PORTLAND 1989	PORTLAND 1990	PORTLAND HISTORICAL	LONGVIEW 1989	LONGVIEW 1990	LONGVIEW HISTORICAL	BONNEVILLE 1989	BONNEVILLE 1990	BONNEVILLE HISTORICAL
JAN	8.2	16.09	11.3	3.3	7.95	6.2	6.04	11.87	7	10.01	18.57	12.6
FEB	6.61	11.83	7.8	2.84	3.43	3.9	2.82	9.54	4.4	5.59	10.82	8.6
MAR	10.09	5.15	7.3	6.73	2.52	3.6	7.7	2.41	4.5	13.23	3.95	8.3
APR	2.27	4.44	4.6	2.08	2.31	2.3	2.21	3.25	3.3	4.54	7.11	5.3
MAY	3.01	4	2.8	2.87	2.37	2.1	2.21	2.13	2.4	3.95	3.49	3.7
JUN	2.58	3.47	2.4	0.78	1.94	1.5	1.86	3.88	2	1.72	4.24	2.4
JUL	1.64	0.54	1	0.91	0.32	0.5	0.77	0.69	0.9	1.71	0.46	0.8
AUG	0.84	1.57	1.6	1.07	0.95	1.1	1.48	1.52	1.6	2.8	1.43	1.7
SEP	0.5	0.67	3.1	1.48	0.34	1.6	0.27	0.5	2.2	1.68	0.4	2.9
OCT	5.3	8.44	6.2	1.73	4.65	3.1	2.04	7.12	4.1	4.21	12.33	6.4
NOV	6.73	11.28	9.9	3.18	3.68	5.2	8.35	7.41	6.3	7.64	10.05	10.6
DEC	7.4	5.11	11.6	3.08	2.4	6.4	3.25	5.56	7.7	5.68	7.47	13.3
TOTAL	55.17	72.59	69.6	30.05	32.86	37.5	39	55.88	46.4	62.76	80.32	76.6

SOURCE. (NOAA 1989a, 1989b, 1990a, 1990b)

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	CITY	COUNTY	STATE	ID NUMBER	PERMIT TYPE	EXPIRATION DATE
CITY OF WARRENTON	WARRENTON	CLATSOP	OR	OR002087-7	NPDES	31-Mar-92
POINT ADAMS PACKING	HAMMOND	CLATSOP	OR	OR000086-8	GEN09	31-Dec-91
TOWN OF ILWACO	ILWACO	PACIFIC	WA	WA002315-9	NPDES	21-Aug-92
FORT COLUMBIA STATE PARK	CHINOOK	PACIFIC	WA	WA003870-9	NPDES	30-Jun-87
WARRENTON DEEP SEA, INC	WARRENTON	CLATSOP	OR	OR000193-7	GEN09	31-Dec-91
BIOPRODUCTS INCORPORATED	WARRENTON	CLATSOP	OR	OR000061-2	NPDES	31-Jul-91
PACIFIC COAST SEAFOODS CO	WARRENTON	CLATSOP	OR	OR000037-0	GEN09	31-Dec-91
JESSIE'S ILWACO FISH CO	ILWACO	PACIFIC	WA	WA000036-1	NPDES	25-Mar-96
CHINOOK PACKING CO	CHINOOK	PACIFIC	WA	WA000015-9	NPDES	20-May-96
CITY OF ASTORIA	ASTORIA	CLATSOP	OR	OR002756-1	NPDES	30-Jun-91
ASTORIA SEAFOOD CO	ASTORIA	CLATSOP	OR	OR000151-1	GEN09	31-Dec-91
OCEAN FOODS OF ASTORIA	ASTORIA	CLATSOP	OR	OR000192-9	GEN09	31-Dec-91
ASTORIA PLYWOOD CORPORATION	ASTORIA	CLATSOP	OR	OR000043-4	GEN04	31-Dec-95
TOWN OF CATHLAMET	CATHLAMET	WAHKIAKUM	WA	WA002266-7	NPDES	28-Jan-85
JAMES RIVER II, INC. (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO (BEAVER)	CLATSKANIE	COLUMBIA	OR	OR202743-0	NPDES	11-Nov-11
COWLITZ COUNTY REGIONAL WWTP	LONGVIEW	COWLITZ	WA	WA003778-8	NPDES	03-Jul-91
CITY OF RAINIER	RAINIER	COLUMBIA	OR	OR002038-9	NPDES	31-Jan-95
RIVERWOOD MOBILE HOME PARK	CLACKA MAS	COLUMBIA	OR	OR003114-3	NPDES	30-Sep-94
STELLA WWTP	UNINCORP	COWLITZ	WA	WA003915-2	NPDES	15-Oct-82
LONGVIEW FIBRE CO	LONGVIEW	COWLITZ	WA	WA000007-8	NPDES	10-May-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-May-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-Dec-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-Dec-96
REYNOLDS METALS CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000008-6	NPDES	15-Oct-95
REYNOLDS METALS CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000008-6	NPDES	15-Oct-95
INTERNATIONAL PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA003872-5	NPDES	31-May-81
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	PRESCOTT	COLUMBIA	OR	OR002996-3	GEN03	31-Dec-95
CITY OF ST HELENS	ST HELENS	COLUMBIA	OR	OR002083-4	NPDES	30-Nov-95
TOWN OF KALAMA	KALAMA	COWLITZ	WA	WA002032-0	NPDES	06-Jul-84
CHEVRON CHEMICAL CO (FERTILIZER)	ST HELENS	COLUMBIA	OR	OR0001635	NPDES	11-Nov-11
KALAMA CHEMICAL, INC	KALAMA	COWLITZ	WA	WA000028-1	NPDES	14-Dec-95
KALAMA CHEMICAL, INC	KALAMA	COWLITZ	WA	WA000028-1	NPDES	14-Dec-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	KALAMA	COWLITZ	WA	WA000035-3	NPDES	15-May-81

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	CITY	COUNTY	STATE	ID NUMBER	PERMIT TYPE	EXPIRATION DATE
BOISE CASCADE CORP - ST HELENS VENEER MILL	ST HELENS	COLUMBIA	OR	OR002733-2	GEN01	31-Dec-95
SALMON CREEK WWTP	VANCOUVER	CLARK	WA	WA002363-9	NPDES	22-Dec-85
VANCOUVER TROUT HATCHERY	VANCOUVER	CLARK	WA	WA003827-0	NPDES	07-Jan-81
CITY OF PORTLAND	PORTLAND	MULTNOMAH	OR	OR202690-5	NPDES	31-Mar-96
CITY OF GRESHAM	PORTLAND	MULTNOMAH	OR	OR002613-1	NPDES	31-Mar-92
CITY OF VANCOUVER (EASTSIDE)	VANCOUVER	CLARK	WA	WA002436-8	NPDES	06-Oct-92
CITY OF VANCOUVER (WESTSIDE)	VANCOUVER	CLARK	WA	WA002435-0	NPDES	16-Sep-90
REYNOLDS METALS CO (TROUTDALE)	TROUTDALE	MULTNOMAH	OR	OR000006-0	NPDES	31-Mar-96
REYNOLDS METALS CO (TROUTDALE)	TROUTDALE	MULTNOMAH	OR	OR000006-0	NPDES	31-Mar-96
JAMES RIVER II, INC (CAMAS MILL)	CAMAS	CLARK	WA	WA000025-6	NPDES	10-May-96
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	VANCOUVER	CLARK	WA	WA000029-9	NPDES	31-Jul-94
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	VANCOUVER	CLARK	WA	WA000029-9	NPDES	31-Jul-94
BOISE CASCADE CORPORATION (VANCOUVER)	VANCOUVER	CLARK	WA	WA000026-4	NPDES	13-Feb-95
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	FAIRVIEW	MULTNOMAH	OR	OR003269-7	GEN13	31-Jul-93
NORTHWEST PACKING CO	VANCOUVER	CLARK	WA	WA003910-1	NPDES	03-Aug-94
GATX TERMINALS CORPORATION	VANCOUVER	CLARK	WA	WA000041-8	NPDES	23-Sep-92
GREAT WESTERN MALTING CO	VANCOUVER	CLARK	WA	WA000001-9	NPDES	21-Jul-82
FORT VANCOUVER PLYWOOD CO	VANCOUVER	CLARK	WA	WA000004-3	NPDES	07-Aug-92
IDEAL BASIC INDUSTRIES - HOLNAM INC	VANCOUVER	CLARK	WA	WA000032-9	NPDES	22-Jun-83
COLUMBIA VISTA CORPORATION	VANCOUVER	CLARK	WA	WA003996-9	NPDES	12-Jun-92
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	WAHKEENA	MULTNOMAH	OR	OR002792-8	GEN03	31-Dec-95
PENDLETON WOOLEN MILLS	WASHOUGAL	CLARK	WA	WA000023-0	NPDES	23-Aug-96
CITY OF CAMAS	CAMAS	CLARK	WA	WA002024-9	NPDES	24-Nov-91
U S ARMY CORPS OF ENGINEERS	BONNEVILLE	MULTNOMAH	OR	OR202262-4	NPDES	31-Dec-89
CITY OF NORTH BONNEVILLE	O BONNEVILL	SKAMANIA	WA	WA002338-8	NPDES	28-Jul-88

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	CLASS	TYPE	SUB-TYPE	RIVER MILE	RIVER SECTION
CITY OF WARRENTON	MINOR	DOMESTIC	DOMESTIC WASTE	7 0	1A
POINT ADAMS PACKING	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	7 0	1A
TOWN OF ILWACO	MINOR	DOMESTIC	DOMESTIC WASTE	3 0	1A
FORT COLUMBIA STATE PARK	MINOR	DOMESTIC	DOMESTIC WASTE	8 0	1A
WARRENTON DEEP SEA, INC	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	9 0	1A
BIOPRODUCTS INCORPORATED	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	10 8	1A
PACIFIC COAST SEAFOODS CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	11 0	1A
JESSIE'S ILWACO FISH CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	3 0	1A
CHINOOK PACKING CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	6 0	1A
CITY OF ASTORIA	MAJOR	DOMESTIC	DOMESTIC WASTE	18 0	1B
ASTORIA SEAFOOD CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	12 0	1B
OCEAN FOODS OF ASTORIA	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	12 0	1B
ASTORIA PLYWOOD CORPORATION	MINOR	INDUSTRIAL	PLYWOOD MANUFACTURE	15 0	1B
TOWN OF CATHLAMET	MINOR	DOMESTIC	DOMESTIC WASTE	40 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
PORTLAND GENERAL ELECTRIC CO (BEAVER)	MINOR	INDUSTRIAL	POWER PRODUCTION	54 0	2B
COWLITZ COUNTY REGIONAL WWTP	MAJOR	DOMESTIC	DOMESTIC WASTE	67 0	2C
CITY OF RAINIER	MINOR	DOMESTIC	DOMESTIC WASTE	67 0	2C
RIVERWOOD MOBILE HOME PARK	MINOR	DOMESTIC	DOMESTIC WASTE	70 6	2C
STELLA WWTP	MINOR	DOMESTIC	DOMESTIC WASTE	56 4	2C
LONGVIEW FIBRE CO	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	67 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
REYNOLDS METALS CO (LONGVIEW)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	63 0	2C
REYNOLDS METALS CO (LONGVIEW)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	63 0	2C
INTERNATIONAL PAPER CO (LONGVIEW)	MINOR	INDUSTRIAL	FORMER WOOD PRODUCTS	66 5	2C
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	MINOR	AGRICULTURAL	FISH HATCHERY	73 6	3A
CITY OF ST HELENS	MAJOR	DOMESTIC	DOMESTIC/PULP&PAPER	86 0	3A
TOWN OF KALAMA	MINOR	DOMESTIC	DOMESTIC WASTE	75 5	3A
CHEVRON CHEMICAL CO (FERTILIZER)	MAJOR	INDUSTRIAL	FERTILIZER PROD	82 0	3A
KALAMA CHEMICAL, INC	MAJOR	INDUSTRIAL	CHEMICAL MANUFACTURE	74 0	3A
KALAMA CHEMICAL, INC	MAJOR	INDUSTRIAL	CHEMICAL MANUFACTURE	74 0	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72.5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	MINOR	INDUSTRIAL	HYDROSULFITE PROD	76 0	3A

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	CLASS	TYPE	SUB-TYPE	RIVER MILE	RIVER SECTION
BOISE CASCADE CORP - ST HELENS VENEER MILL	MINOR	INDUSTRIAL	PLYWOOD PRODUCTION	86 0	3A
SALMON CREEK WWTP	MAJOR	DOMESTIC	DOMESTIC WASTE	97 2	3B
VANCOUVER TROUT HATCHERY	MINOR	AGRICULTURAL	FISH HATCHERY	113 5	4A
CITY OF PORTLAND	MAJOR	DOMESTIC	DOMESTIC WASTE	105 5	4A
CITY OF GRESHAM	MAJOR	DOMESTIC	DOMESTIC WASTE	117.5	4A
CITY OF VANCOUVER (EASTSIDE)	MAJOR	DOMESTIC	DOMESTIC WASTE	110 0	4A
CITY OF VANCOUVER (WESTSIDE)	MAJOR	DOMESTIC	DOMESTIC WASTE	105 1	4A
REYNOLDS METALS CO. (TROUTDALE)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	120 0	4A
REYNOLDS METALS CO (TROUTDALE)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	120 0	4A
JAMES RIVER II, INC (CAMAS MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	120 5	4A
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	102 5	4A
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	102 5	4A
BOISE CASCADE CORPORATION (VANCOUVER)	MAJOR	INDUSTRIAL	PULP AND PAPER	106 0	4A
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	MINOR	INDUSTRIAL	WOOD CHIP RELOADING	119 0	4A
NORTHWEST PACKING CO	MINOR	INDUSTRIAL	FRUIT & VEG CANNING	105 1	4A
GATX TERMINALS CORPORATION	MINOR	INDUSTRIAL	ANTIFREEZE PROD	104 0	4A
GREAT WESTERN MALTING CO	MINOR	INDUSTRIAL	MALT PRODUCTION	105 1	4A
FORT VANCOUVER PLYWOOD CO	MINOR	INDUSTRIAL	PLYWOOD MANUFACTURE	105 2	4A
IDEAL BASIC INDUSTRIES - HOLNAM INC	MINOR	INDUSTRIAL	CEMENT PLANT	105 5	4A
COLUMBIA VISTA CORPORATION	MINOR	INDUSTRIAL	SAWMILL	115 6	4A
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	MINOR	AGRICULTURAL	FISH HATCHERY	134 0	4B
PENDLETON WOOLEN MILLS	MAJOR	INDUSTRIAL	WOOL FINISHING	122 8	4B
CITY OF CAMAS	MINOR	DOMESTIC	DOMESTIC WASTE	121 2	4B
U S ARMY CORPS OF ENGINEERS	MINOR	DOMESTIC	DOMESTIC/FISH HATCH	146 0	4B
CITY OF NORTH BONNEVILLE	MINOR	DOMESTIC	DOMESTIC WASTE	145 0	4B

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	PIPE ID NUMBER	TYPE OF DISCHARGE
CITY OF WARRENTON		TREATED DOMESTIC WASTEWATER
POINT ADAMS PACKING		SEAFOOD PROCESSING WATER
TOWN OF ILWACO		TREATED DOMESTIC WASTEWATER
FORT COLUMBIA STATE PARK		TREATED SANITARY WASTEWATER
WARRENTON DEEP SEA, INC		SEAFOOD PROCESSING WASTE
BIOPRODUCTS INCORPORATED		SEAFOOD PROCESSING WASTE
PACIFIC COAST SEAFOODS CO		SEAFOOD PROCESSING WASTE
JESSIE'S ILWACO FISH CO		SEAFOOD PROCESSING WASTE
CHINOOK PACKING CO		SEAFOOD PROCESSING WASTE
CITY OF ASTORIA		TREATED DOMESTIC WASTEWATER
ASTORIA SEAFOOD CO		SEAFOOD PROCESSING WASTE
OCEAN FOODS OF ASTORIA		SEAFOOD PROCESSING WASTE
ASTORIA PLYWOOD CORPORATION		LOG POND WATER, LOG YARD RUNOFF
TOWN OF CATHLAMET		TREATED DOMESTIC WASTEWATER
JAMES RIVER II, INC (WAUNA MILL)	001	TREATED PROCESS WASTEWATER
JAMES RIVER II, INC (WAUNA MILL)	002	STORMWATER
JAMES RIVER II, INC (WAUNA MILL)	003	FILTER BACKWASH WATER
JAMES RIVER II, INC (WAUNA MILL)	004	LOG WASHER EFFLUENT
PORTLAND GENERAL ELECTRIC CO (BEAVER)		COOLING WATER
COWLITZ COUNTY REGIONAL WWTP		TREATED DOMESTIC WASTEWATER
CITY OF RAINIER		TREATED DOMESTIC WASTEWATER
RIVERWOOD MOBILE HOME PARK		TREATED DOMESTIC WASTEWATER
STELLA WWTP		TREATED DOMESTIC WASTEWATER
LONGVIEW FIBRE CO	001	TREATED PROCESS/SANITARY/FILTER BACKWASH
WEYERHAEUSER PAPER CO (LONGVIEW)	001	TREATED PROCESS WASTEWATER
WEYERHAEUSER PAPER CO (LONGVIEW)	005	TREATED SANITARY WASTEWATER
WEYERHAEUSER PAPER CO (LONGVIEW)	CHLOR-ALKALI	CHLOR-ALKALI PLANT WASTEWATER
REYNOLDS METALS CO (LONGVIEW)	001	TREATED SANITARY WASTEWATER
REYNOLDS METALS CO (LONGVIEW)	002	CONTACT/NON-CONTACT COOLING WATER/STORMWATER/BOILER BLOWDOWN
INTERNATIONAL PAPER CO (LONGVIEW)		TREATED SANITARY WASTEWATER AND TREATED GROUNDWATER
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE		FISH HATCHERY WASTEWATER
CITY OF ST HELENS		TREATED DOMESTIC AND PULP AND PAPER MILL WASTEWATER
TOWN OF KALAMA		TREATED DOMESTIC WASTEWATER
CHEVRON CHEMICAL CO (FERTILIZER)	001	TREATED PROCESS WASTEWATER/COOLING WATER
KALAMA CHEMICAL, INC	001	COOLING WATER
KALAMA CHEMICAL, INC	002	TREATED PROCESS WASTEWATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	001	COOLING WATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	002	TREATED SANITARY WASTEWATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	003	SETTLING BASIN EFFLUENT
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	004	BOILER BLOWDOWN
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	005	NEUTRALIZING TANK EFFLUENT
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	006	OIL/WATER SEPARATOR
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE		TREATED PROCESS WASTEWATER

