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James River, Camas Pulp and Paper Mill
Class II Inspection
June 4-6, 1990

by
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ABSTRACT

Ecology conducted a Class II Inspection at the James River, Camas Pulp and Paper Mill on June 4-6, 1990. The mill was operating within daily maximum permit parameters at the time of the inspection. The Blue Creek discharge (outfall 002) experienced a high pH excursion for a short period during the inspection. No acute effluent toxicity was indicated by rainbow trout, *Hyalella azteca,* or *Daphnia magna* bioassays. Some acute toxicity was indicated by Microtox®. Significant chronic toxicity was indicated by both *Daphnia magna* and *Ceriodaphnia dubia.* BOD_5 and TSS agreement between laboratories was acceptable.

INTRODUCTION

A Class II Inspection of the wastewater treatment plant (WTP) at James River's Pulp and Paper Mill in Camas, Washington, was conducted on June 4-6, 1990. The inspection was conducted by Jeanne Andreasson, Keith Seiders, and Ken Pensula of the Department of Ecology (Ecology) Compliance Monitoring Section. Stewart Lombard, from Ecology's Quality Assurance Section, evaluated the mill's laboratory procedures. The inspection was originally requested by Frank Meriwether, formerly of Ecology's Industrial Section. Steve Young, Environmental Engineer, represented James River and provided assistance. Additional assistance was provided by Gary Smead, also of James River. The mill's WTP is a secondary treatment (aerated stabilization basin) facility which discharges continuously into the Columbia River at an approximate rate of 59 MGD. The discharge is limited by NPDES Permit WA-000025-6. The permit in force during the inspection was scheduled to expire October 11, 1990. Ecology issued a new permit and accompanying order to James River on May 10, 1991. Ecology then issued an amended permit and order on May 24, 1991. The current permit expiration date is May 10, 1996.

Objectives of the Inspection

1. Assess plant compliance with NPDES permit effluent limits at outfall 001, outfall 002 and the sewage treatment package plant for the floating dock.

2. Characterize priority and non-priority pollutants in industrial in-plant waters and treated mill effluent.

3. Evaluate the 001 effluent toxicity using a suite of acute and chronic bioassays.

4. Determine the removal efficiency achieved with secondary treatment of industrial streams.

5. Review lab procedures at the mill to determine adherence to accepted protocols.

6. Characterize the 002 (Blue Creek) discharge into Camas Slough.

7. Contribute to the ongoing efforts to access the potential value of effluent centrifugation as a monitoring tool.

LOCATION AND DESCRIPTION

James River's Pulp and Paper Mill is located at N.E. 4th and Adams St. in the city of Camas, in Clark County, Washington (Figure 1). The mill discharges treated effluent into the Columbia River through a 60 inch diameter single port discharge pipe that extends approximately

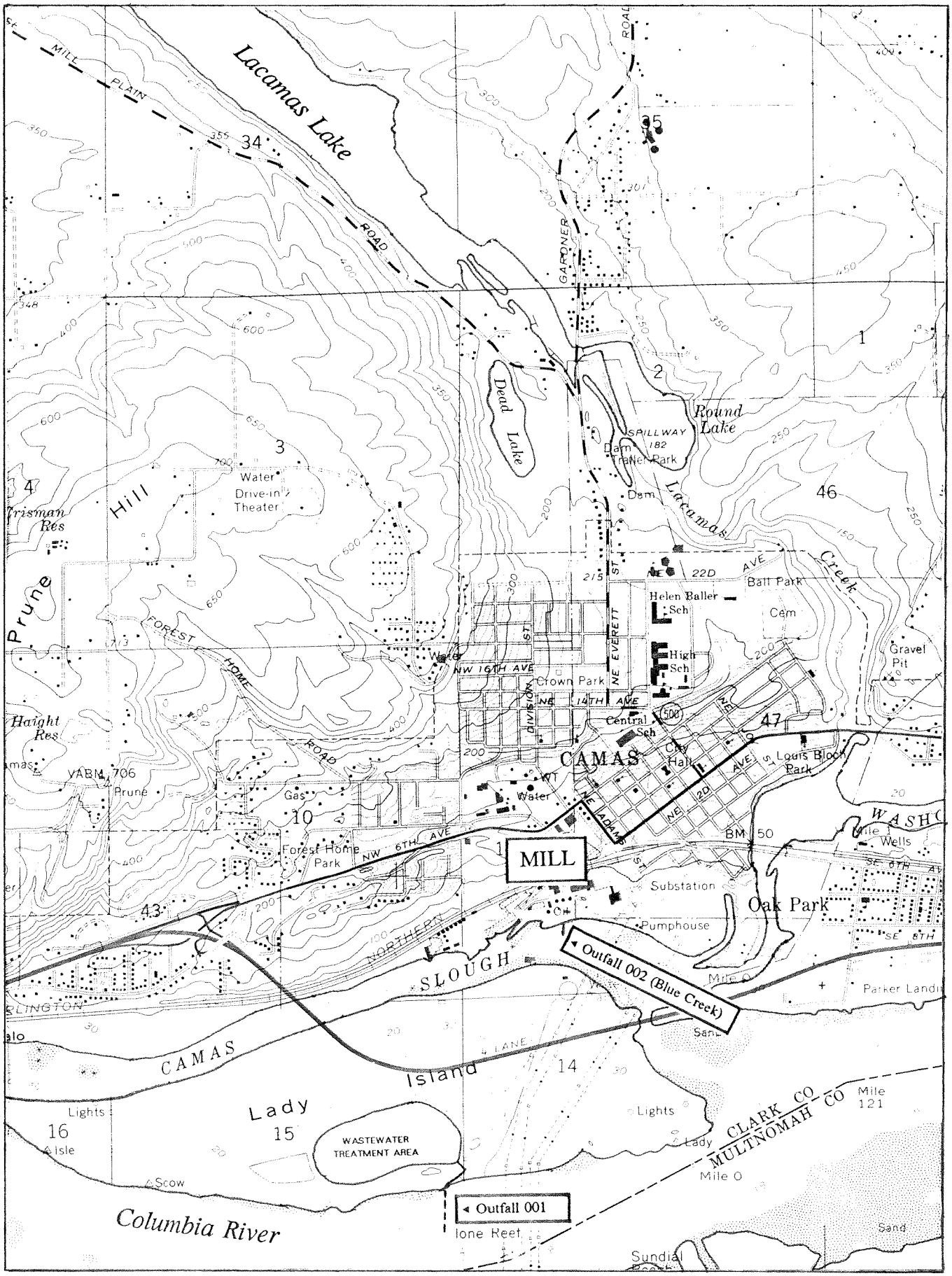

Figure 1. Vicinity Map - James River, Camas - June 1990

384 feet from Lady Island into the Columbia River (Figure 1). Paper machine production is approximately 1600-1800 tons per day and includes communication papers, tissue paper, and toweling. The bleached kraft process is used for making papers requiring a strong sheet, and the bleached magnefite process is used for making tissue grade papers.

Industrial wastewater streams are pumped across Camas Slough to Lady Island where they are treated with combinations of primary and secondary treatment. Alkaline and woodmill sewer streams receive primary treatment (clarification). The primary effluent is combined with the flow from the acid sewer and the total combined flow receives secondary treatment in two sequential aerated stabilization basins (ASBs) encompassing 66 and 42 acres (Figure 2).

The plant is also authorized to discharge water treatment plant filter backwash, Lacamas Lake overflow, and stormwater runoff to Blue Creek (outfall 002) which empties into Camas Slough (Figure 3).

Sanitary sewage is discharged to the City of Camas treatment system with the exception of the single restroom on the floating dock. A small sewage treatment package plant treats the single restroom waste.

METHODS

A complete listing of sampling stations, dates, and parameters is presented in Table 1. Sample locations are noted on Figures 2 (WTP) and 3 (Blue Creek).

Ecology collected 24-hour composite samples of outfall 001, primary clarifier effluent, acid sewer, and outfall 002 (Blue Creek) with ISCO automatic samplers set to collect approximately 330 milliliters every 30 minutes for 24 hours (due to time constraints, the Blue Creek sample was actually a 22.5 hour composite). Sample collection jugs were continually iced to cool samples as they were collected. The sampling equipment (glass collection jugs, tubing, strainers and stainless steel beakers) was specially cleaned using the following protocol:

1. Wash with laboratory detergent;
2. Rinse several times with tap water;
3. Rinse with 10% HNO_3;
4. Rinse three times with distilled/deionized water;
5. Rinse with high purity methylene chloride;
6. Rinse with high purity acetone; and
7. Allow to dry and seal with aluminum foil.

The 001 effluent sampling site was at the northernmost of three effluent weirs. Ecology collected composite, grab, and a three-part grab-composite (for bioassay analysis) samples.

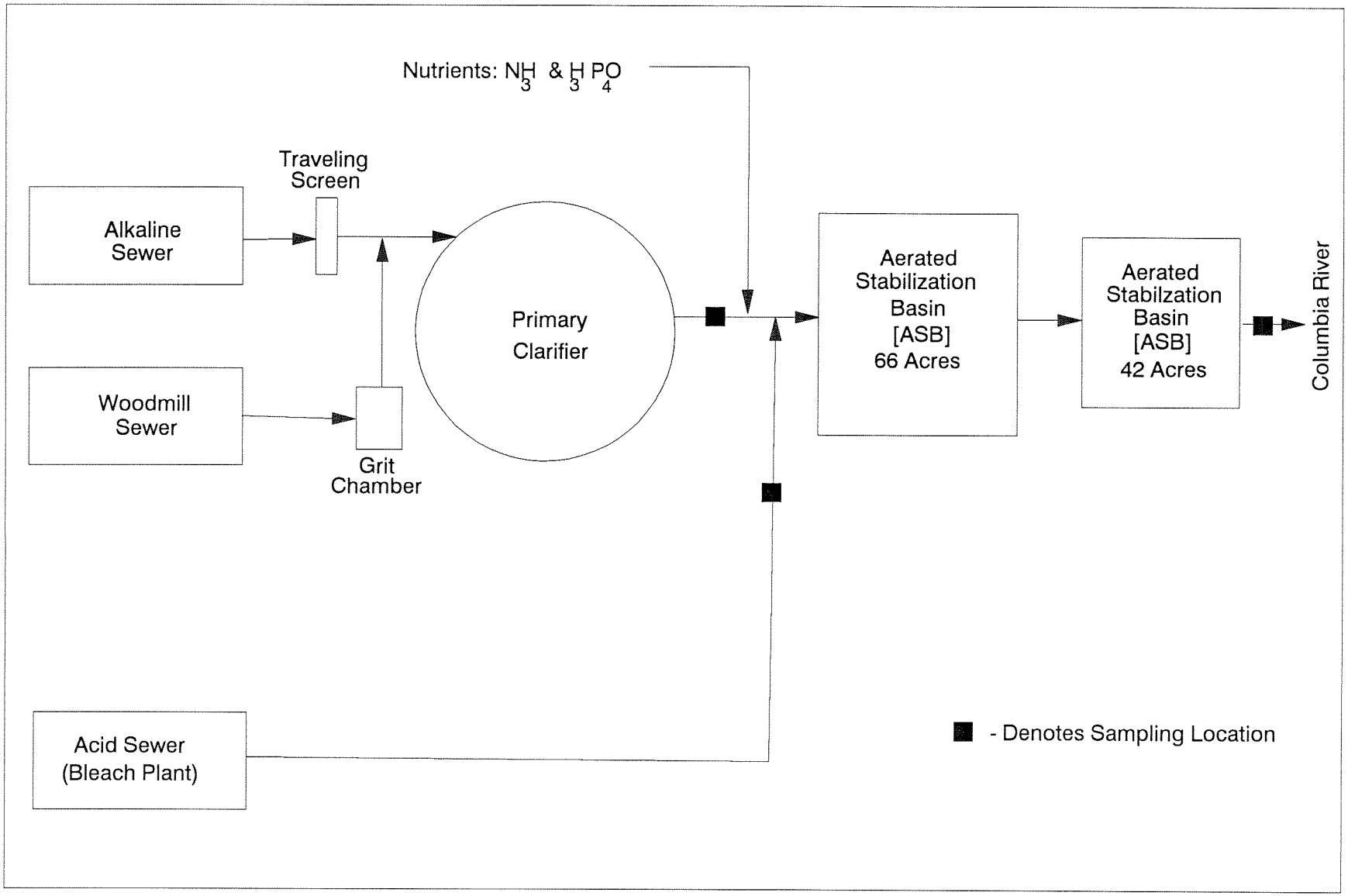

Figure 2 - Wastewater Treatment Plant - James River, Camas - June 1990

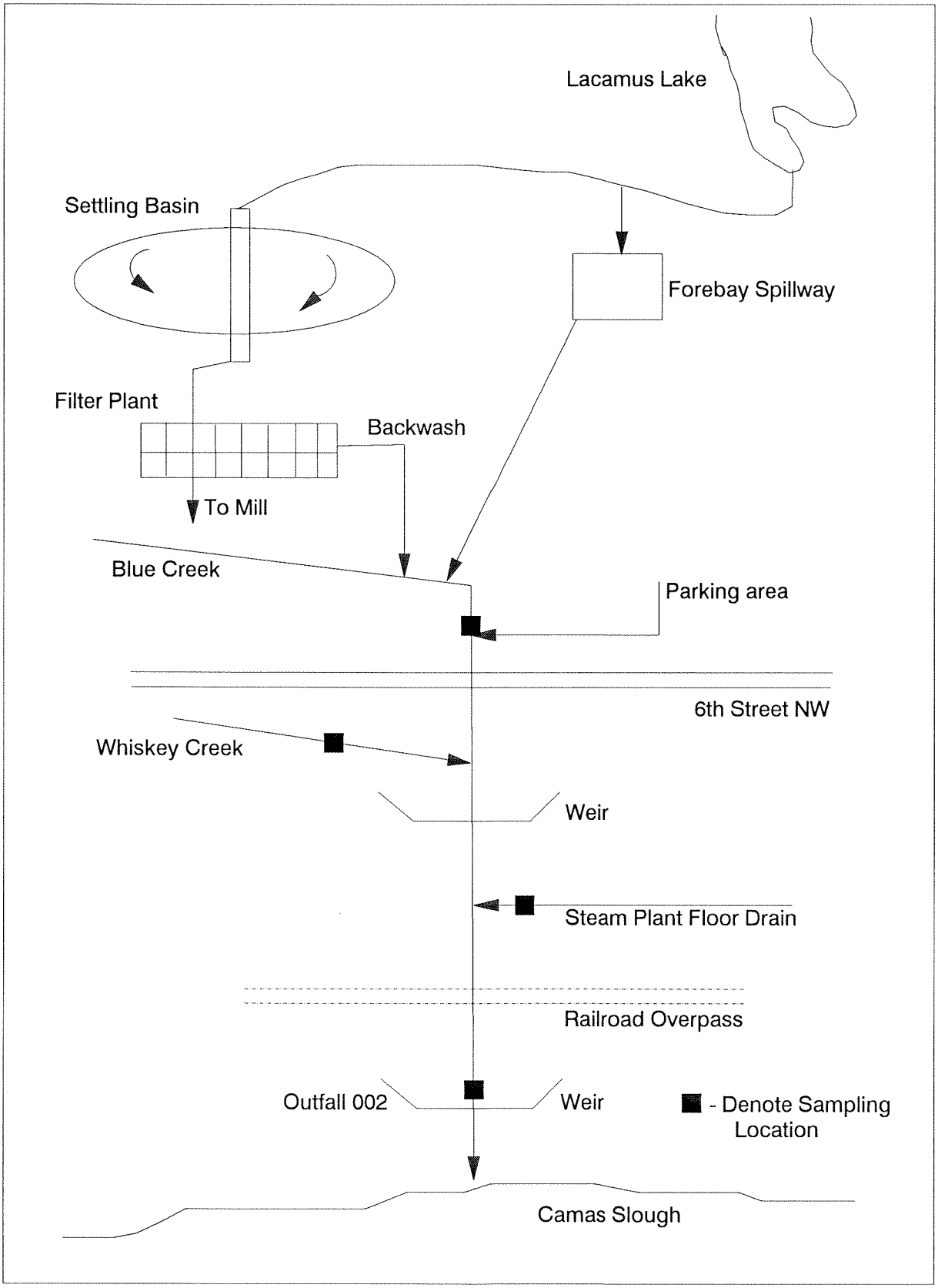

Figure 3 - Blue Creek Sampling Stations - James River, Camas - June, 1990

Table 1. Sampling times and parameters analyzed – James River, Camas – June 1990.

Station:	Primary Effluent				Acid Sewer			Final Effluent (001)					Blue Creek (002)			Upstream Blue Creek Samples: Parking Lot		Whiskey Cr.		Steam Plant		Paper Machine #11 PM	Paper Machine #15 PM	Sanitary Plant	Transfer Blank
Type:	comp	grab	grab	grab	comp	grab	grab	E-comp+	grab	grab	grab	JR-comp+	comp	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab1	grab2	grab	
Date:	6/5–6	6/5	6/5	6/6	6/5–6	6/5	6/6	6/5–6	6/5	6/5	6/6	6/5–6	6/4–5	6/4	6/5	6/4	6/5	6/4	6/5	6/4	6/5	6/5	6/5	6/5	6/6	6/4
Time:	24 hr#	10:10	17:50	11:00	24 hr#	10:40	10:05	24 hr#	09:20	17:30	13:35	24 hr#	24 hr#	17:30	15:10	18:20	13:40	18:40	14:00	17:50	14:50	14:30	14:35	14:15	16:30	
GENERAL CHEMISTRY																										
Turbidity	E				E			E					E													
Conductivity	E	E	E		E	E		E	E	E		E	E	E		E		E		E						
Alkalinity	E				E			E					E													
Acidity	E				E			E					E													
Hardness	E				E			E				E	E													
Cyanide	EE*				EE*			EE*				EE*	EE*										EE*	EE*		EE*
SOLIDS																										
TS	E				E			E					E	E		E		E		E					
TNVS	E				E			E					E	E		E		E		E					
TSS	E	E	E		E			E–JR	E	E		E–JR	E	E		E		E		E					
TNVSS	E				E			E					E	E		E		E		E					
BOD5	E				E			E–JR				E–JR	E													
COD	E	E	E		E	E		E	E	E		E	E	E		E		E		E					
NUTRIENTS																										
NH3–N	E				E			E				E	E													
NO3+NO2–N	E				E			E				E	E													
T–Phosphate	E				E			E				E	E													
Fecal Coliform																									E	
ORGANICS AND METALS																										
Phenols	E				E			E				E	E			E		E		E						E
TOC								E																		
AOX		E	E			E			E	E				E												E
Oil & Grease														E	E	E	E	E	E	E	E					
Resin/Fatty Acids	E				E			E																		
Guaiacols/Catecols	E				E			E																		
Dioxins/Furans					E																					
Formaldehyde		E	E			E			E	E																
Priority pollutants																										
BNA's	E				E			E				E	E			E										E
Pest/PCB	E				E			E				E	E			E										E
VOA		E	E			E			E	E				E												E
Metals + Cr(VI)	E				E			EE**				E	E													E
Cr(VI) only				E			E				E															
BIOASSAYS																										
Rainbow trout acute								E																		
Microtox acute								E																		
Daphnia magna acute/chronic								EE																		
Ceriodaphnia chronic								E																		
Hyalella acute								E																		
FIELD OBSERVATIONS																										
Temp	E	E	E	E	E	E		E	E	E			E	E		E		E		E					
pH	E	E	E	E	E	E		E	E	E			E	E		E		E		E					
Conductivity	E	E	E	E	E	E		E	E	E			E	E		E		E		E					
Chlorine																									E	

* (1) total and (1) weak and dissociable cyanide ** (1) total recoverable, and (1) total dissolved metals. JR = James River analysis, E = Ecology analysis

\+ E–comp indicates Ecology composite sampler, JR–comp indicates James River composite sampler. # 24 hr composites from 0900–0900, with the exception of Blue Creek from 1700–1530.

Table 2 – Analytical methods and laboratories – James River, Camas – June 1990.

	EPA 1983	EPA 1986a	Other Methods	Laboratory
General chemistry				
Turbidty	180.1			Manchester
Conductance	120.1			Manchester
Alkalinity	310.1			Analytical Resources Inc
Acidity	305.1			Manchester
Hardness	130.2			Manchester
Cyanide				
total	335.3			Manchester
weak & dissociable	335.3			Manchester
TS	160.3			Manchester
TNVS	160.4			Manchester
TSS	160.2			Manchester
TNVSS	160.4			Manchester
BOD	405.1			Manchester
COD	410.1			Manchester
NH3-N	350.1			AM Test
N03+NO2-N	353.2			AM Test
T-Phosphate	365.2			AM Test
Fecal Coliform			SM-17 9222D	Manchester
TOC	415.1			AM Test
Oil & Grease				Analytical Resources Inc
Metals (total recoverable/dissolved)				
	(analysis)	(digestion)		
Antimony	204.2	3005		AM Test
Arsenic	206.2	3005		AM Test
Beryllium	200.7	3005		AM Test
Cadmium	200.7	3005		AM Test
Chromium	200.7	3005		AM Test
Copper	200.7	3005		AM Test
Lead	239.2	3005		AM Test
Nickel	200.7	3005		AM Test
Selenium	270.2	3005		AM Test
Silver	200.7	3005		AM Test
Thallium	279.2	3005		AM Test
Zinc	200.7	3005		AM Test
	(digestion and analysis)			
Mercury	245.1			AM Test
Hexavalent Chromium		7195		AM Test
Metals (total - solids)		EPA 1986a		
	(exception is mercury method 245.5 from EPA 1983)			
	(analysis)	(digestion)		
		Manchester	AM Test	
Antimony	7041	3051	3050	Manchester/AM Test
Arsenic	7060	3051	3050	Manchester/AM Test
Beryllium	6010	3051	3050	Manchester/AM Test
Cadmium	6010	3051	3050	Manchester/AM Test
Chromium	6010	3051	3050	Manchester/AM Test
Copper	6010	3051	3050	Manchester/AM Test
Lead	6010/7421+	3051	3050	Manchester/AM Test
Nickel	6010	3051	3050	Manchester/AM Test
Selenium	7740	3051	3050	Manchester/AM Test
Silver	6010	3051	3050	Manchester/AM Test
Thallium	7841	3051	3050	Manchester/AM Test
Zinc	6010	3051	3050	Manchester/AM Test
	(digestion and analysis)			
Mercury	245.5/7470+			Manchester/AM Test

Table 2 - Analytical methods and laboratories - James River, Camas - June 1990 (continued).