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989

FACILITY	PIPE ID NUMBER	TYPE OF DISCHARGE
BOISE CASCADE CORP - ST HELENS VENEER MILL		NON-CONTACT COOLING WATER, COOLING TOWER BLOWDOWN
SALMON CREEK WWTP		TREATED DOMESTIC WASTEWATER
VANCOUVER TROUT HATCHERY		FISH HATCHERY WASTEWATER
CITY OF PORTLAND		TREATED DOMESTIC WASTEWATER
CITY OF GRESHAM		TREATED DOMESTIC WASTEWATER
CITY OF VANCOUVER (EASTSIDE)		TREATED DOMESTIC WASTEWATER
CITY OF VANCOUVER (WESTSIDE)		TREATED DOMESTIC WASTEWATER
REYNOLDS METALS CO (TROUTDALE)	001	CONTACT/NON-CONTACT COOLING WATER/ESP SCRUBBER WATER
REYNOLDS METALS CO (TROUTDALE)	002	TREATED SANITARY WASTEWATER
JAMES RIVER II, INC (CAMAS MILL)		TREATED PROCESS AND SANITARY WASTEWATER
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	001	TREATED PROCESS WASTEWATER
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	002	TREATED SANITARY WASTEWATER
BOISE CASCADE CORPORATION (VANCOUVER)		TREATED PROCESS WASTEWATER
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING		TREATED STORMWATER RUNOFF
NORTHWEST PACKING CO		CAN COOLING AND NON-CONTACT COOLING WATER
GATX TERMINALS CORPORATION		BOILER BLOWDOWN, STORMWATER, WATER SOFTENER REGENERANT
GREAT WESTERN MALTING CO		NON-CONTACT COOLING WATER
FORT VANCOUVER PLYWOOD CO		STORMWATER, NON-CONTACT COOLING WATER
IDEAL BASIC INDUSTRIES - HOLNAM INC		NON-CONTACT COOLING WATER
COLUMBIA VISTA CORPORATION		MILL WASHDOWN WATER, STORMWATER, STEAMCLEANER WATER
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE		FISH HATCHERY WASTEWATER
PENDLETON WOOLEN MILLS	001	TREATED PROCESS WASTEWATER
CITY OF CAMAS		TREATED DOMESTIC WASTEWATER
U S ARMY CORPS OF ENGINEERS		TREATED SANITARY WASTEWATER/FISH HATCHERY WASTEWATER
CITY OF NORTH BONNEVILLE		TREATED DOMESTIC WASTEWATER

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989 FACILITY	LATITUDE (north)	LONGITUDE (west)	WASTEWATER VOLUME DRY (MG)	WASTEWATER VOLUME WET (MG)	BOD DRY (LBS)	BOD WET (LBS)
CITY OF WARRENTON			39 35	112 91	6003	16089
POINT ADAMS PACKING						
TOWN OF ILWACO	46 18'19"	124 01'58"	33 03	56 86	5651	13471
FORT COLUMBIA STATE PARK	46 15'03"	123 55'18"	0 89	0 53	57	33
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED			*	*		
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO	46 18'27"	124 02'14"	*	*	*	*
CHINOOK PACKING CO	46 16'18"	123 56'48"	*	*	*	*
CITY OF ASTORIA	46 12'14"	123 46'21"	333 89	1096 98	48157	57352
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	46 12'20"	123 23'15"	6 10	24 27	1036	6214
JAMES RIVER II, INC (WAUNA MILL)	46 10'01"	123 24'57"	7125 90	7218 20	678800	595900
JAMES RIVER II, INC (WAUNA MILL)	46 09'57"	123 24'54"	3 05	3 10	247	912
JAMES RIVER II, INC (WAUNA MILL)	46 09'26"	123 24'08"	160 90	124 30	*	*
JAMES RIVER II, INC (WAUNA MILL)	46 09'13"	123 23'51"	6 12	20 29	773	2383
PORTLAND GENERAL ELECTRIC CO (BEAVER)			71 71	69 81		
COWLITZ COUNTY REGIONAL WWTP	40 05'52"	122 05 52"	898 80	1499 80	43807	66771
CITY OF RAINIER			56 14	89 85	2426	2571
RIVERWOOD MOBILE HOME PARK			*	*	*	*
STELLA WWTP	46 11'26"	123 07'20"	*	*		
LONGVIEW FIBRE CO	46 05'45"	122 55'00"	12395 90	11098 50	1420300	1678700
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	11389 10	9331 60	1666300	1964600
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	39 00	38 00	2851	2787
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	818 50	661 40		
REYNOLDS METALS CO (LONGVIEW)	46 08'05"	123 00'10"	28 25	29 07	2794	2567
REYNOLDS METALS CO (LONGVIEW)	46 08'05"	123 00'10"	1820 90	1749 40		
INTERNATIONAL PAPER CO (LONGVIEW)	46 06'15"	122 57'00"	1 52	4 21	74	243
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE			*	*		
CITY OF ST HELENS	45 51'16"	122 47'14"	6400 60	6581 30	1483456	1698846
TOWN OF KALAMA	46 00'32"	122 50'42"	18 21	61 04	5977	13127
CHEVRON CHEMICAL CO. (FERTILIZER)	45 55'10"	122 48'52"	3034 00	2228 30		
KALAMA CHEMICAL, INC	46 01'18"	122 51'35"	3617 00	2741 90		
KALAMA CHEMICAL, INC	46 01'18"	122 51'35"	26 99	28 97	3051	6049
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	8155 40	8199 80		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*	332	563
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	7 68	7 86		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	45 59'43"	122 50'29"	*	*		

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989			WASTEWATER VOLUME		BOD	
FACILITY	LATITUDE (north)	LONGITUDE (west)	DRY (MG)	WET (MG)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL			*	*		
SALMON CREEK WWTP	45 42'39"	122 45'30"	*	*	*	*
VANCOUVER TROUT HATCHERY	45 43'59"	122 32'37"	344 00	417 00		
CITY OF PORTLAND	45 37'26"	122 41'32"	11512 60	14323 30	1637651	2314818
CITY OF GRESHAM			1214 60	1654 20	111741	320910
CITY OF VANCOUVER (EASTSIDE)	45 36'45"	122 37'00"	446 30	473 70	61235	76642
CITY OF VANCOUVER (WESTSIDE)	45 38'10"	122 41'45"	2167 80	2241 90	324380	322497
REYNOLDS METALS CO (TROUTDALE)			486 16	467 96		
REYNOLDS METALS CO (TROUTDALE)			9 30	10 35	663	454
JAMES RIVER II, INC (CAMAS MILL)	45 34'15"	122 25'00"	10860 70	10537 40	4124800	5159800
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	45 38'58"	122 44'41"	608 02	626 01		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	45 38'58"	122 44'41"	19 76	17 19	1825	919
BOISE CASCADE CORPORATION (VANCOUVER)	45 37'20"	122 40'50"	1434 50	1254 70	392750	270950
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING			*	*		
NORTHWEST PACKING CO	45 37'56"	122 41'23"	*	*		
GATX TERMINALS CORPORATION	45 38'09"	122 42'38"	0 05	0 14		
GREAT WESTERN MALTING CO	45 37'52"	122 41'39"	1612 40	1571 00		
FORT VANCOUVER PLYWOOD CO	45 37'44"	122 41'24"	*	*	*	*
IDEAL BASIC INDUSTRIES - HOLNAM INC	45 37'37"	122 41'11"	0 11	0 07		
COLUMBIA VISTA CORPORATION	45 35'10"	122 28'05"	0 01	0 07		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE			*	*		
PENDLETON WOOLEN MILLS	45 34'27"	122 21'04"	111 20	113 68	38214	51882
CITY OF CAMAS	45 34'44"	122 23'17"	95 88	224 69	39858	33664
U S ARMY CORPS OF ENGINEERS			3 74	3 87	184	181
CITY OF NORTH BONNEVILLE	45 37'49"	121 58'11"	5 12	8 42	190	318

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TSS		RESIDUAL CHLORINE		FECAL COLIFORM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (cells/100ml)	WET (cells/100ml)
CITY OF WARRENTON	3525	10137	473 0	980 0	(5)	(10)
POINT ADAMS PACKING	*	*				
TOWN OF ILWACO	5963	9457	160 0	802 0	14	13
FORT COLUMBIA STATE PARK	98	31			21	0
WARRENTON DEEP SEA, INC	*	*				
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO	*	*				
JESSIE'S ILWACO FISH CO	*	*			*	*
CHINOOK PACKING CO	*	*			*	*
CITY OF ASTORIA	55138	107310	1344 0	4429 0	9	9
ASTORIA SEAFOOD CO	*	*				
OCEAN FOODS OF ASTORIA	*	*				
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	1904	4934	42 8	9 9	21	72
JAMES RIVER II, INC (WAUNA MILL)	1995200	1685700				
JAMES RIVER II, INC (WAUNA MILL)	1321	1333				
JAMES RIVER II, INC (WAUNA MILL)	899000	840150				
JAMES RIVER II INC (WAUNA MILL)	615	3473				
PORTLAND GENERAL ELECTRIC CO (BEAVER)	5844	1649	0 0	0 0		
COWLITZ COUNTY REGIONAL WWTP	52799	97400			60	75
CITY OF RAINIER	2178	3115	545 0	964 0	25	4
RIVERWOOD MOBILE HOME PARK	*	*	*	*	*	*
STELLA WWTP	*	*				
LONGVIEW FIBRE CO	5729400	5919400	*	*	*	*
WEYERHAEUSER PAPER CO (LONGVIEW)	3892800	4938500				2000
WEYERHAEUSER PAPER CO (LONGVIEW)	4813	3810	525 0	491 0	15	2
WEYERHAEUSER PAPER CO (LONGVIEW)	62460	8184	69 0	92 0		
REYNOLDS METALS CO (LONGVIEW)	3533	3126	248 0	290 0	11	10
REYNOLDS METALS CO (LONGVIEW)	141169	73989				
INTERNATIONAL PAPER CO (LONGVIEW)	90	312	13 9	35 1	2	2
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	*	*				
CITY OF ST HELENS	3086541	3082578			1740	638
TOWN OF KALAMA	3485	6157	167 1	397 1	48	7
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	49448	66341				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR			6759 0	6698 0		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	158	500	26 0	*	2	2
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	178	292				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	391	391				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	583	390				
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TSS		RESIDUAL CHLORINE		FECAL COLIFORM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (cells/100ml)	WET (cells/100ml)
BOISE CASCADE CORP - ST HELENS VENEER MILL	*	*				
SALMON CREEK WWTP	*	*	*	*	*	*
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	1811727	2707634	89111 1	105814 1	55	12
CITY OF GRESHAM	139011	282928	3378 0	6865 0	108	68
CITY OF VANCOUVER (EASTSIDE)	42012	52142	2928 0	5130 0	125	36
CITY OF VANCOUVER (WESTSIDE)	236718	322497	23514 0	30902 0	46	54
REYNOLDS METALS CO (TROUTDALE)	25377	30645				
REYNOLDS METALS CO (TROUTDALE)	1374	1766	68 6	40 7	10	11
JAMES RIVER II, INC. (CAMAS MILL)	6092000	7598200				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	114536	57376				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	2946	1876	228 0	226 0	158	140
BOISE CASCADE CORPORATION (VANCOUVER)	339000	311250				
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO	*	*				
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	*	*				
PENDLETON WOOLEN MILLS	64796	59212				
CITY OF CAMAS	13160	19264	342 0	968 0	18	56
U S ARMY CORPS OF ENGINEERS	184	181	11 3	10 2	3	1
CITY OF NORTH BONNEVILLE	244	157	6 3	14 1	2	11

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	OIL AND GREASE		TOTAL CYANIDE		FREE CYANIDE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING	*	*				
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC	*	*				
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO	*	*				
JESSIE'S ILWACO FISH CO	*	*				
CHINOOK PACKING CO	*	*				
CITY OF ASTORIA						
ASTORIA SEAFOOD CO	*	*				
OCEAN FOODS OF ASTORIA	*	*				
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)	1600	1305				
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	23568	11761	340 00	487 00		
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*	*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)	19328	25536				
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	*	*				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	139	78				
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	OIL AND GREASE		TOTAL CYANIDE		FREE CYANIDE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			*	*	937 80	2727 90
CITY OF GRESHAM					(106 00)	(150 00)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)	5578	5013	11 60	31 50		
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC. (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	1568	3091	14 80	16 20		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	*	*				
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO	*	*				
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION	1	15				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS	4567	5064				
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	pH		TEMPERATURE		HEAT	
FACILITY	DRY	WET	(degrees F)	degrees F)	(MBTU)	(MBTU)
CITY OF WARRENTON	7 2	7 0				
POINT ADAMS PACKING						
TOWN OF ILWACO	7 0	6 6				
FORT COLUMBIA STATE PARK	*	*				
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED	*	*				
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO	*	*	*	*		
CHINOOK PACKING CO	*	*	*	*		
CITY OF ASTORIA	7 6	7 1				
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	7 6	7 5				
JAMES RIVER II, INC (WAUNA MILL)	*	*	87 6	78 2		
JAMES RIVER II, INC (WAUNA MILL)	*	*				
JAMES RIVER II, INC (WAUNA MILL)	*	*				
JAMES RIVER II, INC (WAUNA MILL)	*	*				
PORTLAND GENERAL ELECTRIC CO (BEAVER)	*	*	76 0	61 0		
COWLITZ COUNTY REGIONAL WWTP	*	*				
CITY OF RAINIER	6 3	6 5				
RIVERWOOD MOBILE HOME PARK	*	*				
STELLA WWTP						
LONGVIEW FIBRE CO	*	*	*	*		
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*	*	*		
WEYERHAEUSER PAPER CO (LONGVIEW)	6 6	6 8				
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	7 6	7 6				
REYNOLDS METALS CO (LONGVIEW)	7 6	7 6	*	*		
INTERNATIONAL PAPER CO (LONGVIEW)	7 0	7 0				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	6 9	7 2	*	*		
TOWN OF KALAMA	6 7	6 7				
CHEVRON CHEMICAL CO (FERTILIZER)	*	*	91 3	77 9		
KALAMA CHEMICAL, INC	7 7	7 7	84 2	72 4		
KALAMA CHEMICAL, INC	8 2	8 1				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	8 0	7 7	67 0	49 0	220896	265980
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	*	*				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	*	*	*	*		

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	pH		TEMPERATURE		HEAT	
	DRY	WET				
FACILITY			(degrees F)	degrees F)	(MBTU)	(MBTU)
BOISE CASCADE CORP - ST HELENS VENEER MILL	*	*	*	*		
SALMON CREEK WWTP	*	*				
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	7 4	7 3				
CITY OF GRESHAM	*	*				
CITY OF VANCOUVER (EASTSIDE)	*	*				
CITY OF VANCOUVER (WESTSIDE)	*	*				
REYNOLDS METALS CO (TROUTDALE)	7 8	7 7				
REYNOLDS METALS CO (TROUTDALE)	6 8	6 8				
JAMES RIVER II, INC (CAMAS MILL)	7.2	7 2	*	*		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	*	*	61 0	60 0		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	7 3	7 2				
BOISE CASCADE CORPORATION (VANCOUVER)	7 2	7 1	73 5	65 0		
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO	*	*	*	*		
GATX TERMINALS CORPORATION	*	*	*	*		
GREAT WESTERN MALTING CO			53 2	52 8		
FORT VANCOUVER PLYWOOD CO	*	*	*	*		
IDEAL BASIC INDUSTRIES - HOLNAM INC			52 0	50 0		
COLUMBIA VISTA CORPORATION	6 3	6 3				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS	*	*	69 7	62 1		
CITY OF CAMAS	7 0	6 8				
U S ARMY CORPS OF ENGINEERS	6 5	6 7	59 9	47 2		
CITY OF NORTH BONNEVILLE	6 9	7 1				