		EPA 1983	EPA 1986a	Other Methods	Laboratory
Organics					
Formaldehyde					Analytical Resources Inc
AOX			9020		Manchester
Phenols		420.2			Manchester
Resin/fatty acids				NCASI RAFA-86.01	Manchester
Guaiacols/catechols/phenolics				NCASI CP-86.01	Manchester
Dioxins/furans			8290		Triangle
BNAs			3510/3520/8270++		PNELI
Pesticides/PCBs			3510/3520/8080++		PNELI
VOAs			8240		PNELI
Bioassays					
Rainbow trout	96 hour			Ecology 1981	Parametrix
Microtox	5/15 minute			Beckman/Tetra Tech 1986	Ecova
Daphnia magna	7 day			EPA 1987	EA Engineering
Daphnia magna	48 hour			EPA 1985	EA Engineering
Daphnia magna	48 hour-elutriate			Nebeker, 1984	EA Engineering
Ceriodaphnia dubia	7 day			EPA 1989	EA Engineering
Hyalella azteca	96 hour			Nebeker, 1984	Northwestern Aquatic

+ Lead analysis was by 6010 (Manchester) and 7421 (AM Test), Mercury analysis was by EPA 245.5 (Manchester) and 7470 (AM Test)
++ liquid sample extraction method 3510, solid sample extraction method 3520.
EPA 1983, Methods for Chemical Analysis of Water and Wastes.
EPA 1986a, Test Methods for Evaluating Solid Waste.
SM-17 - Standard Methods for the Examination of Water and Wastewater, 17th ed.
NCASI - National Council for Air and Stream Improvement, 1986.
Ecology 1981, Static Acute Fish Toxicity Test, Biological Testing Methods, 1981
Beckman - Microtox System Operating Manual.
Tetra Tech 1986, Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound.
EPA 1985, Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms.
EPA 1987, "A Short-Term Chronic Toxicity Test using Daphnia magna".
EPA 1989, Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.
Nebeker, 1984, "Biological Methods for Determining Toxicity of Contaminated Freshwater Sediments to Invertebrates"(modification).

James River collected their routine daily 001 composite at the same site. The composite samples were split for permit parameter analysis by the Ecology and James River laboratories.

Primary effluent samples (composite and grab) were collected at the Parshall flume on the discharge side of the primary clarifier.

Composite and grab samples of the acid sewer stream were collected on Lady Island above the juncture of the acid sewer and the primary effluent.

An outfall 002 composite and series of grabs were collected at the final effluent weir on Blue Creek. Upstream Blue Creek grab samples were collected at three locations: the employee parking lot, Whiskey Creek, and the steam plant floor drain (Figure 3).

A fecal coliform sample was collected and a residual chlorine field analysis was made at the sewage treatment package plant on the floating dock.

Two grab samples of paper machine run-off, one from a kraft paper machine (#15 PM) and one from a tissue paper machine (#11 PM), were collected for cyanide analysis.

Samples for analysis by Ecology were appropriately preserved where necessary as detailed in Huntamer and Smith (1988), placed on ice, and shipped to the Ecology/EPA Laboratory in Manchester. The analytical methods employed for the Ecology samples are listed in Table 2 along with the laboratory performing the analysis.

Effluent particulate matter was collected using two Alfa Laval bowl type continuous centrifuges (model WSB/MAB 103), following procedures described by Andreasson (1991). A small peristaltic pump was used to pump effluent from the 001 effluent sampling location to the centrifuges. The centrifuges were cleaned prior to sampling following procedures described by Seiders (1989). A grab composite sample of ASB sludge was collected in conjunction with the centrifuge samples to investigate its possible use as a surrogate for effluent particulate matter.

Data Quality Assurance

Sampling

A determination of sampling equipment contamination was made using field transfer blanks. Base neutral acid extractables (BNAs), pesticide/polychlorinated biphenyls (PCBs), cyanide, phenols (4-AAP method), and metals transfer blanks were prepared by pumping a 1-liter rinse of deionized organic-free water (obtained from the Ecology Manchester Laboratory prior to the inspection) through a clean compositor, discarding the rinse and then pumping 6 liters of the water through and transferring the water to appropriate sample containers. Volatile organics (VOAs) and adsorbable organic halide (AOX) blanks were prepared by transferring deionized organic-free water directly into sample containers.

Low levels (7 μg/L or less) of two VOAs (methylene chloride and acetone) and two BNAs (butylbenzylphthalate and bis(2-ethylhexyl)phthalate) were found in the field transfer blank (Appendices B and C). No pesticides/PCBs, cyanide, phenols (4-AAP method) or AOX were detected (Appendix D and Table 3).

Total recoverable lead, selenium, and zinc were detected at 2, 3, and 62 μg/L respectively, in the transfer blank. Zinc was also measured in the laboratory method blank at 47 μg/L suggesting the zinc contamination may have occurred in the laboratory.

Analysis (General)

Laboratory quality assurance and quality control (QA/QC) methods which were followed during the analyses of general chemistry parameters and priority pollutants are described by Kirchmer (1988), and Huntamer and Smith (1988). Recommended holding times were met for all VOA and pesticide/PCB analyses. Holding times for the Blue Creek composite and the upstream parking lot grab sample exceeded the seven day recommended time by one day for the acid fraction of the BNA analysis. Consequently, the affected compounds have been flagged as estimates with J qualifiers. All other BNA samples were extracted and analyzed within the recommended times.

An independent QA/QC evaluation of the dioxin/furan analysis was conducted by Alta Analytical Laboratory Inc., of California. They concluded that due to significant levels of contamination in the laboratory method blank, the 1,2,3,4,6,7,8-heptachlorodibenzofuran (HpCDF), total HpCDF, octachlorodibenzofuran (OCDF), and octachlorodibenzodioxin (OCDD) should be considered highly unreliable. These compounds are not a major concern for the purposes of this report which is focusing primarily on the much more toxic 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). All other parameters were within the guidelines set by EPA Method 8290 including initial and continuing calibration, column performance checks, isotopic abundance ratios, internal standard recoveries, detection limit calculations, and positive identification.

Matrix Spike/Matrix Spike Duplicate Analysis

Organics

VOA matrix spike and matrix spike duplicate (MS/MSD) recoveries and precision data were within acceptable QC limits for all water samples (Appendix A). MS/MSD quality control limits have not been established for catechols/guaiacols/phenolics or resin/fatty acids. The resin/fatty acid MSD was lost in the laboratory during the final evaporation step. MS/MSD recoveries were not requested as part of the BNA, pesticide/PCB or dioxin/furan analyses.

Metals

The targeted accuracy of ± 25% of the true value for the matrix spikes was met for all metals (Appendix A). The targeted MS/MSD relative percent difference (defined as the difference

Table 3. General chemistry results – James River, Camas – June 1990.

Station:	Primary Effluent			Acid Sewer		Final Effluent (001)+				Blue Creek (002)			Upstream Blue Creek Samples: Parking Lot		Whiskey Ck.		Steam Plant		Paper Machine #11 PM	Paper Machine #15 PM	Sanitary Transfer Plant	Sanitary Transfer Blank
Type:	comp	grab	grab	comp	grab	E-comp	grab	grab	JR-comp	comp	grab	grab	grab	grab	grab	grab	grab	grab	grab1	grab1	grab	
Date:	6/5–6	6/5	6/5	6/5–6	6/5	6/5–6	6/5	6/5	6/5–6	6/4–5	6/4	6/5	6/4	6/5	6/4	6/5	6/4	6/5	6/5	6/5	6/6	6/4
Time:	24 hr#	10:10	17:50	24 hr#	10:40	24 hr#	09:20	17:30	24 hr#	24 hr#	17:30	15:10	18:20	13:40	18:40	14:00	17:50	14:50	14:30	14:35	14:15	16:30
Sample #:	238205	238206	238207	238209	238210	238211	238212	238213	238215	238216	238217	238223	238218	238227	238219	238228	238220	238229	238221	238222	238224	238225
GENERAL CHEMISTRY																						
Turbidity (NTU)	21			1.7		1.9				5.8												
Conductivity (μmhos/cm)	777	754	606	3850	3870	1900	1830	1860	1850	79.2	76.4		71		189		72.7					
Alkalinity (mg/l as CaCO3)	82.4			1.0U		45.9				15.9												
Acidity (mg/l as CaCO3)	1U			385		1U				1U												
Hardness (mg/l as CaCO3	75.1			782		265			265	24.1												
Cyanide, Total (mg/l)	.002U			.002U		0.004			.002U	.002U									0.006	.002U		.002U
Cyanide, Wk & Diss (mg/l)	.002U			0.002		.002U IS			.002U	.002U									0.002	.002U IS		.002U
SOLIDS (mg/l)																						
TS	795			4030		1690				79	143		71		148		93					
TNVS	455			2240		1100				48	67		39		108		44					
TSS	41	31	40	62		69	58	67	73	14	12		8		3		10					
TNVSS	22			10		13				11	8		4		1		6					
BOD5 (mg/l)	178			275P		63			56	31												
COD (mg/l)	537	491	495	1960	1870	751	734	775	775	63.4	18.9		16.2		11.5		16.9					
NUTRIENTS (mg/l)																						
NH3–N	1.21			3.38		0.918			0.614	0.012												
NO3+NO2–N	0.133			0.156		0.012			.010U	0.358												
T–Phosphate	0.398			1.84		0.960			0.960	0.033												
Fecal Coliform (#/100ml)																					1U	
Phenols (μg/l)	469			668		17.8			15.8	2U			2U		2U		2U					2U
TOC (mg/l)						155																
AOX (mg/l)		2.88	2.33		116		27.2	26.9			2.14											5U
Oil & Grease (mg/l)											3.2	LAC	LAC	1.1	1.0U	1.1	1.3	1.0				
Formaldehyde (mg/l)		.34U			.34U		.34U	.34U														
FIELD OBSERVATIONS																						
Temp (C)	8.1	34.0		13.5	43.3	9.1	24.8	20.9	14.0	9.7	16.4	16.9	16.4	16.6	12.7	12.9		16.7				
pH (S.U.)	9.66	7.37		4.96	5.82	7.28	6.84	7.05	7.12	8.72	8.62*	9.27*	7.85	7.90	6.88	7.10	7.9	7.82				
Conductivity (μmhos/cm)		740		3380	4020	1790	1820	1790	1760	75.1	76.7	83.6	67.5	100	181.1	181.3	73					
Chlorine,free (mg/l)																					0.1	

+ E–comp indicates Ecology composite sampler, JR–comp indicates James River composite sampler.
* These Ecology pH measurements were made in a stainless steel beaker.
# 24 hr composites are from 0900–0900, with the exception of Blue Creek from 1700–1530.
LAC Indicates sample lost in laboratory accident.
P Indicates greater than.
U Indicates analyte not detected at given quantitation limit.
IS Indicates interfering substance.

between values divided by their average X 100) of <20% (or <1 detection limit for samples less than 5 times the detection limit) was met for all metals. Note that substantial zinc was measured in the laboratory method blank (47 μg/L).

Surrogate and/or Internal Standard Recoveries

VOA, BNA, and dioxin/furan water surrogate recoveries were within acceptable QC limits (Appendix A). All pesticide/PCB surrogate recoveries were within QC recovery limits with two exceptions. Surrogates were not detected in diluted composite samples of the primary effluent and acid sewer. A comparison with other samples at the same dilution (Ecology's 001 composite with 85% recovery and James River's 001 composite with 63% recovery) indicate that the loss of surrogates may be related to extraction efficiency rather than dilution effects. The primary effluent and acid sewer samples were not suspected of having major pesticides/PCB contamination, however due to the lack of surrogate recovery, less confidence is placed in the results for these two samples and all affected compounds have been flagged with J qualifiers. QC limits for surrogate recovery of catechols/guaiacols/phenolics and resin/fatty acids have not been established.

Bioassays

The Microtox®, rainbow trout, *Hyalella azteca, Daphnia magna,* and *Ceriodaphnia dubia* bioassays were completed using laboratory controls and reference toxicants where appropriate. Rainbow trout and *Daphnia magna* (48-hour acute and 7-day chronic) laboratory controls had survivals of 100%, *Hyalella azteca* control survival was 96.7% and *Ceriodaphnia dubia* control survival was 90%.

RESULTS AND DISCUSSION

Conventional data collected during the inspection are summarized in Table 3.

Comparison of Inspection Results to NPDES Permit Requirements

Outfall 001

The WTP was operating within the requirements of the permit in force at the time of the inspection, as well as the current permit, for daily (or monthly) average and daily maximum TSS loading (Table 4). The daily average BOD_5 load requirements were slightly exceeded, however, the inspection result BOD_5 was well below the daily maxima. The pH was within the required range.

Table 4. NPDES permit limits and inspection results – James River, Camas – June 1990.

OUTFALL 001					
	Daily or monthly average*		Daily maximum		Ecology inspection
Parameter	permit in force+	current permit++	permit in force+	current permit++	results
BOD5, lbs/day	29,300	29,250	52,000	56,000	30,600
TSS, lbs/day	48,600	47,250	79,000	88,300	33,500
pH		5.0 to 8.5 at all times**			6.8-7.3
Flow, MGD (from James River records)	---		---		58.2

OUTFALL 002			
Parameter	Permit in force+	Current permit++	Ecology inspection results
pH	5.0 to 8.5 at all times**	6.0 to 9.5 at all times***	8.6-9.3

SEWAGE PACKAGE PLANT (for the floating dock)

	Monthly average		Daily maximum		Ecology inspection
Parameter	permit in force+	current permit++	permit in force+	current permit++	results
Fecal coliform (number per 100 mls)	---	200	---	400	1U

* Daily average is defined in the permit in force at the time of the inspection (expiration date October 11, 1990) as "the average of daily values obtained over a month's time".
Monthly average is defined in the current permit (issued May 10, 1991) as "the average of the measured values obtained over a calendar month's time".

** Indicates the range of permitted values. Excursions between 4.0 and 9.5 shall be allowed provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 26 minutes per month. Any excursions below 4.0 or above 9.5 shall be considered violations.

*** Indicates the range of permitted values. Excursions between 5.0 and 10.5 shall be allowed provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 26 minutes per month. Any excursions below 5.0 or above 10.5 shall be considered violations.

— No permit limit.

\+ Permit in force at the time of the inspection which expired October 11, 1990.

++ Current permit issued May 10, 1991.

U Indicates analyte not detected at given detection limit.

Outfall 002

Elevated pHs (based on the permit in force during the inspection) of 8.6 (on 6/4/90 at 17:30) and 9.3 (on 6/5/90 at 15:10) were measured in two grab samples from Blue Creek taken at the final 002 effluent weir. The permitted upper limit for pH was 8.5, however, excursions between 4.0 and 9.5 were allowed provided no single excursion exceeded 60 minutes in length and total excursions did not exceed 7 hours and 26 minutes per month (Table 4). (Note: The pH readings of 8.6 and 9.3 were obtained using a Beckman 21 pH meter on samples contained in a stainless steel beaker. Later in the inspection, on a different sample, a comparison of pH observations made in both stainless steel and plastic beakers showed that the stainless steel beaker result was four tenths of a pH unit higher than the plastic beaker result.) The current permit specifies a Blue Creek pH between 6.0 and 9.5, with excursions between 5.0 and 10.5 allowed subject to the same time constraints detailed above (Table 4).

Sewage Treatment Package Plant

Current permit requirements on fecal coliform bacteria counts were met (Table 4). The permit in force did not contain a fecal coliform limit.

Characterization of Priority and Non-priority Pollutants in Effluent and In-plant Streams

Priority Pollutant Organics

VOAs, BNAs, and Pesticides/PCBs

Several organics (acetone, chloroform, phenol, benzoic acid, 2,4-dichlorophenol, and 2,4,6-trichlorophenol) were detected in the effluent at low concentrations (< 100 μg/L). Table 5 shows the organics detected in the various wastewater streams and compares them to Water Quality Criteria where applicable (EPA, 1986). Organics in the final effluent were all well below criteria. Appendices B, C, and D contain the complete VOA, BNA, and pesticide/PCB results.

Dioxin

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (also known as dioxin or TCDD) is generated during the chlorine bleaching of wood pulp. Discharge limits of 0.80 mg/day (annual average) and 1.31 mg/day (daily maximum) have been specified in the current James River permit with a March 8, 1994 compliance date. The point of compliance designated in the permit is the final effluent before discharge. At the time of the inspection, the combined bleach plant effluent upstream of the secondary treatment ASBs, was being proposed as the point of compliance for TCDD. The acid sewer stream provided the best approximation of the combined bleach plant effluents and so was chosen by Ecology as the sampling point.

Table 5. Wastewater priority pollutant organics detected – James River, Camas – June 1990.

Station:	Primary Effluent		Acid Sewer	Final Effluent (001)		Water Quality Criteria++	
Type:	grab	grab	grab	grab	grab		
Date:	6/5	6/5	6/5	6/5	6/5		
Time:	AM	PM	PM	AM	PM	acute	chronic
Sample ID #:	238206	238207	238210	238212	238213	(fresh)	(fresh)
	(µg/l)					(µg/l)	
Volatile Organics							
Methylene Chloride	2	5 U	50 U	5 U	5 U	11,000*(a)	--
Acetone	1 U	5 U	700	49 J	81	--	--
Chloroform	110	82	3900	17	19	28,900*	1,240*
2-Butanone	260 E	410	100 U	10 U	10 U	--	--
4-Methyl-2-Pentanone	34	46	100 U	10 U	10 U	--	--
Toluene	5	7	50 U	5 U	5 U	17,500*	--
Styrene	2	5 U	50 U	5 U	5 U	--	--

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)			
Type:	comp	comp	E-comp+	JR-comp+		
Date:	6/5	6/5	6/5	6/5		
Sample ID #:	238205	238209	238211	238215		
	(µg/l)				(µg/l)	
BNA's						
Phenol	32	32	7	3 U	10,200*	2,560*
Benzyl Alcohol	10	5 U	5 U	5 U	--	--
4-Methylphenol	9	5 U	5 U	5 U	--	--
Benzoic Acid	25	10 U	4 J	4 J	--	--
2,4-Dichlorophenol	3 U	29	5	4	2,020*	365*
2,4,6-Trichlorophenol	3 U	3 U	29	30	--	970*
Pesticides/PCB's						
beta-BHC	0.50 UJ	1.26 J	0.50 U	0.50 U	100*	--
Endosulfan I	0.50 UJ	1.03 J	0.50 U	0.50 U	0.22	0.056

\+ E-comp indicates Ecology composite sampler, JR-comp indicates James River composite sampler.
++ EPA 1986
* Insufficient data to develop criteria. Value presented is the L.O.E.L – Lowest observed effect level.
a Total halomethanes
[ ] Indicates analyte was detected in sample.
U Indicates analyte not detected at given quantitation limit.
E Indicates estimated value exceeding known calibration range.
J Indicates estimated value.

TCDD was not detected in the acid sewer composite sample at an estimated detection limit of 0.02 parts per trillion (ppt) (Table 6). Based on this detection limit and an acid sewer flow rate of 16.0 MGD, loadings below 1.2 mg/day would be undetectable. The detection limit was higher than normal for TCDD (normal detection limit range is fro/m 0.003 to 0.008 ppt) due to increased noise in the analytical signal. Other polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) were detected in the acid sewer sample (Table 6).

Non-Priority Pollutant Organics

Other organic analyses conducted were AOX, phenols (4-AAP method), formaldehyde, guaiacols/catechols/phenolics, and resin/fatty acids in effluent and in-plant streams. AOX loading at outfall 001 was 13,126 lb/day (5,959 kg/day) based on an AOX concentration of 27.05 mg/L (average of two grabs) and a flow rate of 58.2 MGD. The current permit contains annual average and monthly maximum permit limits of 4,950 and 6,360 lbs/day, respectively. These limits are to be complied with within fifty-four (54) months of the issuance of the permit. Detected non-priority pollutant organics are listed in Table 7, and complete results are given in Table 3 and Appendices F and G.

Priority Pollutant Inorganics

Copper, lead, and zinc exceeded EPA's Water Quality Criteria in at least one effluent sample (EPA 1986 and Table 8). However, due to the presence of lead in the transfer blank (2 μg/L), and zinc in the laboratory method blank (47 μg/L), the effluent results for these metals should be considered highly unreliable. As a result of the analytical method used by the laboratory, some of the metals had quantitation limits greater than chronic criteria and could not be used to determine if criteria were being exceeded. Quantitation limits for hexavalent chromium and silver exceeded both acute and chronic criteria.

Total cyanide was below acute and chronic criteria in the effluent samples. The run-off from paper machine #11 (magnifite process) had a total cyanide concentration of 6 μg/L and a weak and dissociable cyanide concentration of 2 μg/L (Table 3).

Effluent Bioassays

No acute effluent toxicity was indicated by the rainbow trout, *Hyalella azteca,* or 48-hour acute *Daphnia magna* bioassays (Table 9). Some toxicity was indicated by Microtox® with 5-minute and 15-minute EC_{50}s of 73.8% effluent and 55.0% effluent, respectively. The 7-day *Daphnia magna* and *Ceriodaphnia dubia* no observed effect concentrations (NOECs) for survival were both 100% effluent, indicating no acute toxicity. Reproduction, an indication of chronic toxicity, was impaired in both species. The NOEC for reproduction was 25% effluent for *Daphnia magna* and $<6.25\%$ effluent for *Ceriodaphnia.* The cause of chronic toxicity was not clear although several metals exceeded toxicity criteria (Table 8).

Table 6. Dioxin/furan analysis of bleach plant effluents – James River, Camas – June 1990.

	Acid sewer (combined bleach plant effluents)		
	Concentration (ppt)		Loading* (mg/day)	
2378-TCDD	0.02	EMPC		
12378-PeCDD	0.04	EMPC		
123478-HxCDD	0.02		1.21	
123678-HxCDD	0.02		1.21	
123789-HxCDD	0.22		13.3	
1234678-HpCDD	0.21		12.7	
OCDD	0.52	+	31.5	+
2378-TCDF	0.54		32.7	
12378-PeCDF	0.005	U		
23478-PeCDF	0.005	U		
123478-HxCDF	0.005	U		
123678-HxCDF	0.003	U		
234678-HxCDF	0.01	EMPC		
123789-HxCDF	0.008	U		
1234678-HpCDF	0.008	+	0.484	+
1234789-HpCDF	0.008	U		
OCDF	0.07	+	4.24	+
Total TCDD	0.08		4.84	
Total PeCDD	0.06		3.63	
Total HxCDD	0.31		18.8	
Total HpCDD	0.26		15.7	
Total TCDF	0.64		38.8	
Total PeCDF	0.43		26.0	
Total HxCDF	0.07	EMPC		
Total HpCDF	0.03	+	1.82	+

ppt parts per trillion.
* Based on Acid sewer flow rate of 16.0 MGD.
U Indicates compound was analyzed for but not detected at the given detection limit.
EMPC Estimated maximum possible concentration OR estimated detection limit.
\+ Unreliable results based on QA/QC review by Alta Analytical Laboratory.