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TDS		FLUORIDE		ALUMINUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)			73048	73989	5209	6736
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	6558292	8187594			21143	9698
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TDS		FLUORIDE		ALUMINUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			100782	124854		
CITY OF GRESHAM			5946	7557		
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)			26808	83688	1045	1767
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)			5451	6418	13263	9214
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	ANTIMONY		CHROMIUM		NICKEL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)					(144 0)	(84 0)
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	(765 0)	(715 0)			(308 0)	(289 0)
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*	*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC					9 5	9 5
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	ANTIMONY		CHROMIUM		NICKEL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			(532 8)	(657 0)	*	*
CITY OF GRESHAM			(446 0)	(687 0)	(378 0)	(378 0)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)	6 2	4 0			16 2	13 8
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	66 2	45 1	19 4	10 0	192 0	161 5
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION			*	*		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			80 6	89 4		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	ZINC		COPPER		LEAD	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)			(6 0)	(43 0)		
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)			(72 0)	(37 0)	(18 0)	(19 0)
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*	*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	5 3	5 3	21 0	21 0		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR			4 9	4 9		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	ZINC		COPPER		LEAD	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	10727 4	12040 8	(2069 9)	(1042 8)	(483 0)	(502 5)
CITY OF GRESHAM	(830 0)	(926 0)	(482 0)	(727 0)	(1124 0)	(1373 0)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	56 0	59 0				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION	*	*	*	*		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	MERCURY		IRON		CADMIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)			35 0	64 5		
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*			*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR			1 5	1 5		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	MERCURY		IRON		CADMIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*	14586 9	28984 8	(96 5)	(131 4)
CITY OF GRESHAM	(759 0)	(759 0)	3019 0	4757 0	(641 0)	(393 0)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION					*	*
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	BORON		ARSENIC		SODIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR	4131 0	2939 0			624717	755163
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO, TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	BORON		ARSENIC		SODIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	26768 0	36964 8	(483 0)	(657 0)		
CITY OF GRESHAM	3084 0	3230 0	(2378 0)	(1625 0)		
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM 1989	COBALT		TIN		MAGNESIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	148 0	148 0				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	COBALT		TIN		MAGNESIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND						
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	SILVER		MOLYBDENUM		MANGANESE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*				
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	SILVER		MOLYBDENUM		MANGANESE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*			1388 5	5796 9
CITY OF GRESHAM	(378 0)	(378 0)	(579 0)	(579 0)	526 0	865.0
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	BARIUM		SULFIDE		SULFATE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR					636354	1709516
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	BARIUM		SULFIDE		SULFATE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	(9661 8)	(13137 6)				
CITY OF GRESHAM	(138 0)	(90 9)				
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			105 7	87 3		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	NITRATE-N		AMMONIA-N		ORGANIC NITROGEN	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO			*	*		
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST. HELENS			*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)			9463	9899	22901	12562
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC			2141	2054		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	NITRATE-N		AMMONIA-N		ORGANIC NITROGEN	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*	*	*	*	*
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TOTAL PHOSPHORUS		COD		BENZO(A)PYRENE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO	*	*				
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II. INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)					*	*
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	611	361	49448	66341		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TOTAL PHOSPHORUS		COD		BENZO(A)PYRENE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						2 00
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*				
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)					3 77	6 60
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)					0 43	1 58
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			233458	244572		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TOTAL PHENOL		PHENOL		TOTAL PAH	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC. (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	13 5	14 6	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TOTAL PHENOL		PHENOL		TOTAL PAH	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	(4546 0)	*				
CITY OF GRESHAM	(553 0)	(687 0)				
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO			*	*		
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			28 7	49 6		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TCDD		CHLOROFORM		PENTACHLOROPHENOL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)	*	*				
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO	*	*				(2727 0)
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO. (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*	*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	TCDD		CHLOROFORM		PENTACHLOROPHENOL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*				
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC. (CAMAS MILL)	*	*				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX V

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	AOX		EPA priority pollutant scan		THORIUM 232	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)	*	*				
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*				
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1989	AOX		EPA priority pollutant scan		THORIUM 232	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			*	*	*	*
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC. (CAMAS MILL)	*	*				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			*	*		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	CITY	COUNTY	STATE	ID NUMBER	PERMIT TYPE	EXPIRATION DATE
CITY OF WARRENTON	WARRENTON	CLATSOP	OR	OR002087-7	NPDES	31-Mar-92
POINT ADAMS PACKING	HAMMOND	CLATSOP	OR	OR000086-8	GEN09	31-Dec-91
TOWN OF ILWACO	ILWACO	PACIFIC	WA	WA002315-9	NPDES	21-Aug-92
FORT COLUMBIA STATE PARK	CHINOOK	PACIFIC	WA	WA003870-9	NPDES	30-Jun-87
WARRENTON DEEP SEA, INC	WARRENTON	CLATSOP	OR	OR000193-7	GEN09	31-Dec-91
BIOPRODUCTS INCORPORATED	WARRENTON	CLATSOP	OR	OR000061	NPDES	31-Jul-91
PACIFIC COAST SEAFOODS CO	WARRENTON	CLATSOP	OR	OR000037-0	GEN09	31-Dec-91
JESSIE'S ILWACO FISH CO	ILWACO	PACIFIC	WA	WA000036-1	NPDES	25-Mar-96
CHINOOK PACKING CO	CHINOOK	PACIFIC	WA	WA000015-9	NPDES	20-May-96
CITY OF ASTORIA	ASTORIA	CLATSOP	OR	OR002756-1	NPDES	30-Jun-91
ASTORIA SEAFOOD CO	ASTORIA	CLATSOP	OR	OR000151-1	GEN09	31-Dec-91
OCEAN FOODS OF ASTORIA	ASTORIA	CLATSOP	OR	OR000192-9	GEN09	31-Dec-91
ASTORIA PLYWOOD CORPORATION	ASTORIA	CLATSOP	OR	OR000043-4	GEN04	31-Dec-95
TOWN OF CATHLAMET	CATHLAMET	WAHKIAKUM	WA	WA002266-7	NPDES	28-Jan-85
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
JAMES RIVER II, INC (WAUNA MILL)	WAUNA	CLATSOP	OR	OR000079-5	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO (BEAVER)	CLATSKANIE	COLUMBIA	OR	OR202743-0	NPDES	11-Nov-11
COWLITZ COUNTY REGIONAL WWTP	LONGVIEW	COWLITZ	WA	WA003778-8	NPDES	03-Jul-91
CITY OF RAINIER	RAINIER	COLUMBIA	OR	OR002038-9	NPDES	31-Jan-95
RIVERWOOD MOBILE HOME PARK	CLACKAMAS	COLUMBIA	OR	OR003114-3	NPDES	30-Sep-94
STELLA WWTP	UNINCORP	COWLITZ	WA	WA003915	NPDES	15-Oct-82
LONGVIEW FIBRE CO	LONGVIEW	COWLITZ	WA	WA000007-8	NPDES	10-May-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-May-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-Dec-96
WEYERHAEUSER PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000012-4	NPDES	10-Dec-96
REYNOLDS METALS CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000008-6	NPDES	15-Oct-95
REYNOLDS METALS CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA000008-6	NPDES	15-Oct-95
INTERNATIONAL PAPER CO (LONGVIEW)	LONGVIEW	COWLITZ	WA	WA003872-5	NPDES	31-May-81
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	PRESCOTT	COLUMBIA	OR	OR002996-3	GEN03	31-Dec-95
CITY OF ST HELENS	ST HELENS	COLUMBIA	OR	OR002083-4	NPDES	30-Nov-95
TOWN OF KALAMA	KALAMA	COWLITZ	WA	WA002032-0	NPDES	06-Jul-84
CHEVRON CHEMICAL CO (FERTILIZER)	ST HELENS	COLUMBIA	OR	OR0001635	NPDES	11-Nov-11
KALAMA CHEMICAL, INC	KALAMA	COWLITZ	WA	WA000028-1	NPDES	14-Dec-95
KALAMA CHEMICAL, INC	KALAMA	COWLITZ	WA	WA000028-1	NPDES	14-Dec-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	RAINIER	COLUMBIA	OR	OR002345-1	NPDES	30-Nov-95
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	KALAMA	COWLITZ	WA	WA000035-3	NPDES	15-May-81

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	CITY	COUNTY	STATE	ID NUMBER	PERMIT TYPE	EXPIRATION DATE
BOISE CASCADE CORP. - ST. HELENS VENEER MILL	ST HELENS	COLUMBIA	OR	OR002733	GEN01	31-Dec-95
SALMON CREEK WWTP	VANCOUVER	CLARK	WA	WA002363-9	NPDES	22-Dec-85
VANCOUVER TROUT HATCHERY	VANCOUVER	CLARK	WA	WA003827-0	NPDES	07-Jan-81
CITY OF PORTLAND	PORTLAND	MULTNOMAH	OR	OR202690-5	NPDES	31-Mar-96
CITY OF GRESHAM	PORTLAND	MULTNOMAH	OR	OR002613-1	NPDES	31-Mar-92
CITY OF VANCOUVER (EASTSIDE)	VANCOUVER	CLARK	WA	WA002436-8	NPDES	06-Oct-92
CITY OF VANCOUVER (WESTSIDE)	VANCOUVER	CLARK	WA	WA002435-0	NPDES	16-Sep-90
REYNOLDS METALS CO. (TROUTDALE)	TROUTDALE	MULTNOMAH	OR	OR000006-0	NPDES	31-Mar-96
REYNOLDS METALS CO. (TROUTDALE)	TROUTDALE	MULTNOMAH	OR	OR000006-0	NPDES	31-Mar-96
JAMES RIVER II, INC (CAMAS MILL)	CAMAS	CLARK	WA	WA000025-6	NPDES	10-May-96
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	VANCOUVER	CLARK	WA	WA000029-9	NPDES	31-Jul-94
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	VANCOUVER	CLARK	WA	WA000029-9	NPDES	31-Jul-94
BOISE CASCADE CORPORATION (VANCOUVER)	VANCOUVER	CLARK	WA	WA000026-4	NPDES	13-Feb-95
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	FAIRVIEW	MULTNOMAH	OR	OR003269-7	GEN13	31-Jul-93
NORTHWEST PACKING CO	VANCOUVER	CLARK	WA	WA003910-1	NPDES	03-Aug-94
GATX TERMINALS CORPORATION	VANCOUVER	CLARK	WA	WA000041-8	NPDES	23-Sep-92
GREAT WESTERN MALTING CO	VANCOUVER	CLARK	WA	WA000001-9	NPDES	21-Jul-82
FORT VANCOUVER PLYWOOD CO	VANCOUVER	CLARK	WA	WA000004-3	NPDES	07-Aug-92
IDEAL BASIC INDUSTRIES - HOLNAM INC	VANCOUVER	CLARK	WA	WA000032-9	NPDES	22-Jun-83
COLUMBIA VISTA CORPORATION	VANCOUVER	CLARK	WA	WA003996-9	NPDES	12-Jun-92
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	WAHKEENA	MULTNOMAH	OR	OR002792-8	GEN03	31-Dec-95
PENDLETON WOOLEN MILLS	WASHOUGAL	CLARK	WA	WA000023-0	NPDES	23-Aug-96
CITY OF CAMAS	CAMAS	CLARK	WA	WA002024-9	NPDES	24-Nov-91
U S ARMY CORPS OF ENGINEERS	BONNEVILLE	MULTNOMAH	OR	OR202262-4	NPDES	31-Dec-89
CITY OF NORTH BONNEVILLE	NO BONNEVILLE	SKAMANIA	WA	WA002338-8	NPDES	28-Jul-88

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	CLASS	TYPE	SUB-TYPE	RIVER MILE	RIVER SECTION
CITY OF WARRENTON	MINOR	DOMESTIC	DOMESTIC WASTE	7 0	1A
POINT ADAMS PACKING	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	7 0	1A
TOWN OF ILWACO	MINOR	DOMESTIC	DOMESTIC WASTE	3 0	1A
FORT COLUMBIA STATE PARK	MINOR	DOMESTIC	DOMESTIC WASTE	8 0	1A
WARRENTON DEEP SEA, INC	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	9 0	1A
BIOPRODUCTS INCORPORATED	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	10 8	1A
PACIFIC COAST SEAFOODS CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	11 0	1A
JESSIE'S ILWACO FISH CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	3 0	1A
CHINOOK PACKING CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	6 0	1A
CITY OF ASTORIA	MAJOR	DOMESTIC	DOMESTIC WASTE	18 0	1B
ASTORIA SEAFOOD CO	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	12 0	1B
OCEAN FOODS OF ASTORIA	MINOR	INDUSTRIAL	SEAFOOD PROCESSING	12 0	1B
ASTORIA PLYWOOD CORPORATION	MINOR	INDUSTRIAL	PLYWOOD MANUFACTURE	15 0	1B
TOWN OF CATHLAMET	MINOR	DOMESTIC	DOMESTIC WASTE	40 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
JAMES RIVER II, INC (WAUNA MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	42 0	2A
PORTLAND GENERAL ELECTRIC CO (BEAVER)	MINOR	INDUSTRIAL	POWER PRODUCTION	54 0	2B
COWLITZ COUNTY REGIONAL WWTP	MAJOR	DOMESTIC	DOMESTIC WASTE	67 0	2C
CITY OF RAINIER	MINOR	DOMESTIC	DOMESTIC WASTE	67 0	2C
RIVERWOOD MOBILE HOME PARK	MINOR	DOMESTIC	DOMESTIC WASTE	70 6	2C
STELLA WWTP	MINOR	DOMESTIC	DOMESTIC WASTE	56 4	2C
LONGVIEW FIBRE CO	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	67 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
WEYERHAEUSER PAPER CO (LONGVIEW)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	63 5	2C
REYNOLDS METALS CO (LONGVIEW)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	63 0	2C
REYNOLDS METALS CO (LONGVIEW)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	63 0	2C
INTERNATIONAL PAPER CO (LONGVIEW)	MINOR	INDUSTRIAL	FORMER WOOD PRODUCTS	66 5	2C
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	MINOR	AGRICULTURAL	FISH HATCHERY	73 6	3A
CITY OF ST HELENS	MAJOR	DOMESTIC	DOMESTIC/PULP&PAPER	86 0	3A
TOWN OF KALAMA	MINOR	DOMESTIC	DOMESTIC WASTE	75 5	3A
CHEVRON CHEMICAL CO (FERTILIZER)	MAJOR	INDUSTRIAL	FERTILIZER PROD	82 0	3A
KALAMA CHEMICAL, INC	MAJOR	INDUSTRIAL	CHEMICAL MANUFACTURE	74 0	3A
KALAMA CHEMICAL, INC	MAJOR	INDUSTRIAL	CHEMICAL MANUFACTURE	74 0	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	MAJOR	INDUSTRIAL	POWER PRODUCTION	72 5	3A
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	MINOR	INDUSTRIAL	HYDROSULFITE PROD	76 0	3A

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	CLASS	TYPE	SUB-TYPE	RIVER MILE	RIVER SECTION
BOISE CASCADE CORP. - ST. HELENS VENEER MILL	MINOR	INDUSTRIAL	PLYWOOD PRODUCTION	86 0	3A
SALMON CREEK WWTP	MAJOR	DOMESTIC	DOMESTIC WASTE	97 2	3B
VANCOUVER TROUT HATCHERY	MINOR	AGRICULTURAL	FISH HATCHERY	113 5	4A
CITY OF PORTLAND	MAJOR	DOMESTIC	DOMESTIC WASTE	105 5	4A
CITY OF GRESHAM	MAJOR	DOMESTIC	DOMESTIC WASTE	117 5	4A
CITY OF VANCOUVER (EASTSIDE)	MAJOR	DOMESTIC	DOMESTIC WASTE	110 0	4A
CITY OF VANCOUVER (WESTSIDE)	MAJOR	DOMESTIC	DOMESTIC WASTE	105 1	4A
REYNOLDS METALS CO. (TROUTDALE)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	120 0	4A
REYNOLDS METALS CO. (TROUTDALE)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	120 0	4A
JAMES RIVER II, INC. (CAMAS MILL)	MAJOR	INDUSTRIAL	PULP AND PAPER MILL	120 5	4A
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	102 5	4A
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	MAJOR	INDUSTRIAL	ALUMINUM PROCESSING	102 5	4A
BOISE CASCADE CORPORATION (VANCOUVER)	MAJOR	INDUSTRIAL	PAPER MILL	106 0	4A
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	MINOR	INDUSTRIAL	WOOD CHIP RELOADING	119 0	4A
NORTHWEST PACKING CO	MINOR	INDUSTRIAL	FRUIT & VEG CANNING	105 1	4A
GATX TERMINALS CORPORATION	MINOR	INDUSTRIAL	ANTIFREEZE PROD	104 0	4A
GREAT WESTERN MALTING CO	MINOR	INDUSTRIAL	MALT PRODUCTION	105 1	4A
FORT VANCOUVER PLYWOOD CO	MINOR	INDUSTRIAL	PLYWOOD MANUFACTURE	105 2	4A
IDEAL BASIC INDUSTRIES - HOLNAM INC	MINOR	INDUSTRIAL	CEMENT PLANT	105 5	4A
COLUMBIA VISTA CORPORATION	MINOR	INDUSTRIAL	SAWMILL	115 6	4A
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	MINOR	AGRICULTURAL	FISH HATCHERY	134 0	4B
PENDLETON WOOLEN MILLS	MAJOR	INDUSTRIAL	WOOL FINISHING	122 8	4B
CITY OF CAMAS	MINOR	DOMESTIC	DOMESTIC WASTE	121 2	4B
U S ARMY CORPS OF ENGINEERS	MINOR	DOMESTIC	DOMESTIC/FISH HATCH	146 0	4B
CITY OF NORTH BONNEVILLE	MINOR	DOMESTIC	DOMESTIC WASTE	145 0	4B

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	PIPE NUMBER	TYPE OF DISCHARGE
CITY OF WARRENTON		TREATED DOMESTIC WASTEWATER
POINT ADAMS PACKING		SEAFOOD PROCESSING WASTE
TOWN OF ILWACO		TREATED DOMESTIC WASTEWATER
FORT COLUMBIA STATE PARK		TREATED SANITARY WASTEWATER
WARRENTON DEEP SEA, INC		SEAFOOD PROCESSING WASTE
BIOPRODUCTS INCORPORATED		SEAFOOD PROCESSING WASTE
PACIFIC COAST SEAFOODS CO		SEAFOOD PROCESSING WASTE
JESSIE'S ILWACO FISH CO		SEAFOOD PROCESSING WASTE
CHINOOK PACKING CO		SEAFOOD PROCESSING WASTE
CITY OF ASTORIA		TREATED DOMESTIC WASTEWATER
ASTORIA SEAFOOD CO		SEAFOOD PROCESSING WASTE
OCEAN FOODS OF ASTORIA		SEAFOOD PROCESSING WASTE
ASTORIA PLYWOOD CORPORATION		LOG POND WATER, LOG YARD RUNOFF
TOWN OF CATHLAMET		TREATED DOMESTIC WASTEWATER
JAMES RIVER II, INC (WAUNA MILL)	001	TREATED PROCESS WASTEWATER
JAMES RIVER II, INC (WAUNA MILL)	002	STORMWATER
JAMES RIVER II, INC (WAUNA MILL)	003	FILTER BACKWASH WATER
JAMES RIVER II, INC (WAUNA MILL)	004	LOG WASHER EFFLUENT
PORTLAND GENERAL ELECTRIC CO (BEAVER)		COOLING WATER
COWLITZ COUNTY REGIONAL WWTP		TREATED DOMESTIC WASTEWATER
CITY OF RAINIER		TREATED DOMESTIC WASTEWATER
RIVERWOOD MOBILE HOME PARK		TREATED DOMESTIC WASTEWATER
STELLA WWTP		TREATED DOMESTIC WASTEWATER
LONGVIEW FIBRE CO	001	TREATED PROCESS/SANITARY/FILTER BACKWASH
WEYERHAEUSER PAPER CO (LONGVIEW)	001	TREATED PROCESS WASTEWATER
WEYERHAEUSER PAPER CO (LONGVIEW)	005	TREATED SANITARY WASTEWATER
WEYERHAEUSER PAPER CO (LONGVIEW)	CHLOR-ALKALI	CHLOR-ALKALI PLANT WASTEWATER
REYNOLDS METALS CO (LONGVIEW)	001	CONTACT/NON-CONTACT COOLING WATER/STORMWATER/BOILER BLOWDOWN
REYNOLDS METALS CO (LONGVIEW)	002	TREATED SANITARY WASTEWATER
INTERNATIONAL PAPER CO (LONGVIEW)		TREATED SANITARY WASTEWATER AND TREATED GROUNDWATER
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE		FISH HATCHERY WASTEWATER
CITY OF ST HELENS		TREATED DOMESTIC AND PULP AND PAPER MILL WASTEWATER
TOWN OF KALAMA		TREATED DOMESTIC WASTEWATER
CHEVRON CHEMICAL CO. (FERTILIZER)	001	TREATED PROCESS WASTEWATER/COOLING WATER
KALAMA CHEMICAL, INC	001	COOLING WATER
KALAMA CHEMICAL, INC	002	TREATED PROCESS WASTEWATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	001	COOLING WATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	002	TREATED SANITARY WASTEWATER
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	003	SETTLING BASIN EFFLUENT
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	004	BOILER BLOWDOWN
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	005	NEUTRALIZING TANK EFFLUENT
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	006	OIL/WATER SEPARATOR EFFLUENT
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE		TREATED PROCESS WASTEWATER

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	PIPE NUMBER	TYPE OF DISCHARGE
BOISE CASCADE CORP - ST HELENS VENEER MILL		NON-CONTACT COOLING WATER, COOLING TOWER BLOWDOWN
SALMON CREEK WWTP		TREATED DOMESTIC WASTEWATER
VANCOUVER TROUT HATCHERY		FISH HATCHERY WASTEWATER
CITY OF PORTLAND		TREATED DOMESTIC WASTEWATER
CITY OF GRESHAM		TREATED DOMESTIC WASTEWATER
CITY OF VANCOUVER (EASTSIDE)		TREATED DOMESTIC WASTEWATER
CITY OF VANCOUVER (WESTSIDE)		TREATED DOMESTIC WASTEWATER
REYNOLDS METALS CO (TROUTDALE)	001	TREATED SANITARY WASTEWATER
REYNOLDS METALS CO (TROUTDALE)	002	CONTACT/NON-CONTACT COOLING WATER/ESP SCRUBBER WATER
JAMES RIVER II, INC (CAMAS MILL)		TREATED PROCESS AND SANITARY WASTEWATER
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	001	TREATED PROCESS WASTEWATER
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	002	TREATED SANITARY WASTEWATER
BOISE CASCADE CORPORATION (VANCOUVER)		TREATED PROCESS WASTEWATER
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING		TREATED STORMWATER RUNOFF
NORTHWEST PACKING CO		CAN COOLING AND NON-CONTACT COOLING WATER
GATX TERMINALS CORPORATION		BOILER BLOWDOWN, STORMWATER, WATER SOFTENER REGENERANT
GREAT WESTERN MALTING CO		NON-CONTACT COOLING WATER
FORT VANCOUVER PLYWOOD CO		STORMWATER, NON-CONTACT COOLING WATER
IDEAL BASIC INDUSTRIES - HOLNAM INC		NON-CONTACT COOLING WATER
COLUMBIA VISTA CORPORATION		MILL WASHDOWN WATER, STORMWATER, STEAMCLEANER WATER
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE		FISH HATCHERY WASTEWATER
PENDLETON WOOLEN MILLS	001	TREATED PROCESS WASTEWATER
CITY OF CAMAS		TREATED DOMESTIC WASTEWATER
U S ARMY CORPS OF ENGINEERS		TREATED SANITARY WASTEWATER/FISH HATCHERY WASTEWATER
CITY OF NORTH BONNEVILLE		TREATED DOMESTIC WASTEWATER

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990			WASTEWATER VOLUME		BOD	
FACILITY	LATITUDE (north)	LONGITUDE (west)	DRY (MG)	WET (MG)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON			41 33	94 73	7740	13058
POINT ADAMS PACKING						
TOWN OF ILWACO	46 18'19"	124 01'58"	40 42	56 68	5896	9185
FORT COLUMBIA STATE PARK	46 15'03"	123 55'18"	*	*	*	*
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED			*	*		
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO	46 18'27"	124 02'14"	*	*	*	*
CHINOOK PACKING CO	46 16'18"	123 56'48"	4 19	2 41	*	*
CITY OF ASTORIA	46 12'14"	123 46'21"	494 60	1178 60	37864	63302
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	46 12'20"	123 23'15"	*	*	*	*
JAMES RIVER II, INC (WAUNA MILL)	46 10'01"	123 24'57"	7639 56	7362 00	664200	779250
JAMES RIVER II, INC (WAUNA MILL)	46 09'57"	123 24'54"	18 48	18 00	204	266
JAMES RIVER II, INC (WAUNA MILL)	46 09'26"	123 24'08"	128 50	126 00	5114	5114
JAMES RIVER II, INC (WAUNA MILL)	46 09'13"	123 23'51"	9 18	26 85	987	2528
PORTLAND GENERAL ELECTRIC CO (BEAVER)			95 17	53 75		
COWLITZ COUNTY REGIONAL WWTP	40 05'52"	122 05'52"	1075 80	1891 50	46280	108614
CITY OF RAINIER			38 99	117 22	1227	4492
RIVERWOOD MOBILE HOME PARK			0 94	0 90	54	83
STELLA WWTP	46 11'26"	123 07'20"	*	*		
LONGVIEW FIBRE CO	46 05'45"	122 55'00"	10739 10	10186 70	1542160	1321100
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	10420 60	8695 80	971500	2288400
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	33 86	33 49	8778	3932
WEYERHAEUSER PAPER CO (LONGVIEW)	46 07'50"	122 59'27"	773 10	678 70		
REYNOLDS METALS CO (LONGVIEW)	46 08'05"	123 00'10"	23 46	23 89	2726	3103
REYNOLDS METALS CO (LONGVIEW)	46 08'05"	123 00'10"	1448 00	*		
INTERNATIONAL PAPER CO (LONGVIEW)	46 06'15"	122 57'00"	0 96	5 44	60	280
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE			*	*		
CITY OF ST HELENS	45 51'16"	122 47'14"	6288 99	6266 32	939754	1283418
TOWN OF KALAMA	46 00'32"	122 50'42"	*	*	*	*
CHEVRON CHEMICAL CO (FERTILIZER)	45 55'10"	122 48'52"	3269 00	2706 00		
KALAMA CHEMICAL, INC	46 01'18"	122 51'35"	3643 00	3246 30		
KALAMA CHEMICAL, INC	46 01'18"	122 51'35"	30 00	27 80	3505	9077
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	7999 50	8369 80		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*	762	736
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	46 02'26"	122 52'56"	*	*		
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	45 59'43"	122 50'29"	170 83	164 64		

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990			WASTEWATER VOLUME		BOD	
FACILITY	LATITUDE (north)	LONGITUDE (west)	DRY (MG)	WET (MG)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST. HELENS VENEER MILL			*	*		
SALMON CREEK WWTP	45 42'39"	122 45'30"	512 43	583 62	80724	135584
VANCOUVER TROUT HATCHERY	45 43'59"	122 32'37"	346 00	347 00		
CITY OF PORTLAND	45 37'26"	122 41'32"	11931 00	14513 70	2500089	2773799
CITY OF GRESHAM			1321 90	1518 50	116976	101885
CITY OF VANCOUVER (EASTSIDE)	45 36'45"	122 37'00"	476 60	503 70	101758	102675
CITY OF VANCOUVER (WESTSIDE)	45 38'10"	122 41'45"	2299 90	2482 90	377751	395462
REYNOLDS METALS CO (TROUTDALE)			490.78	394 08		
REYNOLDS METALS CO (TROUTDALE)			5 83	8.50	77	156
JAMES RIVER II, INC (CAMAS MILL)	45 34'15"	122 25'00"	10860 70	10537 40	4124800	5159800
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	45 38'58"	122 44'41"	593 99	546 43		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	45 38'58"	122 44'41"	10 94	12 38	517	1090
BOISE CASCADE CORPORATION (VANCOUVER)	45 37'20"	122 40'50"	1384 01	1343 68	249750	329850
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING			*	*		
NORTHWEST PACKING CO	45 37'56"	122 41'23"	*	*		
GATX TERMINALS CORPORATION	45 38'09"	122 42'38"	0 03	0 15		
GREAT WESTERN MALTING CO	45 37'52"	122 41'39"	1607 00	1574 00		
FORT VANCOUVER PLYWOOD CO	45 37'44"	122 41'24"	*	*	*	*
IDEAL BASIC INDUSTRIES - HOLNAM INC	45 37'37"	122 41'11"	*	*		
COLUMBIA VISTA CORPORATION	45 35'10"	122 28'05"	0 06	0 05		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE			*	*		
PENDLETON WOOLEN MILLS	45 34'27"	122 21'04"	106 70	116 10	9056	18844
CITY OF CAMAS	45 34'44"	122 23'17"	*	*	*	*
U S ARMY CORPS OF ENGINEERS			3 86	2 82	215	224
CITY OF NORTH BONNEVILLE	45 37'49"	121 58'11"	*	*	*	*

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TSS		RESIDUAL CL		FECAL COLIFORM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (cells/100ml)	WET (cells/100ml)
CITY OF WARRENTON	3240	4942	389 0	850 0	(10)	(10)
POINT ADAMS PACKING	*	*				
TOWN OF ILWACO	7820	9439	168 2	236 4	15	15
FORT COLUMBIA STATE PARK	*	*			*	*
WARRENTON DEEP SEA, INC	*	*				
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO	*	*				
JESSIE'S ILWACO FISH CO	*	*			*	*
CHINOOK PACKING CO	*	*			*	*
CITY OF ASTORIA	42676	126653	2052 5	5231 2	65	18
ASTORIA SEAFOOD CO	*	*				
OCEAN FOODS OF ASTORIA	*	*				
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	*	*	*	*	*	*
JAMES RIVER II, INC (WAUNA MILL)	2825760	1580250				
JAMES RIVER II, INC (WAUNA MILL)	1091	614				
JAMES RIVER II, INC (WAUNA MILL)	701160	820050				
JAMES RIVER II, INC (WAUNA MILL)	857	4346				
PORTLAND GENERAL ELECTRIC CO (BEAVER)	3126	1818	0 0	0 0		
COWLITZ COUNTY REGIONAL WWTP	61783	154323			15	58
CITY OF RAINIER	1624	6426	416 1	1191 5	11	13
RIVERWOOD MOBILE HOME PARK	18	25	6 8	6 3	5	0
STELLA WWTP	*	*				
LONGVIEW FIBRE CO	4271700	4258900	*	*	*	*
WEYERHAEUSER PAPER CO (LONGVIEW)	2243500	4754500				
WEYERHAEUSER PAPER CO (LONGVIEW)	9913	5569	380 6	443 8	543	2
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*	94 6	112 8		
REYNOLDS METALS CO (LONGVIEW)	2860	3477	86 8	194 0	13	14
REYNOLDS METALS CO (LONGVIEW)	103981	*				
INTERNATIONAL PAPER CO (LONGVIEW)	48	252	8 0	45 0	2	2
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	*	*				
CITY OF ST HELENS	2472617	3107377			95	170
TOWN OF KALAMA	*	*	*	*	*	*
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	3453	17616				
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR			6840 0	7066 0		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	621	812	*	*	2	2
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	158	74				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	591	574				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	444	523				
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TSS		RESIDUAL CL		FECAL COLIFORM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (cells/100ml)	WET (cells/100ml)
BOISE CASCADE CORP - ST HELENS VENEER MILL	*	*				
SALMON CREEK WWTP	90954	255898	2424 2	2087 0	2	3
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	2109379	2835099	54663 7	109821 5	162	62
CITY OF GRESHAM	98331	120542	3506 9	4929 7	28	78
CITY OF VANCOUVER (EASTSIDE)	56740	64846	3556 4	4568 7	79	35
CITY OF VANCOUVER (WESTSIDE)	289988	364608	12670 0	17444 0	96	79
REYNOLDS METALS CO (TROUTDALE)	21254	18123				
REYNOLDS METALS CO (TROUTDALE)	1250	1649	26 6	45 5	1	1
JAMES RIVER II, INC (CAMAS MILL)	6092000	7598200				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	37327	29888				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	791	1193	49 2	60 6	45	95
BOISE CASCADE CORPORATION (VANCOUVER)	342000	397800				
JAMES RIVER II, INC. - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO	*	*				
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE	*	*				
PENDLETON WOOLEN MILLS	20989	31957				
CITY OF CAMAS	*	*	*	*	*	*
U S ARMY CORPS OF ENGINEERS	185	179	8 9	7 4	14	29
CITY OF NORTH BONNEVILLE	*	*	*	*	*	*

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	OIL AND GREASE		TOTAL CYANIDE		FREE CYANIDE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING	*	*				
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC	*	*				
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO	*	*				
JESSIE'S ILWACO FISH CO	*	*				
CHINOOK PACKING CO	*	*				
CITY OF ASTORIA						
ASTORIA SEAFOOD CO	*	*				
OCEAN FOODS OF ASTORIA	*	*				
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)	(809)	(496)				
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	16523	*	317 50	*		
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*	*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)	15987	18036				
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	*	1065				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	743	151				
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	OIL AND GREASE		TOTAL CYANIDE		FREE CYANIDE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST. HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			*	*	(4060 0)	5180 0
CITY OF GRESHAM					81 7	85 9
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)	5160	4095	13 95	21 72		
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	2670	8512	(9 03)	(12 27)		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING	*	*				
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO	*	*				
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION	13	6				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS	1826	2700				
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	pH DRY	pH WET	TEMPERATURE DRY (degrees F)	TEMPERATURE WET (degrees F)	HEAT DRY (MBTU)	HEAT WET (MBTU)
CITY OF WARRENTON	7 4	6 9				
POINT ADAMS PACKING						
TOWN OF ILWACO	6 4	6 6				
FORT COLUMBIA STATE PARK	*	*				
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED	*	*				
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO	*	*	*	*		
CHINOOK PACKING CO	*	*	51 0	51 0		
CITY OF ASTORIA	7 4	7 1				
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET	*	*				
JAMES RIVER II, INC (WAUNA MILL)	*	*	89 5	79 6		
JAMES RIVER II, INC (WAUNA MILL)	*	*				
JAMES RIVER II, INC (WAUNA MILL)	*	*				
JAMES RIVER II INC (WAUNA MILL)	*	*				
PORTLAND GENERAL ELECTRIC CO (BEAVER)	*	*	77 3	66 8		
COWLITZ COUNTY REGIONAL WWTP	*	*				
CITY OF RAINIER	6 4	6 6				
RIVERWOOD MOBILE HOME PARK	6 4	6 4				
STELLA WWTP						
LONGVIEW FIBRE CO	*	*	*	*		
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*	*	*		
WEYERHAEUSER PAPER CO (LONGVIEW)	7 0	7 2				
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	7 7	7 6				
REYNOLDS METALS CO (LONGVIEW)	*	*	*	*		
INTERNATIONAL PAPER CO (LONGVIEW)	7 0	7 0				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	7 3	6 9	*	*		
TOWN OF KALAMA	*	*				
CHEVRON CHEMICAL CO (FERTILIZER)	*	*	91 3	77 9		
KALAMA CHEMICAL, INC	8 0	7 9	82 9	68 7		
KALAMA CHEMICAL, INC	*	*				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	8 0	7 8	68 0	49 8	223248	264336
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	*	*				
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	*	*	70 0	54 0		

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990

FACILITY	pH DRY	pH WET	TEMPERATURE DRY (degrees F)	TEMPERATURE WET (degrees F)	HEAT DRY (MBTU)	HEAT WET (MBTU)
BOISE CASCADE CORP - ST HELENS VENEER MILL	*	*	*	*		
SALMON CREEK WWTP	*	*				
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	7 2	7 4				
CITY OF GRESHAM	*	*				
CITY OF VANCOUVER (EASTSIDE)	*	*				
CITY OF VANCOUVER (WESTSIDE)	*	*				
REYNOLDS METALS CO (TROUTDALE)	7 5	7 3				
REYNOLDS METALS CO (TROUTDALE)	6 6	6 8				
JAMES RIVER II, INC (CAMAS MILL)	*	*	*	*		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	*	*	*	*		
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	7 3	7 2				
BOISE CASCADE CORPORATION (VANCOUVER)	7 3	7 4	73 2	65 3		
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO	7 2	7 5	70 0	60 0		
GATX TERMINALS CORPORATION	*	*	*	*		
GREAT WESTERN MALTING CO			*	*		
FORT VANCOUVER PLYWOOD CO	*	*	*	*		
IDEAL BASIC INDUSTRIES - HOLNAM INC			*	*		
COLUMBIA VISTA CORPORATION	6 2	6 8				
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS	6 5	6 5	68 0	61 7		
CITY OF CAMAS	*	*				
U S ARMY CORPS OF ENGINEERS	6 6	6 7	60 2	48 7		
CITY OF NORTH BONNEVILLE	*	*				