Table 7. Wastewater non-priority pollutant organics detected - James River, Camas - June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)
	(μg/l)		
AOX	2,605	116,000	27,050
Phenols (4-AAP method)	469	668	17.8
Guaiacols/catechols/phenolics			
Phenol	35 J	37	3 U
2-Methylphenol	1 J	2 J	1 J
4-Methylphenol	11	0.4 U	5
a-Terpeneol	700	140 J	5 J
o-Chlorophenol	0.4 U	0.4 U	0.2 J
2,4-Dimethylphenol	1	0.4 U	0.1 J
Guaiacol (2-methoxyphenol)	490	670 J	0.6 U
2,4-Dichlorophenol	0.4 U	56 J	6
4-Chloroguaiacol	0.5 J	3 J	0.5 U
2,4,6-Trichlorophenol	2 J	67 J	18 J
4-Allylguaiacol (eugenol)	69	1900 J	2 J
4,5-Dichloroguaiacol	4	130 J	4 J
4-Chlorocatechol	0.4 U	0.4 U	2 J
4-Propenylguaiacol	2 J	0.4 U	0.5 U
6-Chlorovanillin	3	5	2 J
4,5-Dichlorocatechol	0.4 U	34	25 J
4,5,6-Trichloroguaiacol	0.9 J	31	0.5 J
9,10-Dichlorosteric acid	3 J	62 J	1 J
5,6-Dichlorovanillin	2 J	4	1 J
3,4,5-Trichlorocatechol	1 J	90 J	47 J
Tetrachloroguaiacol	1 J	18	1 J
Trichlorosyringol	0.4 U	4	0.1 J
Tetrachlorocatechol	0.7 J	38 J	22
Resin/Fatty Acids			
Linoleic acid	97	0.9 U	3
Palmitoleic acid	35	0.9 U	110 J
Decanoic Acid, Hexa-	50	50 J	46
Oleic acid	26	0.9 U	85 J
Octadecanoic acid	5	3	2
Pimaric acid	13	2	1 J
Sandaracopimaric acid	12	3	1 U
Isopimaric acid	35	7	2
Palustric acid	30	0.9 U	1 U
Dehydroabietic acid	90	140 J	4
Abietic acid	68	8	3
Neoabietic Acid	7	0.9 U	1 U
9,10-Dichlorosteric acid	1	10	3
14-Chlorodehydroabietic	0.8 U	35	1 J
12-Chlorodehydroabietic	2	69 J	7
Dichlorodehydroabietic Acid	0.8 U	8	2

U Indicates compound was analyzed for but not detected at the given quantitation limit

J Indicates an estimated value.

Table 8. Wastewater priority pollutant inorganics – James River, Camas – June 1990.

Station:	Primary Effluent		Acid Sewer		Final Effluent (001)			Transfer Blank	Water Quality Criteria++			
Sample type:	composite	grab	composite	grab	E-comp+	E-grab+	JR-comp+					
Analysis type:	recoverable	total	recoverable	total	recoverable	total	recoverable	recoverable				
Date:	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/4	Freshwater*		Freshwater**	
Sample #:	238205	238208	238209	238226	238211	238214	238215	238225	acute	chronic	acute	chronic
	(μg/l)								(μg/l)			
Antimony	5 U		5 U		5 U		5 U	5 U	9,000^	1,600^	9,000^	1,600^
Arsenic	5 U		5 U		5 U		5 U	5 U	360	190	360	190
Beryllium	7 U		7 U		7 U		7 U	7 U	130^	5.3^	130^	5.3^
Cadmium	2 U		2 U		2 U		2 U	2 U	2.4*	.81*	12**	2.4**
Chromium												
(total)	6 U		13		9		7	6 U	1,220*	145*	3,858**	460**
(hexavalent)	50 U	50 U	50 U	50 U	50 U	50 U	50 U		16	11	16	11
Copper	11		26		8		11	2 U	12*	8.2*	44**	27**
Lead	10		10		5 U		8	2	47*	1.8*	282**	11**
Mercury	0.3		0.2 U		0.2 U		0.2 U	0.2 U	2.4	.012	2.4	.012
Nickel	10 U		10 U		10 U		10 U	10 U	985*	110*	3,235**	360**
Selenium	6		8		6		3	3	260	35	260	35
Silver	10 U		10 U		10 U		10 U	10 U	1.9*	.12	22**	.12
Thallium	10 U		10 U		10 U		10 U	10 U	1,400^	40^	1,400^	40^
Zinc												
(as analyzed)	27 B		230 B		102 B		172 B	62 B	81*	74	267**	242**
(blank corrected)	<0 B		183 B		55 B		125 B	15 B	81*	74	267**	242**
Cyanide												
(total)	2 U		2 U		4		2 U	2 U	22	5.2	22	5.2
(weak & dissociable)	2 U		2		2 U		2 U	2 U				

\+ E–comp indicates Ecology composite sampler, E–grab indicates Ecology grab sample, JR–comp indicates James River composite sampler.

++ EPA 1986.

* Hardness dependant criteria based on 65 mg/l hardness as CaCO3 in Columbia River receiving water as measured at Weyerhaeuser, Longview (Andreasson, 1991).

** Hardness dependant criteria based on 265 mg/l hardness as CaCO3 in James River effluent composite (E–comp).

^ Insufficient data to develop criteria. Value presented is the L.O.E.L. – Lowest observed effect level.

[ ] Indicates EFFLUENT metals above acute and/or chronic criteria.

Indicates EFFLUENT quantitation limits above chronic criteria.

U Indicates analyte not detected at the given quantitation limit.

B Indicates method blank contamination.

Table 9. Final Effluent (001) bioassay results – James River, Camas – June 1990.

Microtox – *(Photobacterium phosphoreum)*		
Sample	EC50 (5 minute)	EC50 (15 minute)
100% effluent	73.8%	55.0%

Rainbow trout – *(Oncorhyncus mykiss)* – 96 hour acute	
Sample	% Survival
100% effluent	100
Control	100

Amphipod – *(Hyalella azteca)* – 96 hour acute	
Sample	% Survival
Effluent	
5%	100
8%	100
13%	100
22%	100
36%	100
60%	100
100%	93.3
Control	96.7
	NOEC = 100%
	LC50 > 100%

Water flea – *(Daphnia magna)* – 48 hour acute	
Sample	% Survival
100% effluent	100
Control	100

Water flea – *(Daphnia magna)* – 7 day chronic		
Sample	% Survival	Mean Neonates/Adult
Effluent		
6.25%	100	78.9
12.5%	80	67.7
25%	100	69.1
50%	100	60.2*
100.0%	100	7.0*
Control	100	84.5
	NOEC = 100%	NOEC = 25%
		LOEC = 50%

Water flea – *(Ceriodaphnia dubia)* – 7 day chronic		
Sample	% Survival	Mean Neonates/Adult
Effluent		
6.25%	90	18.2*
12.5%	100	17.5*
25%	100	5.8*
50%	100	0*
100%	90	0*
Control	90	28.6
	NOEC = 100%	NOEC < 6.25%
		LOEC = 6.25%

EC50 Concentration effecting 50% of the organisms.
NOEC No observed effects concentration.
LOEC Lowest observed effects concentration.
* Indicates a significant difference from control at the 0.05 significance level, using Dunnett's test.

Removal Efficiency of Secondary Treatment

A combined "secondary influent" concentration was calculated for parameters of interest by attributing 72.5% of the flow to the primary effluent and 27.5% of the flow to the acid sewer (Table 10). Flow was apportioned based on 42.2 MGD primary clarifier effluent and 16.0 MGD acid sewer flow (from James River's flow records). Based on this "influent" and the 001 effluent, the BOD_5 removal was 69%, while TSS apparently was not significantly removed by secondary treatment. Low influent TSS and limited settling after the ASBs were the likely cause for no observed TSS removal.

Phenols (4-AAP method) were reduced by 97%. The calculated AOX removal of 20% was slightly less than the reported organic halide removal efficiencies of 25% for aerated lagoons measured as TOCl (total organic chlorine) and 30% for aerated lagoons (measured as AOX) cited by Yee (1990).

Organics and inorganics were generally reduced, although in some instances, the secondary effluent concentration appeared to be higher than the secondary influent concentration (<0% removal). Some of these anomalous results, as well as some high removal efficiencies, may be artifacts associated with analytical measurements made near detection limits.

Laboratory Review and Split Sample Comparison

A review of the James River laboratory conducted by Stew Lombard of Ecology's Quality Assurance Section is included in Appendix H. Recommendations included the following:

1. pH buffers used to calibrate the instrument should bracket the expected values and a check standard should be used;

2. TSS analysis should include one sample analyzed in duplicate and a control chart of the standard deviation of the difference between duplicate results, should be maintained;

3. BOD bottles should be washed with detergent not just rinsed with hot tap water;

4. The pH of the BOD samples should be strictly between 6.5 and 7.5 for the test. Samples should be neutralized with sodium hydroxide if the pH is too low; and

5. A control chart of the glucose-glutamic acid standard which James River analyzes with each batch of BOD samples should be maintained.

Agreement between the Ecology and James River laboratories was acceptable for the permit parameters of TSS and BOD_5 (Table 11). Results were not received for James River's analysis of the Ecology collected composite at Outfall 001.

Table 10. Secondary treatment removal efficiencies – James River, Camas – June 1990.

	Primary Effluent (72.5% of flow)	+	Acid Sewer (27.5% of flow)	=	Secondary Influent (calculated)	Secondary Effluent [Final Effluent (001)]	Removal Influent–Effluent / Influent
GENERAL CHEMISTRY							
	(mg/l)					(mg/l)	%
TSS	41		62		47	69	<0
BOD5	178		275 P		205 P	63	69 P
COD	537		1,960		928	751	19
PRIORITY POLLUTANT ORGANICS							
	(µg/l)					(µg/l)	%
Volatiles							
Methylene chloride	2		ND		1	ND	100
Acetone	ND		700		193	65	66
Chloroform	96		3,900		1142	18	98
2-Butanone	410		ND		297	ND	100
4-Methyl-2-pentanone	40		ND		29	ND	100
Toluene	6		ND		4	ND	100
Styrene	2		ND		1	ND	100
BNA's							
Phenol	32		32		32	7	78
Benzyl alcohol	10		ND		7	ND	100
4-Methylphenol	9		ND		7	ND	100
Benzoic acid	25		ND		18	4 J	78
2,4-Dichlorophenol	ND		29		8	5	37
2,4,6-Trichlorophenol	ND		ND		--	29	--
Pesticides/PCB's							
beta-BHC	ND		1.26 J		0.3	ND	100
Endosulfan I	ND		1.03 J		0.3	ND	100
PRIORITY POLLUTANT INORGANICS							
	(µg/l)					(µg/l)	%
Chromium	ND		13		4	9	<0
Copper	11		26		15	8	47
Lead	10		10		10	ND	100
Mercury	0.3		ND		0.2	ND	100
Selenium	6		8		7	6	8
Zinc (blank corrected)	<0 B		183 B		50	55 B	<0
Cyanide	ND		ND		--	4	--
NON-PRIORITY POLLUTANT ORGANICS							
	(µg/l)					(µg/l)	%
Phenols	469		668		524	17.8	97
AOX	2,605		116,000		33789	27,050	20
Resin/fatty acids							
Linoleic acid	97		ND		70	3	96
Palmitoleic acid	35		ND		25	110 J	<0
Decanoic Acid, Hexa-	50		50 J		50	46	8
Oleic acid	26		ND		19	85 J	<0
Octadecanoic acid	5		3		4	2	55
Pimaric acid	13		2		10	1 J	90
Sandaracopimaric acid	12		3		10	ND	100
Isopimaric acid	35		7		27	2	93
Palustric acid	30		ND		22	ND	100
Dehydroabietic acid	90		140 J		104	4	96
Abietic acid	68		8		52	3	94
Neoabietic Acid	7		ND		5	ND	100
9,10-Dichlorosteric acid	1		10		3	3	14
14-Chlorodehydroabietic Acid	ND		35		10	1 J	90
12-Chlorodehydroabietic Acid	2		69 J		20	7	66
Dichlorodehydroabietic Acid	ND		8		2	2	9

Table 10. Secondary treatment removal efficiencies (continued).