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	TDS DRY (LBS)	WET (LBS)	FLUORIDE DRY (LBS)	WET (LBS)	ALUMINUM DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)			50948	*	5605	*
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	11192049	6512253			6027	16621
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TDS		FLUORIDE		ALUMINUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST. HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			65853	142147		
CITY OF GRESHAM			13136	11592		
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)			18871	24672	368	571
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC. (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)			6995	8324	4683	3547
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	ANTIMONY		CHROMIUM		NICKEL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)					*	*
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	586 2	*			239 3	*
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*	*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC			*	*	*	4 8
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	ANTIMONY DRY (LBS)	WET (LBS)	CHROMIUM DRY (LBS)	WET (LBS)	NICKEL DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			(495 1)	(602 3)	*	*
CITY OF GRESHAM			(548 0)	(630 3)	(630 7)	(630 3)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)	2 0	2 5			20 5	14 8
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	47 0	15 1	6 7	7 5	112 6	83 0
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION			*	*		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			54 0	63 1		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	ZINC		COPPER		LEAD	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)			0 0	(12 0)		
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)			*	*	*	*
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)	*					
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*	*	*	*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	*	6 0	*	17 4	*	*
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR			1 1	0 2		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE	*	*				

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	ZINC DRY (LBS)	WET (LBS)	COPPER DRY (LBS)	WET (LBS)	LEAD DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	10992 0	14937 5	2921 0	(6023 0)	(495 1)	(602 3)
CITY OF GRESHAM	700 9	1778 7	(548 0)	(779 0)	(1096 3)	(1260 3)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)	69 1	56 8				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION	*	*	*	*		
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	MERCURY		IRON		CADMIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)			92 0	47 0		
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*			*	*
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC					*	*
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR			4 7	3 9		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	MERCURY		IRON		CADMIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*	29164 0	27225 0	(99 0)	(60 2)
CITY OF GRESHAM	(440 6)	(940 0)	1890 7	3881 8	(432 4)	(430 0)
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION					*	*
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	BORON		ARSENIC		SODIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC			*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR	4760 0	3985 0			610577	668363
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	BORON		ARSENIC		SODIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	22281 0	28911 0	(495 1)	40 9		
CITY OF GRESHAM	3396 3	3067 6	27 3	861 7		
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	COBALT		TIN		MAGNESIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC			*		*	
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	COBALT		TIN		MAGNESIUM	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND						
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	SILVER		MOLYBDENUM		MANGANESE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*				
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	SILVER		MOLYBDENUM		MANGANESE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*			(3714 0)	1807 0
CITY OF GRESHAM	(548 6)	(759 8)	(903 5)	(926 8)	613 9	675 4
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	BARIUM DRY (LBS)	WET (LBS)	SULFIDE DRY (LBS)	WET (LBS)	SULFATE DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO. (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR					1632147	1271451
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	BARIUM		SULFIDE		SULFATE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	(9902 7)	(12046 4)				
CITY OF GRESHAM	(69 8)	(122 5)				
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC. (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC. - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			120 8	109 9		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	NITRATE-N		AMMONIA-N		ORGANIC N	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC.						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO			*	*		
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS			*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)			6849	9298	19893	12328
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC			635	1375		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990 FACILITY	NITRATE-N DRY (LBS)	WET (LBS)	AMMONIA-N DRY (LBS)	WET (LBS)	ORGANIC N DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*	*	*	*	*
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO. (TROUTDALE)						
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION	*					
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TOTAL PHOSPHORUS		COD		BENZO(A)PYRENE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO	*	*				
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)					5 55	*
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	486	430	28342	77449		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TOTAL PHOSPHORUS		COD		BENZO(A)PYRENE	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						2 00
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*				
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)					4 39	3 29
REYNOLDS METALS CO (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)					*	*
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC. - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			75819	135754		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TOTAL PHENOL		PHENOL		TOTAL PAH	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)					*	
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS						
TOWN OF KALAMA						
CHEVRON CHEMICAL CO (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	10 5	20 4	*	1 5		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC - HOECHT-CELANESE						

* = Data not available

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SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TOTAL PHENOL		PHENOL		TOTAL PAH	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST. HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	(495 1)	(12046 4)				
CITY OF GRESHAM	(813 4)	(630 3)				
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO			*	*		
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			23 5	34 4		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TCDD/TCDF		CHLOROFORM		PENTACHLOROPHENOL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO.						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC. (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)	*	*				
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO (LONGVIEW)						
REYNOLDS METALS CO (LONGVIEW)						
REYNOLDS METALS CO. (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)					*	
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST. HELENS	*	*	*	*		
TOWN OF KALAMA						
CHEVRON CHEMICAL CO. (FERTILIZER)						
KALAMA CHEMICAL, INC.						
KALAMA CHEMICAL, INC						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC. - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	TCDD/TCDF		CHLOROFORM		PENTACHLOROPHENOL	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP - ST HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND	*	*				
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO. (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)	*	*				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC. - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION					*	
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS						
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX W

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	AOX		EPA priority pollutants		THORIUM 232	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
CITY OF WARRENTON						
POINT ADAMS PACKING						
TOWN OF ILWACO						
FORT COLUMBIA STATE PARK						
WARRENTON DEEP SEA, INC						
BIOPRODUCTS INCORPORATED						
PACIFIC COAST SEAFOODS CO						
JESSIE'S ILWACO FISH CO						
CHINOOK PACKING CO						
CITY OF ASTORIA						
ASTORIA SEAFOOD CO						
OCEAN FOODS OF ASTORIA						
ASTORIA PLYWOOD CORPORATION						
TOWN OF CATHLAMET						
JAMES RIVER II, INC. (WAUNA MILL)	*	*				
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
JAMES RIVER II, INC (WAUNA MILL)						
PORTLAND GENERAL ELECTRIC CO (BEAVER)						
COWLITZ COUNTY REGIONAL WWTP						
CITY OF RAINIER						
RIVERWOOD MOBILE HOME PARK						
STELLA WWTP						
LONGVIEW FIBRE CO	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)	*	*				
WEYERHAEUSER PAPER CO (LONGVIEW)						
WEYERHAEUSER PAPER CO. (LONGVIEW)						
REYNOLDS METALS CO. (LONGVIEW)						
REYNOLDS METALS CO. (LONGVIEW)						
INTERNATIONAL PAPER CO (LONGVIEW)						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
CITY OF ST HELENS	*	*				
TOWN OF KALAMA						
CHEVRON CHEMICAL CO. (FERTILIZER)						
KALAMA CHEMICAL, INC						
KALAMA CHEMICAL, INC	*		*	*		
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO , TROJAN NUCLEAR						
PORTLAND GENERAL ELECTRIC CO., TROJAN NUCLEAR						
VIRGINIA CHEMICALS, INC. - HOECHT-CELANESE						

* = Data not available

SUMMARY OF PERMITTED POINT SOURCE DATA FOR THE LOWER COLUMBIA RIVER BELOW BONNEVILLE DAM, 1990	AOX		EPA priority pollutants		THORIUM 232	
FACILITY	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)	DRY (LBS)	WET (LBS)
BOISE CASCADE CORP. - ST. HELENS VENEER MILL						
SALMON CREEK WWTP						
VANCOUVER TROUT HATCHERY						
CITY OF PORTLAND			*	*	*	*
CITY OF GRESHAM						
CITY OF VANCOUVER (EASTSIDE)						
CITY OF VANCOUVER (WESTSIDE)						
REYNOLDS METALS CO. (TROUTDALE)						
REYNOLDS METALS CO. (TROUTDALE)						
JAMES RIVER II, INC (CAMAS MILL)	*	*				
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
THE ALUMINUM COMPANY OF AMERICA (ALCOA)						
BOISE CASCADE CORPORATION (VANCOUVER)						
JAMES RIVER II, INC - SUNDIAL CHIP RELOADING						
NORTHWEST PACKING CO						
GATX TERMINALS CORPORATION						
GREAT WESTERN MALTING CO						
FORT VANCOUVER PLYWOOD CO						
IDEAL BASIC INDUSTRIES - HOLNAM INC						
COLUMBIA VISTA CORPORATION						
OREGON STATE DEPARTMENT OF FISH AND WILDLIFE						
PENDLETON WOOLEN MILLS			*	*		
CITY OF CAMAS						
U S ARMY CORPS OF ENGINEERS						
CITY OF NORTH BONNEVILLE						

* = Data not available

APPENDIX X

APPENDIX X CHEMICALS USED IN OREGON AND WASHINGTON FORESTS

(Page 1 of 5)

EPA NUMBER	TOXICITY VALUE	MOBILITY VALUE	PERSISTENCE VALUE	CHEMICAL INGREDIENT	COMMON NAME	TARGET CROP	PESTICIDE TYPE
		NON LEACHER	< 6 MONTHS	diesel oil			
100-435	CAUTION	LEACHER	6-12 MONTHS	simazine	PRINCEP AG	CHRISTMAS	HERBICIDE
100-437	CAUTION	LEACHER	6-12 MONTHS	simazine	PRINCEP 80W	FOREST	HERBICIDE
100-535	CAUTION	LEACHER	> 1 YR	atrazine	AATREX ALC	CHRISTMAS	HERBICIDE
100-603	CAUTION	LEACHER	6-12 MONTHS	simazine	PRINCEP CALIBER 90	CHRISTMAS	HERBICIDE
100-607	DANGER	NON LEACHER	> 1 YR.	metoloxyl	RIDOML 2E	FOREST	FUNGICIDE
100-646	CAUTION	NON LEACHER	> 1 YR	metoloxyl	SUBDUE 5G	FOREST	FUNGICIDE
10163-78	DANGER-POISON	NON LEACHER	< 6 MONTHS	azinphos methyl	GOWAN AZINPHOS-W 50 WP	FOREST	INSECTICIDE
10182-104	CAUTION	NON LEACHER	< 6 MONTHS	fluazifop-butyl	FUSILADE 2000 HERBICIDE	CHRISTMAS	HERBICIDE
11220-1	DANGER-POISON	NON LEACHER	< 6 MONTHS	dichloropropene	TELONE II	FOREST	FUNGICIDE
11220-20	DANGER-POISON	NON LEACHER	< 6 MONTHS	dichloropropene, chloropicrin	TRI-FORM 15	FOREST	INSECTICIDE
11220-21	DANGER-POISON	NON LEACHER	< 6 MONTHS	dichloropropene, chloropicrin	TRI-FORM 30	FOREST	FUNGICIDE
1386-43	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D	2, 4-D AMINE WEED KILLER.	FOREST	HERBICIDE
1471-113	CAUTION	NON LEACHER	< 6 MONTHS	aryzolin	SURFLAN A S FOR ORNAMENTALS	CHRISTMAS	HERBICIDE
19713-46	CAUTION	LEACHER	6-12 MONTHS	simazine	SIMAZINE 80W	CHRISTMAS	HERBICIDE
19713-6	CAUTION	LEACHER	> 1 YR	atrazine	ATRAZINE 80	FOREST	HERBICIDE
19713-60	CAUTION	LEACHER	6-12 MONTHS	simazine	DREXEL SIMAZINE 4L	CHRISTMAS	HERBICIDE
19713-91	WARNING	NON LEACHER	6-12 MONTHS	diazinon	DIAZINON INSECTICIDE	FOREST	INSECTICIDE
1990-76	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	COOP WEED OUT LO-VOL ESTER 4-LB	FOREST	HERBICIDE
2217-675	CAUTION	NON LEACHER	6-12 MONTHS	dichlobenil	NOROSAC 4G	FOREST	HERBICIDE
2217-703	DANGER	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine, 2, 4-D diethanalamine	HI-DEP	FOREST	HERBICIDE
2217-758	WARNING	NON LEACHER	< 6 MONTHS	2,4-D isooctyl,2-octyl ester, dichlorprop isooctyl ester	ACME SUPER BRUSH KILLER	FOREST	HERBICIDE
228-139	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl, 2-octyl ester	RIVERDALE 2 4-D LOW VOLATILE ESTER	FOREST	HERBICIDE
228-143	DANGER	NON LEACHER	< 6 MONTHS	MCPA dimethylamine	MCPA 4 AMINE	FOREST	HERBICIDE
228-143-2935	DANGER	NON LEACHER	< 6 MONTHS	MCPA dimethylamine	MCPA 4	FOREST	HERBICIDE
228-143-42750	DANGER	NON LEACHER	< 6 MONTHS	MCPA dimethylamine	MCPA AMINE 4	FOREST	HERBICIDE
228-145-2935	DANGER	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	AMINE 4	FOREST	HERBICIDE
228-156	WARNING	NON LEACHER	< 6 MONTHS	MCPA isooctyl ester	RIVERDALE WEEDSTROY MCPA LV ESTER	FOREST	HERBICIDE
228-156-2935	WARNING	NON LEACHER	< 6 MONTHS	MCPA isooctyl ester	MCPA ESTER	FOREST	HERBICIDE
228-167-2993	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl, 2-octyl ester	BRAYTON BRUSH KILLER	FOREST	HERBICIDE
239-1281-34704	DANGER	NON LEACHER	< 6 MONTHS	naled, oil/petroleum distillate	DIBROM 8 EMULSIVE	FOREST	INSECTICIDE
2393-460	WARNING	NON LEACHER	< 6 MONTHS	dazomel	BASAMO GRANULAR	FOREST	FUNGICIDE
241-208	CAUTION	NON LEACHER	< 6 MONTHS	malathion	CYTHON ULV	FOREST	INSECTICIDE
241-2o8	CAUTION	NON LEACHER	< 6 MONTHS	penoimetholin	PROWL DB HERBICIDE	CHRISTMAS	HERBICIDE
241-299	CAUTION	NON LEACHER	< 6 MONTHS	imazopyr isopropylamine	ARSENAL APPL CONC (SITE PREP)	FOREST	HERBICIDE
241-305	WARNING	NON LEACHER	< 6 MONTHS	penoimetholin	STOMP HERBICIDE	CHRISTMAS	HERBICIDE
241-308	CAUTION	NON LEACHER	< 6 MONTHS	imazopyr isopropylamine	ARSENAL 5-G (FORESTRY)	FOREST	HERBICIDE
241-330	CAUTION	NON LEACHER	< 6 MONTHS	imazopyr	CHOPPER RTU-BASAL & CUT SURFACE	FOREST	HERBICIDE
264-124	CAUTION	NON LEACHER	< 6 MONTHS	amilrole, simazine	AMIZINE	FOREST	HERBICIDE
264-2	DANGER	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	WEEDAR 64	FOREST	HERBICIDE
264-20	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D butoxyethyl ester	WEEDONE LV4 (CONIFER RELEASE)	FOREST	HERBICIDE
264-222	CAUTION	NON LEACHER	< 6 MONTHS	dichlorpropbutoxyethanol, 2, 4-D butoxyethel ester	WEEDONE 170 (CONIFER RELEASE)	FOREST	HERBICIDE
264-231	CAUTION	NON LEACHER	< 6 MONTHS	dichlorprop	WEEDONE 2, 4-DP (FOREST)	FOREST	HERBICIDE
264-271	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D butoxyethel ester	WEEDONE EMULSIFIABLE LV6 (CONF REL)	FOREST	HERBICIDE
264-314	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN 50W	FOREST	INSECTICIDE

EPA NUMBER	TOXICITY VALUE	MOBILITY VALUE	PERSISTENCE VALUE	CHEMICAL INGREDIENT	COMMON NAME	TARGET CROP	PESTICIDE TYPE
264-316	WARNING	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN 80S	FOREST	INSECTICIDE
264-323	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl, oil/petroleum distillate	SEVIN 4 OIL	FOREST	INSECTICIDE
264-333	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN XLR PLUS	FOREST	INSECTICIDE
264-334-802	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	LILLY/MILLER SEVIN SPRAY	FOREST	INSECTICIDE
264-334-909	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	COOKE SEVIN BRAND LIQUID CARBARYL	FOREST	INSECTICIDE
264-335	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN SL	FOREST	INSECTICIDE
264-335-10404	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	LESCO BRAND SEVIN SL	FOREST	INSECTICIDE
264-335-34704	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN 4LC	FOREST	INSECTICIDE
264-349	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN 4F	FOREST	INSECTICIDE
264-419-54508	DANGER	NON LEACHER	< 6 MONTHS	dichloprop, 2, 4-D diethanalamine	DPC AMINE	FOREST	HERBICIDE
264-422	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl, oil/petroleum distillate	SEVIN ULV	FOREST	INSECTICIDE
264-423	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN FL	FOREST	INSECTICIDE
2749-163	CAUTION	LEACHER	6-12 MONTHS	simazine	SIMAZINE 80W	CHRISTMAS	HERBICIDE
2749-163-34704	CAUTION	LEACHER	6-12 MONTHS	simazine	SIMAZINE 80W	CHRISTMAS	HERBICIDE
2749-41	WARNING	NON LEACHER	< 6 MONTHS	dimethoate	DIMETHOGON 267 EC	FOREST	INSECTICIDE
2749-485-34704	CAUTION	LEACHER	> 1 YR	atrazine	ATRAZINE 90 (CONIFER-TANK MIX)	FOREST	HERBICIDE
2749-509-9779	CAUTION	LEACHER	6 - 12 MONTHS	simazine	SIMAZINE 90 DF	CHRISTMAS	HERBICIDE
275-18	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL WORM KILLER	FOREST	INSECTICIDE
275-36	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 4L WORM KILLER	FOREST	INSECTICIDE
275-37	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 2X WETTABLE POWDER	FOREST	INSECTICIDE
275-48	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 6L	FOREST	INSECTICIDE
275-51	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 8L	FOREST	INSECTICIDE
275-59	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 6 AF WORM KILLER	FOREST	INSECTICIDE
275-65	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL ES	FOREST	INSECTICIDE
275-67	CAUTION	NON LEACHER	< 6 MONTHS	B T	DIPEL 8AF	FOREST	INSECTICIDE
279-1380	DANGER	NON LEACHER	> 1 YR	endosulfan	THIODAN 50 WP (CHRISTMAS TREE)	CHRISTMAS	INSECTICIDE
279-2821	WARNING	NON LEACHER	< 6 MONTHS	dimethoate	DIMETHOATE 267 (CONIFER)	FOREST	INSECTICIDE
279-2876	DANGER-POISON	LEACHER	< 6 MONTHS	carbofuran	FURADAN 4 F	FOREST	INSECTICIDE
279-2876-3125	DANGER-POISON	LEACHER	< 6 MONTHS	carbofuran	FURADAN 4 F	FOREST	INSECTICIDE
279-2924	DANGER-POISON	NON LEACHER	> 1 YR	endosulfan	THIODAN 3 E C (CHRISTMAS TREE)	CHRISTMAS	INSECTICIDE
279-3023	WARNING	LEACHER	< 6 MONTHS	carbofuran	FURADAN 15G	FOREST	INSECTICIDE
279-3051	WARNING	NON LEACHER	< 6 MONTHS	permethrin	POUNCE 25 WP	FOREST	INSECTICIDE
279-3057	WARNING	NON LEACHER	< 6 MONTHS	bifenthrin	TALSTAR 10 WP (ORNAMENTALS, NURSERY)	CHRISTMAS	INSECTICIDE
2935-388	WARNING	NON LEACHER	6 - 12 MONTHS	diazinon, oil/xylene	DIAZINON 4 SPRAY	FOREST	INSECTICIDE
3125-111	CAUTION	NON LEACHER	< 6 MONTHS	oxydemeton methyl, oil/petroleum solvent	METASYSTOX-R SPRAY CONC (DOUG FIR)	FOREST	INSECTICIDE
3125-193	DANGER	NON LEACHER	< 6 MONTHS	azinphos methyl	GUTHION 50% WETTABLE POWDER	CHRISTMAS	INSECTICIDE
3125-338	DANGER-POISON	NON LEACHER	< 6 MONTHS	azinphos methyl	GUTHION 3 FLOWABLE	CHRISTMAS	INSECTICIDE
322-1	DANGER-POISON	NON LEACHER	> 1 YR	strychnine	FORT DODGE GOPHER BAIT	FOREST	RODENTICIDE
33560-21	CAUTION	LEACHER	< 6 MONTHS	hexazinone	PRONONE 10G (FORESTRY)	FOREST	HERBICIDE
33560-41	WARNING	LEACHER	< 6 MONTHS	hexazinone	PRONONE POWER PELLET (ENDANG SPCS)	FOREST	HERBICIDE
34704-10	DANGER-POISON	NON LEACHER	< 6 MONTHS	methyl parathion, oil/xylene	METHYL PARATHION 4-E	FOREST	INSECTICIDE
34704-115	CAUTION	NON LEACHER	< 6 MONTHS	MSMA	MSMA 6 PLUS	FOREST	HERBICIDE
34704-2	DANGER-POISON	NON LEACHER	< 6 MONTHS	parathion, oil/xylene	PARATHION 4 EC	CHRISTMAS	INSECTICIDE
34704-203	CAUTION	NON LEACHER	< 6 MONTHS	malathion	MALATHION ULV-91	FOREST	INSECTICIDE
34704-24	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEYMOL 4 INSECTICIDE	FOREST	INSECTICIDE
34704-350	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	CARBARYL 50 WP	FOREST	INSECTICIDE
34704-41	WARNING	NON LEACHER	6 - 12 MONTHS	diazinon, oil/xylene	DIAZINON AG500	FOREST	INSECTICIDE

APPENDIX X CHEMICALS USED IN OREGON AND WASHINGTON FORESTS
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EPA NUMBER	TOXICITY VALUE	MOBILITY VALUE	PERSISTENCE VALUE	CHEMICAL INGREDIENT	COMMON NAME	TARGET CROP	PESTICIDE TYPE
34704-447	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	CARBARYL 4L	FOREST	INSECTICIDE
34704-5	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	AMINE 4 2, 4-D WEED KILLER	FOREST	HERBICIDE
34704-546	DANGER	NON LEACHER	< 6 MONTHS	naled	DIBROM 8 EC	FOREST	INSECTICIDE
34704-685	CAUTION	LEACHER	> 1 YR.	atrazine	SIMAZINE 80 W	FOREST	HERBICIDE
34704-686	CAUTION	LEACHER	> 1 YR.	atrazine	SIMAZINE 90 WDG	FOREST	HERBICIDE
34704-687	CAUTION	LEACHER	6 - 12 MONTHS	simazine	SIMAZINE 4L FLOWABLE HERBICIDE	CHRISTMAS	HERBICIDE
34704-69	CAUTION	LEACHER	> 1 YR	atrazine	ATRAZINE 4L (CONIFER - TANK MIXES)	FOREST	HERBICIDE
34704-85	DANGER-POISON	NON LEACHER	< 6 MONTHS	parathion	PARATHION 8-F	CHRISTMAS	INSECTICIDE
34704-9	DANGER-POISON	NON LEACHER	< 6 MONTHS	parathion, oil/xylene	PARATHION 8-E	CHRISTMAS	INSECTICIDE
352-329	DANGER	LEACHER	< 6 MONTHS	hexazinone	VELPAR L (SITE PREP-CONIFER REL)	FOREST	HERBICIDE
352-342	DANGER	NON LEACHER	< 6 MONTHS	methamyl	LANNATE	FOREST	INSECTICIDE
352-354	CAUTION	NON LEACHER	6 - 12 MONTHS	benamyl	BENLATE (PINE SEEDLING)	FOREST	FUNGICIDE
352-370	DANGER-POISON	NON LEACHER	< 6 MONTHS	methamyl	LANNATE L	FOREST	INSECTICIDE
352-376	CAUTION	NON LEACHER	< 6 MONTHS	fosamine ammonium	KRENITE	FOREST	HERBICIDE
352-378	WARNING	LEACHER	< 6 MONTHS	hexazinone	VELPAR (SITE PREP & CONIFER REL)	FOREST	HERBICIDE
352-392	DANGER	LEACHER	< 6 MONTHS	hexazinone	VELPAR L HERBICIDE	CHRISTMAS	HERBICIDE
352-395	WARNING	NON LEACHER	< 6 MONTHS	fosamine ammonium	KRENITE S	FOREST	HERBICIDE
352-401	CAUTION	NON LEACHER	< 6 MONTHS	sulfometuron methyl	OUST HERBICIDE	FOREST	HERBICIDE
352-450	DANGER	LEACHER	< 6 MONTHS	hexazinone	VELPAR ULW (DRY APPL. FOREST)	FOREST	HERBICIDE
352-485	WARNING	NON LEACHER	< 6 MONTHS	fenvalerate	PYDRIN 2 4 E C	CHRISTMAS	INSECTICIDE
352-490	CAUTION	LEACHER	> 1 YR	atrazine	ATRAZINE 4L	CHRISTMAS	HERBICIDE
352-491	CAUTION	LEACHER	> 1 YR	atrazine	ATRAZINE 80 W	FOREST	HERBICIDE
352-502	DANGER	NON LEACHER	< 6 MONTHS	fenvalerate	ASANA 1 9 EMULSIFIABLE CONCENTRATE	FOREST	INSECTICIDE
352-515	WARNING	NON LEACHER	< 6 MONTHS	fenvalerate	ASANA XL	FOREST	INSECTICIDE
37100-29-2217	CAUTION	NON LEACHER	< 6 MONTHS	B T.	BACTOSPEINE WETTABLE POWDER	FOREST	INSECTICIDE
37100-32-2217	CAUTION	NON LEACHER	< 6 MONTHS	B T	BACTOSPEINE FLOWABLE CONC	FOREST	INSECTICIDE
37100-8-400	CAUTION	NON LEACHER	< 6 MONTHS	diflubenzuron	DIMLIN 25 W	CHRISTMAS	INSECTICIDE
38167-17	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	WEED RHAP A-4D	FOREST	HERBICIDE
39511-58-34704	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl ethylmethyl ester	LOW VOL B-4 2, 4-D HERBICIDE (FOREST)	FOREST	HERBICIDE
400-82	DANGER	NON LEACHER	< 6 MONTHS	propargite	OMITE-CR (CHRISTMAS TREES)	CHRISTMAS	INSECTICIDE
419-220-53853	CAUTION	NON LEACHER	< 6 MONTHS	B T	BURGESS DIPEL HG	FOREST	INSECTICIDE
42545-18	CAUTION	NON LEACHER	< 6 MONTHS	MCPA diethanolamine	MCPA AMINE 4	FOREST	HERBICIDE
42545-18-2935	DANGER	NON LEACHER	< 6 MONTHS	MCPA diethanolamine	MCPA AMINE 4	FOREST	HERBICIDE
42545-27	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2, 4-D LV4	FOREST	HERBICIDE
42545-27-2935	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2, 4-D LV4	FOREST	HERBICIDE
42545-37	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	2, 4-D AMINE NO 4	FOREST	HERBICIDE
42545-37-2935	DANGER	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	2, 4-D AMINE NO 4	FOREST	HERBICIDE
42545-38	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2, 4-D LV6	FOREST	HERBICIDE
42545-38-2935	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2, 4-D LOW VOLATE ESTER 6L	FOREST	HERBICIDE
42545-43	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	SEE 2, 4-D	FOREST	HERBICIDE
42545-43-9779	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	SEE 2, 4-D LV4	FOREST	HERBICIDE
42697-1	CAUTION	NON LEACHER	< 6 MONTHS	Soap	INSECTICIDE CONCENTRATE	CHRISTMAS	INSECTICIDE
4581-230	WARNING	NON LEACHER	< 6 MONTHS	ziram	ZIRAM F-4	FOREST	FUNGICIDE
46077-7-51036	DANGER	NON LEACHER	< 6 MONTHS	Azinphos methyl	MICRO-FLO AZINPHOSMETHYL 50W	FOREST	INSECTICIDE
464-306	WARNING	NON LEACHER	< 6 MONTHS	2, 4-D triisopropanolamine, picloram	TORDON 101 MIXTURE	FOREST	HERBICIDE
464-347	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	ESTERON 6E HERBICIDE (FOREST SITE)	FOREST	HERBICIDE
464-349-264	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	ESTERON 99 CONCENTRATE	FOREST	HERBICIDE

APPENDIX X CHEMICALS USED IN OREGON AND WASHINGTON FORESTS

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EPA NUMBER	TOXICITY VALUE	MOBILITY VALUE	PERSISTENCE VALUE	CHEMICAL INGREDIENT	COMMON NAME	TARGET CROP	PESTICIDE TYPE
464-402	CAUTION	NON LEACHER	< 6 MONTHS	dolapon magnesium salt, dolapon sodium salt	DOWPON M GRASS KILLER	FOREST	HERBICIDE
464-421	CAUTION	LEACHER	> 1 YR	picloram potassium salt	TORDON K HERBICIDE	FOREST	HERBICIDE
464-510	WARNING	LEACHER	> 1 YR	picloram triisopropanolamine 2, 4-D triisopropanolamine	TORDON RTU HERBICIDE	FOREST	HERBICIDE
464-546	DANGER	NON LEACHER	< 6 MONTHS	triclopyr	REDEEM HERBICIDE	FOREST	HERBICIDE
464-554	CAUTION	NON LEACHER	< 6 MONTHS	triclopyr butoxyethyl ester	GARLON 4	FOREST	HERBICIDE
464-566-1381	WARNING	NON LEACHER	< 6 MONTHS	2, 4-D butoxyethyl ester	CLASS IV 4 PREMIUM	FOREST	HERBICIDE
464-576	CAUTION	LEACHER	> 1 YR	picloram isooctylester, triclopyr	ACCESS HERBICIDE	FOREST	HERBICIDE
464-643	CAUTION	NON LEACHER	< 6 MONTHS	triclopyr	EXETOR HERBICIDE	FOREST	HERBICIDE
476-1917	WARNING	NON LEACHER	< 6 MONTHS	phosmet	IMIDAN 50-WP	FOREST	INSECTICIDE
4787-8-51036	CAUTION	NON LEACHER	< 6 MONTHS	malathion	MALATHON ULV	FOREST	INSECTICIDE
4816-490	CAUTION	NON LEACHER	< 6 MONTHS	pyrethrins, piperonyl butoxide, oil/petrol dist	PYRENONE CROP SPRAY INSECTICIDE	FOREST	INSECTICIDE
50534-157-34704	DANGER	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO 90DG	CHRISTMAS	FUNGICIDE
51534-157-9779	DANGER	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO 90DF	FOREST	FUNGICIDE
50534-161	WARNING	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO FLOWABLE FUNGICIDE	CHRISTMAS	FUNGICIDE
50534-188	DANGER	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO 720 (VARIOUS CROPS)	FOREST	FUNGICIDE
50534-23	DANGER	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO W-75	FOREST	FUNGICIDE
50534-8	WARNING	NON LEACHER	< 6 MONTHS	chlorothalonil	BRAVO 500	FOREST	FUNGICIDE
50534-9	DANGER	NON LEACHER	< 6 MONTHS	chlorothalonil	DADCONIL 2787 FLOW (FOREST NURSERY)	FOREST	FUNGICIDE
51036-71	WARNING	NON LEACHER	6 - 12 MONTHS	diazinon	DIAZINON AG-500	FOREST	INSECTICIDE
51036-91	DANGER-POISON	NON LEACHER	> 1 YR	endosulfan	MICRO FLO ENDOSULFAN 50 WP	CHRISTMAS	INSECTICIDE
52251-6	WARNING	NON LEACHER	> 1 YR	lindane	OR-CAL LINDANE 400	CHRISTMAS	INSECTICIDE
524-308	WARNING	NON LEACHER	< 6 MONTHS	glyphosate	ROUNDUP	FOREST	HERBICIDE
524-326	CAUTION	NON LEACHER	< 6 MONTHS	glyphosate	ACCORD (GARLON TANK MX-CONIFER REL)	FOREST	HERBICIDE
524-343	CAUTION	NON LEACHER	< 6 MONTHS	glyphosate	RODEO	FOREST	HERBICIDE
524-386	WARNING	NON LEACHER	< 6 MONTHS	dicamba dimethylamine	TROOPER HERBICIDE	FOREST	HERBICIDE
5481-165-34704	DANGER	NON LEACHER	< 6 MONTHS	naled, oil/petroleum solvent	NALED 8	FOREST	INSECTICIDE
5481-213	CAUTION	LEACHER	6-12 MONTHS	simazine	ALCO SIMIZINE 4G	CHRISTMAS	HERBICIDE
55947-1	WARNING	NON LEACHER	< 6 MONTHS	dicamba dimethylamine	ANVEL	FOREST	HERBICIDE
55947-101	CAUTION	NON LEACHER	< 6 MONTHS	fluvalinate	MAVRIK AQUAFLOW INSECTICIDE	CHRISTMAS	INSECTICIDE
55947-20	CAUTION	NON LEACHER	< 6 MONTHS	dicamba dimethylamine, 2, 4-D dimethylamine	BANVEL-720 WS INDUSTRIAL HERBICIDE	FOREST	HERBICIDE
55947-32	CAUTION	NON LEACHER	< 6 MONTHS	dicamba dimethylamine	BANVEL CST	FOREST	HERBICIDE
55947-69	CAUTION	NON LEACHER	< 6 MONTHS	B T	THURICIDE 32LV	FOREST	INSECTICIDE
55947-97	WARNING	NON LEACHER	> 1 YR	dienochlor	PENTAC AQUAFLOW MITICIDE	CHRISTMAS	INSECTICIDE
56-57	CAUTION	NON LEACHER	> 1 YR	diphacinone	EATONS ANSWER - POCKET GOPHERS	FOREST	RODENTCIDE
5785-22	DANGER-POISON	NON LEACHER	< 6 MONTHS	methyl bromide	TERR-O-GAS 98	FOREST	HERBICIDE
5785-24-37733	DANGER-POISON	NON LEACHER	< 6 MONTHS	methyl bromide, chloropicrin	BRO-MEAN C-33	FOREST	FUNGICIDE
58998-1	CAUTION	NON LEACHER	< 6 MONTHS	B T	BIOBIT WETTABLE POWDER	FOREST	INSECTICIDE
58998-2	CAUTION	NON LEACHER	< 6 MONTHS	B T	BIOBIT FLOWABLE CONCENTRATE	FOREST	INSECTICIDE
58998-7	CAUTION	NON LEACHER	< 6 MONTHS	B T	FORAY 48B FLOWABLE CONCENTRATE	FOREST	INSECTICIDE
5905-248	WARNING	NON LEACHER	6-12 MONTHS	diazinon, oil/xylene	DIAZINON AG500	FOREST	INSECTICIDE
5905-248-38167	WARNING	NON LEACHER	6-12 MONTHS	diazinon, oil/xylene	DIAZINON AG500	FOREST	INSECTICIDE
5905-414	DANGER	NON LEACHER	< 6 MONTHS	methyl parathion	7 51B METHYL PARATHION	CHRISTMAS	INSECTICIDE
5905-55	DANGER-POISON	NON LEACHER	< 6 MONTHS	methyl parathion, oil/aromatic petroleum distil	4LB METHYL PARATHION	FOREST	INSECTICIDE
5905-55-38167	DANGER	NON LEACHER	< 6 MONTHS	methyl parathion, oil/xylene	4LB METHYL PARATHION	FOREST	INSECTICIDE
5905-82	DANGER	NON LEACHER	< 6 MONTHS	parathion, oil/xylene	PARATHION 4-E	CHRISTMAS	INSECTICIDE
5905-86	DANGER-POISON	NON LEACHER	< 6 MONTHS	parathion, oil/xylene	PARATHION 8E	CHRISTMAS	INSECTICIDE

APPENDIX X CHEMICALS USED IN OREGON AND WASHINGTON FORESTS

(Page 5 of 5)