	Primary Effluent (72.5% of flow)	+	Acid Sewer (27.5% of flow)	=	Secondary Influent (calculated)	Secondary Effluent [Final Effluent (001)]	Removal Influent–Effluent / Influent
NON-PRIORITY POLLUTANT ORGANICS (CONT)							
	(µg/l)					(µg/l)	%
Guaiacols/catechols/phenolics							
Phenol	35 J		37		36	ND	100
2-Methylphenol	1 J		2 J		1	1 J	22
4-Methylphenol	11		ND		8	5	37
a-Terpeneol	700		140 J		546	5 J	99
o-Chlorophenol	ND		ND		--	0.2 J	--
2,4-Dimethylphenol	1 J		ND		1	0.1 J	86
Guaiacol (2-methoxyphenol)	490		670 J		540	ND	100
2,4-Dichlorophenol	ND		56 J		15	6	61
4-Chloroguaiacol	0.5 J		3 J		1	ND	100
2,4,6-Trichlorophenol	2 J		67 J		20	18 J	9
4-Allylguaiacol (eugenol)	69		1,900 J		573	2 J	100
4,5-Dichloroguaiacol	4		130 J		39	4 J	90
4-Chlorocatechol	ND		ND		--	2 J	--
4-Propenylguaiacol	2 J		ND		1	ND	100
6-Chlorovanillin	3		5		4	2 J	44
4,5-Dichlorocatechol	ND		34		9	25 J	<0
4,5,6-Trichloroguaiacol	0.9 J		31		9	0.5 J	95
9,10-Dichlorosteric acid	3 J		62 J		19	1 J	95
5,6-Dichlorovanillin	2 J		4		3	1 J	61
3,4,5-Trichlorocatechol	1 J		90 J		25	47 J	<0
Tetrachloroguaiacol	1 J		18		6	1 J	82
Trichlorosyringol	ND		4		1	0.1 J	91
Tetrachlorocatechol	0.7 J		38 J		11	22	<0

ND Not detected.
J Indicates an estimated value when the result is less than the specified quantitation limit.
P Greater than.
B Indicates method blank contamination.

Table 11. Results of Ecology and permittee split sample analyses - James River, Camas - June 1990.

Station:	Final Effluent (001)			
Sampler:	Ecology		James River	
Laboratory:	Ecology	James River	Ecology	James River
TSS (mg/l)	69		73	64
BOD5 (mg/l)	63		56	52

Analysis of Blue Creek Samples

Blue Creek BOD_5 and TSS levels were similar to those achieved at municipal treatment facilities using secondary treatment (Table 12). Nutrient concentrations were low. The Blue Creek pH was elevated as previously discussed.

The only organic compounds detected at the effluent weir (outfall 002) were low levels of acetone and chloroform. AOX was measured at 2,140 μg/L in the 002 sample. The pesticide delta-BHC was measured in the parking lot grab sample at a concentration slightly greater than the detection limit.

Mercury was detected in the outfall 002 sample at 0.3 μg/L just above the 0.2 μg/L detection limit. Lead (3 μg/L) and selenium (3 μg/L) were also detected in low concentrations; but the concentrations measured were similar to those measured in the transfer blank (2 and 3 μg/L, respectively). Zinc was also reported, but at a concentration (24 μg/L) less than that measured in the laboratory method blank (47 μg/L).

Centrifuge Study

Three additional VOAs were detected in the centrifuged particulates compared to the effluent, probably due to the low detection levels achieved by concentrating the suspended solids (Table 13). Most of the BNAs detected in the effluent were also detected in the particulate fraction. Organic loadings calculated from the particulates were on the order of 1/100th the loadings calculated from the effluent, possibly due to the fact that the organics detected don't have a particular affinity for particulates. No pesticides/PCBs were detected in particulates.

Most of the metals measured in the effluent were also found in the particulate and dissolved fractions. In most cases it appears the metals also were predominantly in the dissolved phase in the effluent. Metals analysis of the particulates was conducted independently by two laboratories (Ecology and AM Test) and the interlaboratory agreement was generally good, with the exceptions of antimony, mercury and selenium.

Aerated stabilization basin sludge was analyzed as a surrogate material for centrifuged particulates. Surrogate and particulate organic results, converted to a total organic carbon (TOC) basis, and the particulate/surrogate ratio for detected compounds indicate little if any correlation for volatile organics (Table 14). There was no correlation for non-volatile organics, possibly due in part to higher surrogate detection levels (Appendix I). Surrogate and particulate metals were both analyzed independently by two laboratories and reported on a dry weight basis. With the exceptions of antimony, mercury, and selenium in the particulates, metals results are reasonably consistent between laboratories. Particulate/surrogate ratios, where calculable, are also fairly consistent ranging from 0.16 to 0.53 (with the exception of one mercury ratio of 5).

Table 12. Analysis of Blue Creek samples – James River, Camas – June 1990.

Station:	Blue Creek (002)			Parking Lot		Whiskey Creek		Steam Plant	
Sample type:	composite	grab	grab	grab	grab	grab	grab	grab	grab
Sample date:	6/4	6/4	6/5	6/4	6/5	6/4	6/5	6/4	6/5
Sample #:	238216	238217	238223	238218	238227	238219	238228	238220	238229
General Chemistry									
Conductivity (μmhos/cm)	79.2	764		71		189		72.7	
Cyanide (μg/l)									
(total)	2U								
(weak & dissociable)	2U								
Total solids (mg/l)	79	143		71		148		93	
TNVS (mg/l)	48	67		39		108		44	
TSS (mg/l)	14	12		8		3		10	
TNVSS (mg/l)	11	8		4		1		6	
BOD5 (mg/l)	31								
COD (mg/l)	63.4	18.9		16.2		11.5		16.9	
NH3-N (mg/l)	0.012								
NO2+NO3 (mg/l)	0.358								
T-Phosphate (mg/l)	0.033								
Phenols (μg/l)	2U			2U		2U		2U	
AOX (μg/l)		2140							
Oil & Grease (mg/l)		3.2	LAC	LAC	1.1	1.0U	1.1	1.3	1.0
Field Observations									
Temperature (C)	9.7	16.4	16.9	16.4	16.6	12.7	12.9		16.7
pH	8.72	8.62*	9.27*	7.85	7.90	6.88	7.10	7.9	7.82
Conductivity (μmhos/cm)	75.1	76.7	83.6	67.5	100	181.	181.3	73	
Organics									
VOAs (μg/l)									
Acetone		3							
Chloroform		3							
BNAs (μg/l)	ND			ND					
Pesticides/PCBs (μg/l)									
delta-BHC	ND			0.06					
Metals (μg/l)									
Lead	3								
Mercury	0.3								
Selenium	3								
Zinc	24 B								

U Indicates analyte not detected at given quantitation limit.
* These Ecology pH measurements were made in a stainless steel beaker.
LAC Indicates samples lost in laboratory accident.
B Indicates method blank contamination.
ND None detected.

Table 13. Centrifuge study priority pollutants detected - James River, Camas - June 1990.

	Effluent Concentrations (grams/1,000,000 gallons)			
	Whole	Centrate*	Particulates**	
VOAs				
Methylene chloride^	19 U	NOT TESTED	0.0031	
Acetone^	246 J		8 E	
Carbon disulfide	19 U		0.0013 U	
Chloroform	68		0.0013 U	
2-Butanone	38 U		4.2 E	
2-Hexanone	19 U		0.07	
Toluene	19 U		0.0039	
BNAs				
Phenol	26	11 UJ	0.29 U	
4-Methylphenol	19 U	19 UJ	0.15 J	
Benzoic Acid	15 J	38 UJ	0.25 J	
2,4-Dichlorophenol	19	11 UJ	0.11 J	
2,4,6-Trichlorophenol	110	61 J	0.44	
Diethylphthalate	15 U	8 J	0.39 U	
Di-n-Butylphthalate	8 U	314 B	0.17 U	
Metals	(Lab 1)	(Lab 1)	(Lab 1)	(Lab 2)
Antimony, Total	0	19 U	0.9	0.16 J
Antimony, Total recoverable	19 U	19 U	0	0.00
Antimony, Dissolved	34	19 U	0	0.00
Arsenic, Total	0	45	0.16	0.20 U
Arsenic, Total recoverable	19 U	38	0	0.00
Arsenic, Dissolved	19 U	129	0	0.00
Cadmium, Total	0	8 U	0.29	0.67 U
Cadmium, Total recoverable	8 U	8 U	0	0.00
Cadmium, Dissolved	8 U	8 U	0	0.00
Chromium, Total^	0	30	1.6	1.6 J
Chromium, Total recoverable	34	30	0	0.00
Chromium, Dissolved	34	30	0	0.00
Copper, Total^	0	42	23	22
Copper, Total recoverable	30	11	0	0.00
Copper, Dissolved	8 U	8 U	0	0.00
Lead, Total^	0	26	2.2	6.7 U
Lead, Total recoverable^	19 U	19	0	0.00
Lead, Dissolved	53	8	0	0.00
Mercury, Total	0	1	1.0	0.03
Mercury, Total recoverable	1 U	1 U	0	0.00
Mercury, Dissolved	36	1	0	0.00
Nickel, Total	0	38 U	1.5 U	5.3 U
Nickel, Total recoverable	38 U	38 U	0	0.00
Nickel, Dissolved	38 U	76	0	0.00
Selenium, Total^	0	34	2.3	0.27 U
Selenium, Total recoverable^	23	23	0	0.00
Selenium, Dissolved	38 U	38 U	0	0.00
Zinc, Total	0	174 B	50	49
Zinc, Total recoverable	386 B	273 B	0	0.00
Zinc, Dissolved	269 B	746 B	0	0.00

[ ] Indicates detected analyte

* Centrate – The portion of the whole effluent that passes through the centrifuge. Filtered through a 0.45 μm filter prior to analysis.

** Particulates – The portion of the whole effluent retained by the centrifuge.

U Indicates analyte not detected at quantitation limit given.

J Estimated amount, concentration is below quantitation limit.

B Indicates method blank contamination.

E The concentration of the associated value exceeded the known calibration range.

^ Indicates centrifuge and/or effluent field transfer blank contamination.

Laboratory (Metals): (1) AM Test, (2) Manchester – D.O.E

Table 14. Comparison of centrifuge particulates and surrogate priority pollutants - James River, Camas - June 1990.

	Particulates+		Surrogate-(ASB Sludge)++		P/S ratio+++	
VOLATILES (mg/Kg-TOC) Laboratory - PNELI						
Methylene chloride^	0.05		0.17	U	--	
Acetone^	135	E	1.3	J	104	
Carbon disulfide	0.022	U	0.3		0	
2-Butanone	70	E	0.3		247	
2-Hexanone	1.2		0.17	U	--	
Toluene	0.065		0.6		0.1	
BNAs (mg/Kg-TOC) Laboratory - PNELI						
4-Methylphenol	2.4	J	10	U	--	
Benzoic Acid	4	J	22	U	--	
2,4-Dichlorophenol	1.9	J	6	U	--	
2,4,6-Trichlorophenol	7		7	U	--	
Bis(2-ethylhexyl)phthalate^	4	U	5	BJ	0	
PESTICIDES/PCBs (mg/Kg-TOC) Laboratory - PNELI	NONE DETECTED		NONE DETECTED			
METALS (mg/Kg-dry) Laboratory	AM Test	Manchester	AM Test	Manchester	AM Test	Manchester
Antimony, Total	3.35	0.61 J	7.01 U	2.0 J	--	0.31
Arsenic, Total	0.60	0.76 U	2.1	3.0 J	0.29	0
Cadmium, Total	1.12	3 U	2.8	8.6 J	0.40	0
Chromium, Total^	6.15	6.1 J	18.9	24	0.325	0.25
Copper, Total^	87.7	83.1	564	533	0.155	0.156
Lead, Total^	8.38	25 U	16.1	45 U	0.520	--
Mercury, Total	3.93	0.102	0.783	0.21	5.02	0.48
Nickel, Total	5.6 U	20 U	7.0	36 U	0	--
Selenium, Total^	8.94	1 U	4.2	2 U	2.1	--
Zinc, Total	210	186	393	350	0.534	0.532

\+ Particulates - The portion of the whole effluent retained by the centrifuge.
++ Surrogate - A readily available sludge material which may approximate the effluent particulates in chemical make-up and contaminant concentrations.
+++ Particulate to Surrogate ratio.
^ Indicates centrifuge and/or effluent field blank contamination.
U Indicates analyte not detected at quantitation limit given.
J Estimated amount, concentration is below quantitation limit.
B Indicates method blank contamination.
E Estimated amount, concentration is above highest calibration standard.