EPA NUMBER	TOXICITY VALUE	MOBILITY VALUE	PERSISTENCE VALUE	CHEMICAL INGREDIENT	COMMON NAME	TARGET CROP	PESTICIDE TYPE
5905-86-38167	DANGER	NON LEACHER	< 6 MONTHS	parathion, oil/xylene	PARATHION 8E	CHRISTMAS	INSECTICIDE
59639-15	DANGER	NON LEACHER	< 6 MONTHS	naled, oil/petroleum distillate	VALENT DIBRON 8 EMULSIVE	FOREST	INSECTICIDE
59639-26	CAUTION	NON LEACHER	< 6 MONTHS	acephate	VALENT ORTHENE TURF, TREE & ORN SPRAY	CHRISTMAS	INSECTICIDE
59639-57	DANGER	NON LEACHER	> 1 YR	lindane	VALENT LINDANE #200 SPRY (FRST NRSRY)	FOREST	INSECTICIDE
62719-11	WARNING	NON LEACHER	6-12 MONTHS	chlorpyrifos	DURSBAN 4E	FOREST	INSECTICIDE
62719-17	WARNING	LEACHER	> 1 YR	picloram potassium salt	TORDON K	FOREST	HERBICIDE
62719-31	WARNING	LEACHER	> 1 YR	picloram triisopropanolamine, 2, 4-D triisopropanolamine	TORDON RTU	FOREST	HERBICIDE
62719-37	DANGER	NON LEACHER	< 6 MONTHS	triclopyr	GARLON 3A	FOREST	HERBICIDE
62719-40	CAUTION	NON LEACHER	< 6 MONTHS	triclopyr	GARLON 4	FOREST	HERBICIDE
62719-5	WARNING	LEACHER	> 1 YR	picloram triisopropanolamine	TORDON 101 MIXTURE	FOREST	HERBICIDE
62719-57	CAUTION	LEACHER	> 1 YR	picloram isooctyl ester, triclopyr	ACCESS	FOREST	INSECTICIDE
62719-68	WARNING	NON LEACHER	6-12 MONTHS	chlorpyrifos	DURSBAN 50W	CHRISTMAS	INSECTICIDE
62719-72	WARNING	NON LEACHER	6-12 MONTHS	chlorpyrifos	DURSBAN 50W	CHRISTMAS	INSECTICIDE
62719-73	CAUTION	NON LEACHER	< 6 MONTHS	clopyralid	STINGER	CHRISTMAS	HERBICIDE
644-98	CAUTION	NON LEACHER	< 6 MONTHS	decanol, mineral oil	FLIT-MLO	FOREST	INSECTICIDE
655-459	WARNING	NON LEACHER	6-12 MONTHS	diazinon	DIAZINON AG500	FOREST	INSECTICIDE
655-777	CAUTION	NON LEACHER	< 6 MONTHS	malathion	PRENTOX 5LB MALATHION	FOREST	INSECTICIDE
70-785	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	SEVIN 50% WETTABLE	FOREST	INSECTICIDE
707-159	CAUTION	NON LEACHER	6-12 MONTHS	pronamide	KERB 50-W IN WSP	CHRISTMAS	HERBICIDE
707-174	WARNING	NON LEACHER	< 6 MONTHS	oxyfluorfen	GOAL 1 6E	CHRISTMAS	HERBICIDE
707-202	CAUTION	NON LEACHER	> 1 YR	dicofol	KELTHANE MF (CHRISTMAS TREE)	CHRISTMAS	INSECTICIDE
8536-15	DANGER-POISON	NON LEACHER	> 6 MONTHS	methyl bromide	METHYL BROMIDE 100 FUMIGANT	FOREST	HERBICIDE
8590-419-39867	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	BLUE RIBBON SEVIN BRAND CARBARYL 4F	FOREST	INSECTICIDE
8622-12	DANGER-POISON	NON LEACHER	> 6 MONTHS	methyl bromide	98-2	FOREST	INSECTICIDE
8622-16	DANGER-POISON	NON LEACHER	> 6 MONTHS	methyl bromide	METABROM 100	FOREST	HERBICIDE
8622-17	DANGER-POISON	NON LEACHER	> 6 MONTHS	methyl bromide, chloropicrin	METABROM 99	FOREST	FUNGICIDE
9779-256	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2,4-D LV6	FOREST	HERBICIDE
9779-257	CAUTION	NON LEACHER	< 6 MONTHS	2, 4-D isooctyl 2-octyl ester	2,4-D LV4	FOREST	HERBICIDE
9779-260	CAUTION	NON LEACHER	< 6 MONTHS	carbaryl	CARBARYL 4L	FOREST	INSECTICIDE
9779-262	DANGER	NON LEACHER	< 6 MONTHS	MCPA dimethylamine	MCPA AMINE	FOREST	HERBICIDE
9779-263	DANGER	NON LEACHER	< 6 MONTHS	2, 4-D dimethylamine	2, 4-D AMINE 4	FOREST	HERBICIDE
9779-294	WARNING	NON LEACHER	< 6 MONTHS	carbaryl	CARBARYL 90DF	FOREST	INSECTICIDE
9779-296	CAUTION	LEACHER	6-12 MONTHS	simazine	SIMAZINE 4L	CHRISTMAS	HERBICIDE
9859-267-51036	WARNING	NON LEACHER	< 6 MONTHS	carbaryl	CARBRYL SPRAYABLE	FOREST	INSECTICIDE

APPENDIX Y

APPENDIX Y. CHEMICALS USED IN OREGON AND WASHINGTON AGRICULTURE AGRICULTURAL CENSUS DATA BY COUNTIES: 1987 AND 1982

OREGON

		Clatsop	Columbia	Multnomah
Commercial fertilizer	farms, 1987	57	209	317
	1982	85	198	288
	acres on which used, 1987	1266	6799	10892
	1982	1945	7645	11800
Cropland fertilized, except pastureland	farms, 1987	39	171	262
	1982	48	151	214
	acres on which used, 1987	866	5543	10156
	1982	1115	6286	10127
Pastureland and rangeland fertilized	farms, 1987	26	65	67
	1982	44	83	92
	acres on which used, 1987	400	1256	736
	1982	888	1359	1673
Lime	farms, 1987	--	11	65
	1982	--	39	62
	acres on which used, 1987	--	80	1162
	1982	--	862	911
	tons, 1987	--	166	1959
	1982	--	1235	1501
Sprays, dust, granules, fumigants, etc. to control insects on hay and other crops	farms, 1987	30	80	202
	1982	21	38	157
	acres on which used, 1987	(D)	31192	6900
	1982	154	2647	8490
Nematodes in crops	farms, 1987	1	10	21
	1982	--	24	14
	acres on which used, 1987	(D)	250	341
	1982	--	39	123
Diseases in crops and orchards	farms, 1987	31	53	84
	1982	16	47	52
	acres on which used, 1987	475	1161	3505
	1982	32	1945	4780
Weeds, grass, or brush in crops and pasture	farms, 1987	121	234	239
	1982	94	245	217
	acres on which used, 1987	4307	7765	9843
	1982	750	10195	6990
Chemicals used for defoliation or for growth control of crops or thinning of fruit	farms, 1987	--	15	27
	1982	8	16	30
	acres on which used, 1987	--	15	792
	1982	240	914	441

Source: U.S. Department Commerce, Bureau of the Census

WASHINGTON		Clark	Cowlitz	Pacific	Skamania	Wahkiakum
Commercial fertilizer	farms, 1987	504	152	151	29	34
	1982	641	106	151	27	33
	acres on which used, 1987	19930	6414	4230	1856	2071
	1982	21742	5944	4839	645	1583
Cropland fertilized, except pastureland	farms, 1987	413	117	131	27	17
	1982	502	70	142	20	18
	acres on which used, 1987	17356	4538	2908	1505	981
	1982	18949	4492	3635	462	876
Pastureland and rangeland fertilized	farms, 1987	145	56	28	9	23
	1982	211	49	35	13	20
	acres on which used, 1987	2574	1876	1322	351	1090
	1982	2793	1452	1204	183	707
Lime	farms, 1987	82	8	28	7	3
	1982	79	20	26	4	3
	acres on which used, 1987	794	226	314	145	45
	1982	745	388	678	15	40
	tons, 1987	497	353	658	(D)	90
	1982	1381	839	1210	(D)	55
Sprays, dust, granules, fumigants, etc. to control insects on hay and other crops	farms, 1987	170	27	98	9	8
	1982	135	20	88	5	2
	acres on which used, 1987	4403	661	1244	414	216
	1982	3606	982	1182	265	(D)
Nematodes in crops	farms, 1987	16	10	--	--	--
	1982	18	2	7	--	--
	acres on which used, 1987	265	382	--	--	--
	1982	297	(D)	182	--	--
Diseases in crops and orchards	farms, 1987	120	26	37	6	10
	1982	135	20	82	5	--
	acres on which used, 1987	2682	300	340	311	56
	1982	2808	338	942	31	--
Weeds, grass, or brush in crops and pasture	farms, 1987	588	205	121	22	54
	1982	623	220	194	19	51
	acres on which used, 1987	18082	6721	2763	782	1148
	1982	17113	8045	7443	(D)	2104
Chemicals used for defoliation or for growth control of crops or thinning of fruit	farms, 1987	23	16	7	8	--
	1982	83	1	--	5	--
	acres on which used, 1987	838	275	35	159	--
	1982	1559	(D)	--	48	--

Source: U.S. Department of Commerce, Bureau of the Census

AGRICULTURAL CHEMICALS USED FOR PEST CONTROL PROGRAM IN THE PACIFIC NORTHWEST	
Alfalfa Hay and Seed Crops	
Chemical Name	Trade Name
azınphosmethyl	Guthıon
bifenthrin	Capture
carbaryl	Sevın
carbofuran	Furadan
chlorpyrifos	rsban
diazinon	Dıazınon
dimethoate	Cygon, Rebelate, De-Trend
dısulfoton	Di-Syston
enndosulfan	Thıodan, Triovel
malathion	
metaldehyde bait	
methıdathion	Supracıde
methomyl	Lannate, Nudrın
methoxychlor	
methyl parathion	Penncap-M
mevınphos	Phosdrın
permethrin	Pounce
phosmet	Imidan
trichlorfon	Proxol, Dylox

Source: Pacific Northwest Insect Control Handbook Washington, Idaho, Oregon (1991) Compiled and Edited by Extensıon Entomologists: Oregon State University, University of Idaho, Washington State University

AGRICULTURAL CHEMICALS USED FOR TREE FRUIT PEST CONTROL PROGRAM		
Chemical Name	Trade Name	Toxicity Category
Insecticides & Miticides		
amitraz	Mitac	III
azinphos methyl	Guthion, Azinphos M.	I
carbaryl	Sevin	III
chlorpyrifos	Lorsban	II
clofentezine	Apollo	II
diazinon	Diazinon	II
dimethoate	Cygon	II
endosulfan	Thiodan	I
esfenvalerate	Asana	II
fenbutatin-oxide	Vendex	III
formetanate hydro chloride	Carzol	I
malathion	Malathion 8	III
methidathion	Supracide	I
methomyl	Lannate	I
methoxychlor	Methoxychlor	IV
methyl parathion	Penncap-M	I
oil (superior type 98%)	--	--
oxamyl	Vydate	III
oxythioquinox	Morestan	III
parathion	Parathion	I
permethrin	Pounce, Ambush	II, III
phosmet	Imidan	II
phosphamidon	Phosphamidon	I
propargite	Omite	III

Fungicides		
benomyl	Benolate	IV
captan	Captan	IV
chlorathalonil	Bravo	IV
copper sulfate	Copper Sulfate	I
copper other forms	Kocide, Micro Kop	III
dinocap	Karathane	III
dodine	Cyprex, Syllit	I
fenarimol	Rubigan	III
lime-sulfur	Orthorix	I
myclobutanil	Rally 40W	III
streptomycin	Agristrep	IV
triadimefon	Bayleton	
triforine	Funginex	IV
ziram	Ziram	III
Herbicides		
2,4-D	Envy, Formula 40, Dacamine 4D	I, III
dichlobenil	Casoron	III
diuron	Karmex	III
fluazifop-butyl	Fusilade	II, III
glyphosate	Roundup	II
napropamide	Devrinol	III
norflurazon	Solicam	IV
oryzalin	Surflan	IV
oxyfluorfen	Goal	--
paraquat	Gramoxone	II
pendimethalin	Prowl	III
pronamide	Kerb 50-W	--
simazine	Princep	IV

terbacil	Sinbar	IV
Chemical Thinning Program		
carbaryl	Savit 4F, Sevin XLP Plus, Sevin 50 WP	
DNOC[1]	Elgetol	
ethephon	Ethrel	
GA_3	Pro-Gibb	
GA_{4+7} + BA	Promalin	
NAA[2]	NAA 200 (+ surfactant) NAA 800 (+ surfactant) NAA WP (+ surfactant)	
NAD[3]	Amid-Thin W (+ surfactant)	
VERTEBRATE PEST MANAGEMENT		
Acute Toxicants (Single Dose)		
Aminopyridine		
Fenthion		
Starlicide		
Strychnine		
Strychnine Sulfate		
Zinc Phosphide		
Chronic Toxicants (Multiple Dose)		
Chlorophacinone Bait or Ground Spray		
Diphacinone		
Repellents		
Bone Meal		
Hinder		
Putrescent Egg		
Soap		
Thriam		

Fumigants (Gases)		
Aluminum Phosphide		
Magnesium Phosphide		
Potassium Nitrate & Sulfur		
Sodium Isopropylxanthate + Sulfur		
Sodium Nitrate + Sulfur		

Note: Toxicity Category: I is most toxic, IV is least toxic

[1] dinitrocresol

[2] naphthaleacetic acid

[3] nicotinamide adenine dinucleotide

Source: 1991 Crop Protection Guide for Tree Fruits in Washington. Cooperative Extension, Washington State University, College of Agriculture and Home Economics. EB0419

APPENDIX Z

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	FLOW		Calcium - Ca			Magnesium - Mg		
	(CFS)	(MGD)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989	3070	1984 1929	6 8	2706789 46	243611051 2	2 3	93786 1771	8581435 2
MARCH 21 1989	73800	47698 1876						
MAY 16 1989	2470	1596 40276	5 4	220193 633	20147717 43	1 8	73397 8777	6715905 809
JULY 16 1989	7560	4886 1558	7 8	318057 47	29102258 51	2 4	97863 8369	8954541 079
SEPT 5 1989	9030	5836 24165	6 4	311714 444	28521871 58	2 1	102281 302	9358739 113
NOV 30 1989	34400	22233 3015	5 7	1057602 58	97299437 02	1 7	315425 33	29019130 34
1989		(MGD)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY	6353 33333	4106 26674		283321 849	4744082698		91181 0055	1526780346
WET	37090	23971 894		1882196	31022854428		204606	3421651464
TOTAL		14039 0804		1082758 93	35766937126		147893 379	4948431810

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POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Sodium - Na			Potassium - K			Sulfate sulfur		
	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989	4 8	1910674 91	171960742	0 9	358251 546	32242639 13	6	2388343 64	214950927 5
MARCH 21 1989									
MAY 16 1989	4.3	175339.374	16043552 77	3 5	142718 096	13058705 74	2	81553 1974	7462117.565
JULY 16 1989	7 9	322135 13	29475364 38	1 1	44854 2586	4104164 661	5	203882 994	18655293 91
SEPT 5 1989	7 3	355549 287	32532759 78	1	48705 3818	4456542 435	5	243526 909	22282712 17
NOV 30 1989	5	927721 558	85350383 35	0 8	148435 449	13656061 34	3	556632 935	51210230 01
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		284341 264	4761152292		78759 2453	1318784183		176321 033	2952407543
WET		1419198	23415312409		253343	4176781742		1472488	24220665336
TOTAL		851769 749	28176464701		166051 371	5495565925		824404 66	27173072879

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POLLUTANT LOADING ESTIMATES AT WILLAMETTE

	Clonde - Cl (mg/L)	(lb/d)	(lbs)	Fluonde - F (mg/L)	(lb/d)	(lbs)	Silicate silicon (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989	4	1592229.09	143300618 4	0 1	39805.7273	3582515.46	17	6766973 64	609027628
MARCH 21 1989									
MAY 16 1989	3	122329 796	11193176 35	<0 100	4077 65987	373105 878	15	611648 981	55965881 74
JULY 16 1989	8	326212 79	29848470 26	0 1	4077 65987	373105 878	18	733978 777	67159058 09
SEPT 5 1989	5	243526 909	22282712 17	0 1	4870 53818	445654 243	17	827991 491	75761221 39
NOV 30 1989	3	556632 935	51210230 01	<0 100	18554 4312	1707007 67	16	2968708 99	273121226 7
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		230689 832	3862785886		4341 95264	72703826		724539 749	12132055835
WET		1074431	17700487201		29180	481346604		4867841	80275545780
TOTAL		652560 423	21563273087		16761 0159	554050430		2796190 53	92407601614

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Total dissolved solids			Nitrate-nitrite nitrogen			Ammonia nitrogen		
	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989	61	24281493.67	2185334430	0 9	358251 546	32242639 1	0 7	278640 091	25077608 2
MARCH 21 1989				0 6	238834 364	21495092 8	0 04	15922 2909	1433006.18
MAY 16 1989	48	1957276 738	179090821 6	0 2	8155 31974	746211 757	0 05	2038 82994	186552 939
JULY 16 1989	72	2935915 108	268636232 4	0 4	16310 6395	1492423 51	0 05	2038 82994	186552 939
SEPT 5 1989	62	3019733 672	276305631	0 3	14611 6145	1336962 73	0 06	2922 32291	267392 546
NOV 30 1989	52	9648304 205	887643986 8	0 4	74217 7247	6828030 67	0 05	9277 21558	853503 833
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		2637641 839	44165993779		13025 8579	218111478		2333 32759	39070403 9
WET		16964899	279641035922		223768	3674322928		101280	1660089839
TOTAL		9801270 387	3 23807E+11		118396 868	3892434406		51806 5968	1699160243

APPENDIX Z

POLLUTANT LOADING ESTIMATES AT WILLAMETTE

	Total kjeldahl nitrogen			Total posphorus (TP)			Ortho-phosphate-P		
	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989	0 3	119417 182	10747546.4	0.05	19902 8637	1791257 73	0 04	15922 2909	1433006 18
MARCH 21 1989	0 3	119417 182	10747546 4	0 1	39805 7273	3582515 46	0 07	27864 0091	2507760 82
MAY 16 1989	0 2	8155 31974	746211 757	0 07	2854 36191	261174 115	0 05	2038 82994	186552 939
JULY 16 1989	0 4	16310 6395	1492423 51	0 11	4485 42586	410416 466	0 08	3262 1279	298484 703
SEPT 5 1989	0 2	9741 07636	891308 487	0 1	4870 53818	445654 243	0 1	4870 53818	445654 243
NOV 30 1989	0 2	37108 8623	3414015 33	0 08	14843 5449	1365606 13	0 06	11132 6587	1024204 6
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		11402 3452	190926569		4070 10865	68151934 3		3390 49867	56772205
WET		91981	1511152557		24851	408855679		18306	301208277
TOTAL		51691 7103	1702079126		14460 4103	477007613		10848 4091	357980482