Complete priority pollutant scans for the centrifuge study are included in Appendix I. The James River, Camas results will be included as part of an Ecology report on the Centrifuge study due out in mid 1991 (Andreasson, 1991).

CONCLUSIONS AND RECOMMENDATIONS

Permit requirements for daily (or monthly) maximum BOD_5 and TSS loading at outfall 001 were met. The daily average BOD_5 limit was slightly exceeded. Excursions in pH (based on the permit in force at the time of the inspection) of 8.6 and 9.3 were observed at outfall 002 on Blue Creek. Such excursions were allowed subject to the time duration constraints detailed in the permit (Blue Creek pHs up to 9.5, with excursions up to 10.5 are allowed in the current permit). Effluent from the sewage treatment package plant for the floating dock was meeting current permit requirements for fecal coliform (the permit in force had no numerical fecal coliform limit).

EPA's acute and chronic Water Quality Criteria for zinc were exceeded in 001 effluent composite samples collected by both Ecology and James River. Unfortunately, zinc was found in the laboratory method blank and the transfer blank, so reliability of the data is questionable. Chronic criteria for copper and lead were also slightly exceeded in the 001 effluent sample collected by James River (lead, however, was also measured in the field transfer blank at a comparable level). Due to the high detection levels reported for some of the metals, resampling and reanalysis of metals (especially hexavalent chromium) is recommended for the next inspection. Required detection levels (i.e., sufficient to establish adherence to Water Quality Criteria) should be clearly indicated to the laboratory.

2,3,7,8-TCDD was not detected in the sample collected at the acid sewer. The estimated detection limit was 0.02 ppt. Related compounds, including 2,3,7,8-TCDF were detected.

AOX loading was 13,126 lb/day, more than twice the annual average and monthly maximum limits which are to be complied with within 54 months of the current permit issuance date.

No acute effluent toxicity was indicated by rainbow trout, *Hyalella azteca,* or 48-hour acute *Daphnia magna* bioassays. Some acute toxicity was indicated by Microtox®. Although 7-day survival NOECs were 100% effluent, reproduction, a measure of chronic toxicity, was impaired for both *Daphnia magna* and *Ceriodaphnia dubia* with NOECs of 25% effluent and $<6.25\%$ effluent, respectively.

Removal efficiencies achieved with secondary treatment were tabulated for organic priority and non-priority pollutants and inorganic priority pollutants. Pollutants were generally reduced with secondary treatment although some of the reduction may be artifacts associated with analytical results near detection limits.

Several recommendations were made regarding laboratory procedures for pH, TSS, and BOD_5. Ecology and James River split sample results for permit parameters were in good agreement.

Analysis of outfall 002 and up-stream Blue Creek samples were unremarkable and indicated no special problem areas with the exception of a high pH excursion.

Although particulate matter samples were gathered and the resulting data analyzed, it is too early in Ecology's piloting of centrifugation to draw any definitive conclusions from the data. Most compounds appeared to be soluble rather than associated with the particulate phase. Lagoon sludge may prove to be useful as a surrogate for effluent particulate metals.

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APPENDICES

Appendix A - Results of VOA Matrix Spike/Matrix Spike Duplicate Samples - James River, Camas - June 1990.

Sample:	Matrix Spike	Matrix Spike Duplicate	RPD*	QC Limits	
Sample ID:	238225	238225			
	% Recovery	% Recovery		RPD	% Recovery
1,1-Dichloroethene	95	97	2.1	<14	(61-145)
Trichloroethene	119	118	0.8	<14	(71-120)
Benzene	111	110	0.9	<11	(76-127)
Toluene	109	115	5.4	<13	(76-125)
Chlorobenzene	111	110	0.9	<13	(75-130)

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentage.

Appendix A - Results of Non-priority Pollutant Matrix Spike/Matrix Spike Duplicates - James River, Camas - June 1990.

Sample: Sample ID:	Matrix Spike 238211 % Recovery	Matrix Spike Duplicate 238211 % Recovery	QC Limits have not been established
Guaiacols/Catechols/Phenolics			
Phenol	82	10	
Ethanone, 1-phenyl-	82	13	
2-Methylphenol	97	31	
4-Methylphenol	96	19	
a-Terpeneol	99	30	
2,4-Dimethylphenol	104	44	
2-Cyclopenten-1-one, 2-methyl	NAR	NAR	
Guaiacol (2-methoxyphenol)	105	62	
2,4-Dichlorophenol	97	61	
2,4,6-Trichlorophenol	135	118	
2,4,5-Trichlorophenol	104	104	
4-Allylguaiacol (eugenol)	102	117	
4,5-Dichloroguaiacol	103	129	
4-Chlorocatechol	103	126	
4-Propenylguaiacol	99	120	
6-Chlorovanillin	100	127	
4,5-Dichlorocatechol	166	221	
4,5,6-Trichloroguaiacol	99	121	
9,10-Dichlorosteric acid	98	118	
5,6-Dichlorovanillin	138	158	
Pentachlorophenol	98	115	
3,4,5-Trichlorocatechol	226	299	
Tetrachloroguaiacol	101	121	
Trichlorosyringol	116	141	
Tetrachlorocatechol	124	153	
Resin/Fatty Acids			
Linoleic acid	74	LAC	
Palmitoleic acid	NAR	LAC	
Decanoic Acid, Hexa-	NAR	LAC	
Oleic acid	NAR	LAC	
Octadecanoic acid	90	LAC	
Pimaric acid	65	LAC	
Sandaracopimaric acid	66	LAC	
Isopimaric acid	38	LAC	
Palustric acid	39	LAC	
Eicosatrienoic acid	60	LAC	
Dehydroabietic acid	36	LAC	
Retene	69	LAC	
Abietic acid	47	LAC	
Neoabietic Acid	34	LAC	
9,10-Dichlorosteric acid	21	LAC	
14-Chlorodehydroabietic	36	LAC	
12-Chlorodehydroabietic	27	LAC	
Dichlorodehydroabietic Acid	35	LAC	

NAR No analytical result
LAC Laboratory accident rendered the sample not suitable for analysis.

Appendix A - Results of Metals Matrix Spike/Matrix Spike Duplicates - James River, Camas - June 1990.

Sample: Sample ID:	*Matrix Spike* 238216 % Recovery	*Matrix Spike Duplicate* 238216 % Recovery	*RPD**	*QC Limits* RPD	*QC Limits* % Recovery
Antimony	94	91	3.2	<20%	(75-125)
Arsenic	101	99	2.0	<20%	(75-125)
Beryllium	96	100	4.1	<20%	(75-125)
Cadmium	103	100	3.0	<20%	(75-125)
Chromium (total)	101	105	3.9	<20%	(75-125)
Chromium (hexavalent)	120	108	10.5	<20%	(75-125)
Copper	99	95	4.1	<20%	(75-125)
Lead	100	100	0.0	<20%	(75-125)
Mercury	95 **	102 **	7.1	<20%	(75-125)
Nickel	102	107	4.8	<20%	(75-125)
Selenium	105	105	0.0	<20%	(75-125)
Thallium	76	78	2.6	<20%	(75-125)
Zinc	98	102	4.0	<20%	(75-125)

* RPD = relative percent difference is the absolute difference between samples divided by their average and expressed as a percentage.

** Sample 238209

Appendix A. - Priority Pollutant Organics Surrogate Recoveries - James River, Camas - June 1990.

Station:	Primary Effluent		Acid Sewer	Final Effluent (001)		Blue Creek (002)		Transfer Blank	
Sample type:	grab	grab	grab	grab	grab	grab			
Sample ID:	238206	238207	238210	238212	238213	238217		238225	QC limits
	% Recovery								%
VOA Surrogates									
Toluene-d8	107	105	109	98	108	103		104	(88-110)
Bromofluorobenzene	102	98	102	95	102	99		100	(86-115)
1,2-Dichloroethane-d4	105	102	103	106	103	104		99	(76-114)

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)		Blue Creek (002)	Parking Lot	Transfer Blank	
Sample type:	composite	composite	E-comp+	JR-comp+	composite	grab		
Sample ID#:	238205	238209	238211	238215	238216	238218	238225	QC limits
	% Recovery							%
BNA Surrogates								
Nitrobenzene-d5	78	54	80	76	75	84	83	(35-114)
2-Fluorobiphenyl	71	64	66	66	65	73	70	(43-116)
Terphenyl	65	56	44	45	78	81	84	(33-141)
Phenol-d5	77	82	79	82	71	63	76	(10- 94)
2-Fluorophenol	50	79	78	79	70	30	73	(21-100)
2,4,6-Tribromophenol	76	88	82	86	74	42	70	(10-123)
Pesticide/PCB Surrogate								
Dibutylchlorendate	0	0	85	63	79	70	90	(24-154)*

\+ E-comp indicates Ecology composite sampler, JR-comp indicates James River composite sampler.
* EPA has established only an advisory limit for this pesticide surrogate.
[ ] Indicates surrogate recovery outside CLP control limits.

Appendix A. Dioxin/Furan Surrogate and Internal Standard Recoveries - James River, Camas - June 1990.

Station:	Acid sewer
Sample ID#:	238209
	% Recovery
Surrogate Recovery Summary	
37C1-TCDD	63.8
13C12-PeCDF 234	81.8
13C12-HxCDF 478	53.0
13C12-HxCDD 478	54.6
13C12-HpCDF 789	73.2
Alternate Standards Recovery Summary	
13C12-HxCDF 789	59.5
13C12-HxCDF 234	56.9
Internal Standards Recovery Summary	
13C12-2378-TCDF	43.2
13C12-2378-TCDD	44.9
13C12-PeCDF 123	57.4
13C12-PeCDD 123	70.0
13C12-HxCDF 678	36.2
13C12-HxCDD 678	45.8
13C12-HpCDF 678	49.7
13C12-HpCDD 678	54.6
13C12-OCDD	32.5

Information on QC Limits was not provided with the data package, however, an independant QA/QC assessment by by Alta Analytical Laboratory of California found all QA/QC parameters to be within EPA method 8290 guidelines.

Appendix A. - Non-priority Pollutant Organics Surrogate Recoveries - James River, Camas - June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)			QC Limits
Sample type:	composite	composite	E-comp+	MS*	MSD*	have not been
Sample ID:	238205	238209	238211	238211-MS	238211-MSD	established
	% Recovery					
Guaiacols/Catechols/Phenolics						
Surrogates						
2-Ethoxyphenol	112	134	98	106	75	
2,4,6-Tribromophenol	82	70	87	100	120	
D6-Resorcinol	79	NAR	66	123	144	
2-Fluorobiphenyl	96	104	96	82	52	
2-Fluorophenol	86	95	78	79	14	
D5-Nitrobenzene	141	182	87	86	16	
D5-Phenol	102	114	78	86	15	
Internal Standard						
2,6-Dibromophenol	46	62	80	80	72	
Resin/Fatty Acids						
Surrogates						
Et-o-Methylpodocarpic acid	30	33	35	65	5	
Heptadecanoic acid	49	30	32	137	12	
1-Fluorenecarboxylic acid	53	71	67	88	5	

* MS - matrix spike sample, MSD - matrix spike duplicate sample
\+ E-comp indicates Ecology composite sampler.
NAR No Analytical Result

Appendix B. Results of Volatile Organics scan – James River, Camas – June 1990.