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Arsenic - As (mg/L)	(lb/d)	(lbs)	Aluminum - Al (mg/L)	(lb/d)	(lbs)	Barium - Ba (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0 001	40 7765987	3731 05878	0 1	4077 65987	373105 878	0 005	203 882994	18655 2939
JULY 16 1989	<0 001	40.7765987	3731 05878	0.05	2038 82994	186552 939	0 006	244 659592	22386 3527
SEPT 5 1989	<0 001	48 7053818	4456 54243	0 01	487 053818	44565 4243	0 004	194 821527	17826 1697
NOV 30 1989	<0 001	185 544312	17070 0767	0 07	12988 1018	1194905 37	0 005	927 721558	85350 3833
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		43 4195264	7945 77333		2201 18121	402816 161		214 454704	39245 2109
WET		185.544312	33769 0647		12988 1018	2363834 53		927 721558	168845 324
TOTAL		114 481919	41714 8381		7594 64151	2766650 69		571 088131	208090 534

APPENDIX Z

POLLUTANT LOADING ESTIMATES AT WILLAMETTE

	Beryllium - Be (mg/L)	(lb/d)	(lbs)	Cadmium - Cd (mg/L)	(lb/d)	(lbs)	Chromium - Cr (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0.001	20 3882994	1865 52939	<0 001	40 7765987	3731 05878	<0 001	40 7765987	3731 05878
JULY 16 1989	<0.001	20 3882994	1865 52939	<0 001	40 7765987	3731 05878	<0 001	40 7765987	3731 05878
SEPT 5 1989	<0 001	24 3526909	2228 27122	<0 001	48 7053818	4456 54243	0 001	48 7053818	4456 54243
NOV 30 1989	<0 001	92 7721558	8535 03833	<0 001	185 544312	17070 0767	<0 001	185 544312	17070 0767
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		21.7097632	3972 88667		43 4195264	7945 77333		43 4195264	7945 77333
WET		92 7721558	16884 5324		185 544312	33769 0647		185 544312	33769 0647
TOTAL		57 2409595	20857 419		114 481919	41714 8381		114 481919	41714 8381

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Cobalt - Co (mg/L)	(lb/d)	(lbs)	Copper - Cu (mg/L)	(lb/d)	(lbs)	Iron - Fe (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0.003	122 329796	11193.1763	0 003	122 329796	11193 1763	0 14	5708 72382	522348 23
JULY 16 1989	<0.003	122 329796	11193 1763	0 005	203 882994	18655 2939	0 098	3996 10667	365643 761
SEPT 5 1989	<0 003	146 116145	13369 6273	0 004	194 821527	17826 1697	0 047	2289 15294	209457 494
	<0 003								
NOV 30 1989	<0 003	556 632935	51210 23	0 002	371 088623	34140 1533	0 099	18368 8869	1689937 59
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		130.258579	23837 32		173 678106	31783 0933		3997 99448	731632 99
WET		556 632935	101307 194		371 088623	67538 1294		18368 8869	3343137 41
TOTAL		343 445757	125144 514		272 383364	99321 2228		11183 4407	4074770 4

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Lead - Pb			Manganese - Mn			Mercury - Hg		
	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0.001	40.7765987	3731 05878	0 016	652 425579	59696 9405	<0 000	4 07765987	373 105878
JULY 16 1989	0.001	40.7765987	3731.05878	0 015	611 648981	55965 8817	<0 000	16.3106395	1492 42351
SEPT 5 1989	<0 001	48 7053818	4456.54243	0.01	487 053818	44565 4243	<0 000	4 87053818	445 654243
NOV 30 1989	0.006	1113 26587	102420 46	0 006	1113 26587	102420 46	<0 000	18 5544312	1707 00767
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		43 4195264	7945.77333		583 709459	106818 831		8 41961251	1540 78909
WET		1113 26587	202614 388		1113 26587	202614 388		18 5544312	3376 90647
TOTAL		578 342698	210560.162		848 487665	309433 219		13 4870218	4917 69556

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Molybdenum - Mo (mg/L)	(lb/d)	(lbs)	Nickel - Ni (mg/L)	(lb/d)	(lbs)	Selenium - Se (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0.010	407.765987	37310 5878	0.001	40 7765987	3731.05878	<0 001	40 7765987	3731 05878
JULY 16 1989	<0 010	407.765987	37310 5878	0 001	40 7765987	3731 05878	<0 001	40 7765987	3731 05878
SEPT 5 1989	<0 010	487 053818	44565 4243	0 001	48.7053818	4456 54243	<0 001	48 7053818	4456 54243
NOV 30 1989	<0 010	1855 44312	170700 767	0 002	371 088623	34140 1533	<0 001	185 544312	17070 0767
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		434.195264	79457 7333		43 4195264	7945 77333		43 4195264	7945 77333
WET		1855.44312	337690 647		371 088623	67538 1294		185 544312	33769 0647
TOTAL		1144.81919	417148 381		207 254075	75483 9028		114 481919	41714 8381

APPENDIX Z

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Silver - Ag			Strontium - Sr			Zinc - Zn		
	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
JANUARY 31 1989									
MARCH 21 1989									
MAY 16 1989	<0.001	40 7765987	3731.05878	0 032	1304 85116	119393 881	0 005	203 882994	18655 2939
JULY 16 1989	<0 001	40 7765987	3731.05878	0 046	1875 72354	171628.704	0 006	244 659592	22386 3527
SEPT 5 1989	<0.001	48 7053818	4456.54243	0 038	1850 80451	169348 613	0 025	1217 63455	111413 561
NOV 30 1989	<0 001	185 544312	17070 0767	0 035	6494 05091	597452 683	<0 003	556 632935	51210 23
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		43 4195264	7945.77333		1677 1264	306914 132		555.392377	101636.805
WET		185.544312	33769 0647		6494 05091	1181917 27		556 632935	101307 194
TOTAL		114 481919	41714 8381		4085 58865	1488831 4		556 012656	202943 999

POLLUTANT LOADING
ESTIMATES AT
WILLAMETTE

	Total suspended solids (TSS) (mg/L)	(lb/d)	(lbs)
JANUARY 31 1989			
MARCH 21 1989	42	16718405.5	1504656493
MAY 16 1989	8	326212.79	29848470.3
JULY 16 1989	8	326212.79	29848470 3
SEPT 5 1989	7	340937 673	31195797
NOV 30 1989	8	1484354 49	136560613
1989		(lb/d)	(lbs)
DRY		331121 084	60595158 4
WET		9101379.98	1656451157
TOTAL		4716250 53	1717046315

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POLLUTANT LOADING
ESTIMATES AT
WARRENDALE

	FLOW		Calcium - Ca			Magnesium - Mg		
DATE	(CFS)	(MGD)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
MARCH 21 1989	169000	109227.557	21	19142347.7	1722811296	6 6	6016166 43	541454978 7
MAY 16 1989	275000	177737 149	16	23732412	2171515694	4 6	6823068 436	624310761 9
SEPT 5 1989	106000	68509.5919	16	9147766 06	837020594 6	4 6	2629982 743	240643421
NOV 30 1989	195000	126031 796	19	19983769 6	1838506804	5 6	5889953 148	541875689 6
1989		(MGD)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY	190500	123123 37		16440089	3008536288		4726525 59	864954182 9
WET	182000	117629 677		19563058 7	3560476678		5953059 789	1083456882
TOTAL		240753 047		18001573 8	6569012966		5339792 689	1948411065

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Sodium - Na (mg/L)	(lb/d)	(lbs)	Potassium - K (mg/L)	(lb/d)	(lbs)	Sulfate sulfur (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	9	8203863.31	738347698	1.9	1731926.7	155873403	18	16407726 6	1476695396
MAY 16 1989	6.1	9047982 06	827890358	1.4	2076586 05	190007623	12	17799309	1628636770
SEPT 5 1989	5 6	3201718 12	292957208	1 1	628908 917	57545165 9	10	5717353 79	523137871.7
NOV 30 1989	8 1	8519396 52	783784480	1 4	1472488 29	135468922	13	13673105 5	1257925708
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		6124850 09	1120847566		1352747 48	247552789		11758331 4	2151774642
WET		8361629 92	1521816645		1602207 49	291601764		15040416 1	2737355726
TOTAL		7243240	2642664211		1477477 49	539154553		13399373 7	4889130368

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Chlonde - Cl (mg/L)	(lb/d)	(lbs)	Fluonde - F (mg/L)	(lb/d)	(lbs)	Silicate silicon (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	4.8	4375393 77	393785439	0 2	182308.074	16407726.6	15	13673105 5	1230579497
MAY 16 1989	2 6	3856516 94	352871300	0 2	296655 149	27143946.2	12	17799309	1628636770
SEPT 5 1989	2 7	1543685.52	141247225	0 2	114347 076	10462757 4	6.6	3773453 5	345270995 3
NOV 30 1989	3 8	3996753 92	367701361	0 2	210355 47	19352703 2	9 5	9991884 81	919253402 1
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		2700101 23	494118526		205501 113	37606703 6		10786381 2	1973907766
WET		4186073 84	761865440		196331 772	35732382 4		11832495 2	2153514120
TOTAL		3443087 54	1255983965		200916 442	73339086		11309438 2	4127421885

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

	Total dissolved solids (TSS)			Nitrate-nitrite nitrogen			Ammonia nitrogen		
DATE	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
MARCH 21 1989	133	121234869	10911138207	0.41	373731 551	33635839 6	0 03	27346 211	2461158 99
MAY 16 1989	77	114212232 5	10450419276	0 12	177993 09	16286367 7	0 01	14832 7575	1357197 31
SEPT 5 1989	89	50884448.72	4655927058	<0 100	57173 5379	5231378 72	0 03	17152 0614	1569413 61
NOV 30 1989	104	109384844 2	10063405665	0 27	283979 884	26126149 3	0.03	31553 3204	2902905 48
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		82548340 62	15106346333		117583 314	21517746 4		15992 4094	2926610 92
WET		115309856 6	20986393897		328855 717	59851740 6		29449 7657	5359857 36
TOTAL		98929098 6	36092740230		223219 516	81369487		22721 0876	8286468 29

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

	Total kjeldahl nitrogen	(TKN)		Total phosphorus (TP)			Orthophosphate phosphorus		
DATE	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
MARCH 21 1989	<0.200	182308.074	16407726 6	0 06	54692 4221	4922317 99	0 04	36461 6147	3281545 325
MAY 16 1989	0 4	593310.299	54287892 3	0 03	44498 2724	4071591 93	0 02	29665 5149	2714394 617
SEPT 5 1989	<0.200	114347.076	10462757 4	0 01	5717.35379	523137 872	<0 010	5717 35379	523137 8717
NOV 30 1989	0 2	210355 47	19352703 2	0 05	52588 8674	4838175 8	0 02	21035 547	1935270 32
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		353828 687	64750649 8		25107 8131	4594729 8		17691 4344	3237532 489
WET		196331 772	35732382 4		53640 6447	9762597 34		28748 5808	5232241 713
TOTAL		275080 229	100483032		39374 2289	14357327 1		23220 0076	8469774 202

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Arsenic - AS (mg/L)	(lb/d)	(lbs)	Aluminum - Al (mg/L)	(lb/d)	(lbs)	Barium - Ba (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	0.002	1823.08074	164077 266	0 43	391962.358	35276612 2	0 032	29169 2918	2625236 26
MAY 16 1989	0.001	1483 27575	135719 731	0 04	59331.0299	5428789 23	0.022	32632 0664	2985834 079
SEPT 5 1989	<0 001	571 735379	52313 7872	<0 010	5717 35379	523137 872	0 024	13721 6491	1255530 892
NOV 30 1989	0 001	1051 77735	96763 516	<0 010	10517 7735	967635 16	0 029	30501 5431	2806141 964
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		1027 50556	188033 518		32524 1918	5951927 11		23176 8578	4241364 971
WET		1437 42904	261612 086		201240 066	36625692		29835 4174	5430045 973
TOTAL		1232 4673	449645 604		116882 129	42577619 1		26506 1376	9671410 944

APPENDIX AA

POLLUTANT LOADIN ESTIMATES AT WARRENDALE

	Beryllium - Be			Cadmium - Cd			Chromium Cr		
DATE	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)	(mg/L)	(lb/d)	(lbs)
MARCH 21 1989	<0.001	455.770184	41019.3166	<0.001	911.540368	82038 6331	0 002	1823 080736	164077.2663
MAY 16 1989	<0.001	741.637874	67859 8654	<0 001	1483 27575	135719 731	0 001	1483 275747	135719 7309
SEPT 5 1989	<0 001	285.867689	26156.8936	<0 001	571 735379	52313.7872	0 001	571 7353789	52313 78717
NOV 30 1989	<0 001	525 888674	48381 758	<0 001	1051 77735	96763 516	<0 001	1051 777348	96763 51601
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		513 752781	94016 759		1027 50556	188033 518		1027 505563	188033 518
WET		490 829429	89330 9561		981 658858	178661 912		1437 429042	261612 0857
TOTAL		502 291105	183347 715		1004 58221	366695 43		1232 467303	449645 6037

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Cobalt - Co (mg/L)	(lb/d)	(lbs)	Copper - Cu (mg/L)	(lb/d)	(lbs)	Iron - Fe (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	<0.003	2734.6211	246115.899	0 011	10026.944	902424.964	0 37	337269.936	30354294 26
MAY 16 1989	<0 003	4449 82724	407159 193	0 003	4449 82724	407159 193	0 047	69713 9601	6378827 35
SEPT 5 1989	<0 003	1715 20614	156941 361	0 005	2858 67689	261568 936	0 007	4002 14765	366196 5102
NOV 30 1989	<0 003	3155 33204	290290 548	0 001	1051.77735	96763 516	0 026	27346 211	2515851 416
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		3082 51669	564100 554		3654 25207	668728 128		36858 0539	6745023 86
WET		2944 97657	535985 736		5539 3607	1008163 65		182308 074	33180069 4
TOTAL		3013 74663	1100086 29		4596 80638	1676891 78		109583 064	39925093 26

APPENDIX AA

POLLUTANT LOADIN ESTIMATES AT WARRENDALE

DATE	Lead - Pb (mg/L)	(lb/d)	(lbs)	Manganese - Mn (mg/L)	(lb/d)	(lbs)	Mercury - Hg (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	0.009	8203.86331	738347.698	0.026	23700.0496	2133004.46	<0.000	91.15403682	8203 863314
MAY 16 1989	0.001	1483.27575	135719.731	0.001	1483.27575	135719 731	<0 000	148 3275747	13571 97309
SEPT 5 1989	<0.001	571.735379	52313 7872	0.001	571.735379	52313 7872	<0 000	57.17353789	5231 378717
NOV 30 1989	<0 001	1051 77735	96763 516	<0.001	1051.77735	96763 516	<0 000	105 1777348	9676 351601
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		1027.50556	188033 518		1027 50556	188033 518		102 7505563	18803 3518
WET		4627.82033	842263 3		12375 9135	2252416 25		98 1658858	17866 19122
TOTAL		2827 66295	1030296 82		6701.70951	2440449 77		100 458221	36669 54302

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Molybdenum - Mo (mg/L)	(lb/d)	(lbs)	Nickel - Ni (mg/L)	(lb/d)	(lbs)	Selenium - Se (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	<0.010	9115.40368	820386 331	0.006	5469 24221	492231 799	<0.001	911 5403682	82038 63314
MAY 16 1989	<0.010	14832.7575	1357197 31	<0 001	1483.27575	135719 731	<0 001	1483 275747	135719 7309
SEPT 5 1989	<0.010	5717.35379	523137.872	<0.001	571.735379	52313 7872	<0 001	571 7353789	52313 78717
NOV 30 1989	<0 010	10517 7735	967635 16	0 001	1051 77735	96763 516	<0 001	1051 777348	96763 51601
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		10275 0556	1880335 18		1027 50556	188033 518		1027 505563	188033 518
WET		9816 58858	1786619.12		3260 50978	593412 78		981 658858	178661 9122
TOTAL		10045 8221	3666954 3		2144 00767	781446 298		1004 58221	366695 4302

APPENDIX AA

POLLUTANT LOADIN
ESTIMATES AT
WARRENDALE

DATE	Silver - Ag (mg/L)	(lb/d)	(lbs)	Strontium - Sr (mg/L)	(lb/d)	(lbs)	Zinc - Zn (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	<0.001	911.540368	82038.6331	0.12	109384.844	9844635.98	0.013	11850 0248	1066502 231
MAY 16 1989	<0.001	1483.27575	135719 731	0.082	121628 611	11129017 9	<0 003	4449 82724	407159 1926
SEPT 5 1989	<0.001	571.735379	52313.7872	0 089	50884.4487	4655927.06	0 01	5717 35379	523137 8717
NOV 30 1989	<0 001	1051 77735	96763.516	0 11	115695.508	10643986 8	<0 003	3155 33204	290290 548
1989		(lb/d)	(lbs)		(lb/d)	(lbs)		(lb/d)	(lbs)
DRY		1027 50556	188033 518		86256 53	15784945		5083 59051	930297 0642
WET		981 658858	178661 912		112540 176	20482312 1		7502 67842	1365487 472
TOTAL		1004 58221	366695 43		99398 3531	36267257 1		6293 13446	2295784 536

POLLUTANT LOADIN ESTIMATES AT WARRENDALE

DATE	Total suspended solids (TSS) (mg/L)	(lb/d)	(lbs)
MARCH 21 1989	19	17319267	1558734030
MAY 16 1989	25	37081893.7	3392993271
SEPT 5 1989	6	3430412 27	313882723
NOV 30 1989	16	16828437 6	1548216256
1989		(lb/d)	(lbs)
DRY		20256153	3706875994
WET		17073852 3	3107441115
TOTAL		18665002 6	6814317109