Station:	Primary Effluent		Acid Sewer	Final Effluent (001)		Blue Creek (002)	Transfer Blank
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	6/5	6/5	6/5	6/5	6/5	6/4	6/4
Time:	AM	PM	PM	AM	PM	PM	PM
Sample ID #:	238206	238207	238210	238212	238213	238217	238225
				(µg/l)			
Chloromethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Bromomethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Vinyl Chloride	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Chloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Methylene Chloride	[2]	5 U	50 U	5 U	5 U	1 U	[2]
Acetone	1 U	5 U	[700]	[49] J	[81]	[3]	[5]
Carbon Disulfide	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,1-Dichloroethene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,2-Dichloroethene (total)	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Chloroform	[110]	[82]	[3900]	[17]	[19]	[3]	1 U
1,2-Dichloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
2-Butanone	[260] E	[410]	100 U	10 U	10 U	2 U	2 U
1,1,1-Trichloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Carbon Tetrachloride	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Vinyl Acetate	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Bromodichloromethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,2-Dichloropropane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
cis-1,3-Dichloropropene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Trichloroethene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Dibromochloromethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Benzene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
trans-1,3-Dichloropropene	7 U	5 U	50 U	5 U	5 U	1 U	1 U
Bromoform	1 U	5 U	50 U	5 U	5 U	1 U	1 U
4-Methyl-2-Pentanone	[34]	[46]	100 U	10 U	10 U	2 U	2 U
2-Hexanone	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Tetrachloroethene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Toluene	[5]	[7]	50 U	5 U	5 U	1 U	1 U
Chlorobenzene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Ethylbenzene	1 U	5 U	50 U	5 U	5 U	1 U	1 U
Styrene	[2]	5 U	50 U	5 U	5 U	1 U	1 U
Total Xylenes	1 U	5 U	50 U	5 U	5 U	1 U	1 U

[ ] Indicates detected analyte.
U Indicates analyte not detected at given quantitation limit.
E Indicates estimated value exceeding known calibration range.
J Indicates estimated value.

Appendix C. Results of BNA scan - James River, Camas - June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)		Blue Creek (002)	Parking Lot	Transfer Blank
Type:	comp	comp	E-comp+	JR-comp+	comp	grab	grab
Date:	6/5	6/5	6/5	6/5	6/4	6/4	6/4
Sample ID #:	238205	238209	238211	238215	238216	238218	238225
				(µg/l)			
Phenol	32	32	7	3 U	3 UJ	3 UJ	3 U
Bis(2-Chloroethyl)Ether	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Chlorophenol	3 U	3 U	3 U	3 U	3 UJ	3 UJ	3 U
1,3-Dichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
1,4-Dichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Benzyl Alcohol	10	5 U	5 U	5 U	5 UJ	5 UJ	5 U
1,2-Dichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2-Methylphenol	5 U	5 U	5 U	5 U	5 UJ	5 UJ	4 U
Bis(2-chloroisopropyl)ether	3 U	3 U	3 U	3 U	3 U	3 U	2 U
4-Methylphenol	9	5 U	5 U	5 U	5 UJ	5 UJ	4 U
N-Nitroso-Di-n-Propylamine	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Hexachloroethane	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Nitrobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Isophorone	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Nitrophenol	3 U	3 U	3 U	3 U	3 UJ	3 UJ	2 U
2,4-Dimethylphenol	4 U	4 U	4 U	4 U	4 UJ	4 UJ	4 U
Benzoic Acid	25	10 U	4 J	4 J	10 UJ	10 UJ	9 U
Bis(2-Chloroethoxy)Methane	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2,4-Dichlorophenol	3 U	29	5	4	3 UJ	3 UJ	3 U
1,2,4-Trichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Naphthalene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
4-Chloroaniline	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Hexachlorobutadiene	4 U	4 U	4 U	4 U	4 U	4 U	4 U
4-Chloro-3-Methylphenol	5 U	5 U	5 U	5 U	5 UJ	5 UJ	4 U
2-Methylnaphthalene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Hexachlorocyclopentadiene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2,4,6-Trichlorophenol	3 U	3 U	29	30	3 UJ	3 UJ	3 U
2,4,5-Trichlorophenol	3 U	3 U	3 U	3 U	3 UJ	3 UJ	3 U
2-Chloronaphthalene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2-Nitroaniline	3 U	3 U	3 U	3 U	3 U	3 U	2 U
Dimethyl Phthalate	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acenaphthylene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
3-Nitroaniline	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Acenaphthene	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2,4-Dinitrophenol	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 U
4-Nitrophenol	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 U
Dibenzofuran	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2,4-Dinitrotoluene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Diethyl Phthalate	4 U	4 U	4 U	4 U	4 U	4 U	4 U
4-Chlorophenyl-Phenylether	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Fluorene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Nitroaniline	3 U	3 U	3 U	3 U	3 U	3 U	3 U
4,6-Dinitro-2-Methylphenol	7 U	7 U	7 U	7 U	7 UJ	7 UJ	6 U
N-Nitrosodiphenylamine	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Bromophenyl-Phenylether	2 U	2 U	2 U	2 U	2 U	2 U	1 U
Hexachlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pentachlorophenol	10 U	10 U	10 U	10 U	10 UJ	10 UJ	9 U
Phenanthrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Anthracene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Di-n-Butyl Phthalate	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Fluoranthene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pyrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Butylbenzylpthalate	4 U	4 U	4 U	4 U	4 U	4 U	5
3,3'-Dichlorobenzidine	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(a)Anthracene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chrysene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bis(2-Ethylhexyl)phthalate	3 U	3 U	3 U	3 U	3 U	3 U	7
Di-n-Octyl Phthalate	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(b)Fluoranthene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(k)Fluoranthene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(a)Pyrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Indeno(1,2,3-cd)Pyrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibenzo(a,h)Anthracene	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(g,h,i)Perylene	1 U	1 U	1 U	1 U	1 U	1 U	1 U

\+ E-comp indicates Ecology composite sampler, JR-comp indicates James River composite sampler.

[ ] Indicates detected analyte.

U Indicates analyte not detected at given quantitation limit.

J Indicates estimated value.

Appendix D. Results of Pesticide/PCB scan – James River, Camas – June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)		Blue Creek (002)	Parking Lot	Transfer Blank
Type:	comp	comp	E-comp+	JR-comp+	comp	grab	grab
Date:	6/5	6/5	6/5	6/5	6/4	6/4	6/5
Sample ID #:	238205	238209	238211	238215	238216	238218	238225
				(µg/l)			
alpha-BHC	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
beta-BHC	0.50 UJ	1.26 J	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.06	0.05 U
gamma-BHC (Lindane)	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
Heptachlor	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
Aldrin	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
Endosulfan I	0.50 UJ	1.03 J	0.50 U	0.50 U	0.05 U	0.05 U	0.05 U
Dieldrin	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
Endrin	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
Endosulfan II	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
4,4'-DDD	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
Methoxychlor	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Endrin Ketone	1.00 UJ	1.00 UJ	1.00 U	1.00 U	0.10 U	0.10 U	0.10 U
alpha Chlordane	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
gamma Chlordane	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Toxaphene	10.00 UJ	10.00 UJ	10.00 U	10.00 U	1.00 U	1.00 U	1.00 U
Aroclor-1016	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	5.00 UJ	5.00 UJ	5.00 U	5.00 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	10.00 UJ	10.00 UJ	10.00 U	10.00 U	1.00 U	1.00 U	1.00 U
Aroclor-1260	10.00 UJ	10.00 UJ	10.00 U	10.00 U	1.00 U	1.00 U	1.00 U

\+ E-comp indicates Ecology composite sampler, JR-comp indicates James River composite sampler.

[ ] Indicates detected analyte.

U Indicates analyte not detected at given quantitation limit.

J Indicates estimated value.

Appendix E. Priority pollutant metals scan – James River, Camas – June 1990.

Station:	Primary Effluent		Acid Sewer		Final Effluent (001)				Blue Creek (002)	Transfer Blank
Sample type:	composite	grab	composite	grab	E-comp+		E-grab+	JR-comp+	composite	
Analysis type:	recoverable	total	recoverable	total	recoverable	dissolved	total	recoverable	recoverable	recoverable
Date:	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/5	6/4
Sample #:	238205	238208	238209	238226	238211	238211	238214	238215	238216	238225
					(µg/l)					
Antimony	5 U		5 U		5 U	9		5 U	5 U	5 U
Arsenic	5 U		5 U		5 U	5 U		5 U	5 U	5 U
Beryllium	7 U		7 U		7 U	7 U		7 U	7 U	7 U
Cadmium	2 U		2 U		2 U	2 U		2 U	2 U	2 U
Chromium										
(all valences)	6 U		13		9	9		7	6 U	6 U
(hexavalent)	50 U	50 U	50 U	50 U	50 U		50 U	50 U		
Copper	11		26		8	2 U		11	2 U	2 U
Lead	10		10		5 U	14		8	3	2
Mercury	0.3		0.2 U		0.2 U	9.5		0.2 U	0.3	0.2 U
Nickel	10 U		10 U		10 U	10 U		10 U	10 U	10 U
Selenium	6		8		6	10 U		3	3	3
Silver	10 U		10 U		10 U	10 U		10 U	10 U	10 U
Thallium	10 U		10 U		10 U	10 U		10 U	10 U	10 U
Zinc	27 B		230 B		102 B	71 B		172 B	24 B	62 B

\+ E-comp indicates Ecology composite sampler, E-grab indicates Ecology grab sample, JR-comp indicates James River composite sampler.

[ ] Indicates detected analyte.

U Indicates analyte not detected at the given quantitation limit.

B *Indicates method blank contamination.*

Appendix F. Guaiacols/Catechols/Phenolics scans - James River, Camas - June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)
Type:	composite	composite	composite
Date:	6/5	6/5	6/5
Sample ID #:	238205	238209	238211
		(µg/l)	
Phenol	35 J	37	3 U
Ethanone, 1-phenyl-	4 U	5 U	2 U
2-Methylphenol	1 J	2 J	1 J
4-Methylphenol	11	0.4 U	5
a-Terpeneol	700	140 J	5 J
o-Chlorophenol	0.4 U	0.4 U	0.2 J
2,4-Dimethylphenol	1	0.4 U	0.1 J
2-Cyclopenten-1-one, 2-methyl	0.4 U	0.4 U	0.5 U
2-Cyclopenten-1-one, 3-methyl	0.4 U	0.4 U	0.5 U
Guaiacol (2-methoxyphenol)	490	670 J	0.6 U
4-Chloro-3-Methylphenol	0.4 U	0.4 U	0.5 U
2,4-Dichlorophenol	0.4 U	56 J	6
2-Nitrophenol	0.4 U	0.4 U	0.5 U
4-Chloroguaiacol	0.5 J	3 J	0.5 U
2,4,6-Trichlorophenol	2 J	67 J	18 J
4-Nitrophenol	0.4 U	0.4 U	0.5 U
2,4,5-Trichlorophenol	0.4 U	0.4 U	0.5 U
4-Allylguaiacol (eugenol)	69	1900 J	2 J
4,5-Dichloroguaiacol	4	130 J	4 J
4-Chlorocatechol	0.4 U	0.4 U	2 J
4-Propenylguaiacol	2 J	0.4 U	0.5 U
6-Chlorovanillin	3	5	2 J
4,5-Dichlorocatechol	0.4 U	34	25 J
4,5,6-Trichloroguaiacol	0.9 J	31	0.5 J
9,10-Dichlorosteric acid	3 J	62 J	1 J
5,6-Dichlorovanillin	2 J	4	1 J
Pentachlorophenol	0.4 U	0.4 U	0.5 U
3,4,5-Trichlorocatechol	1 J	90 J	47 J
Tetrachloroguaiacol	1 J	18	1 J
Trichlorosyringol	0.4 U	4	0.1 J
Tetrachlorocatechol	0.7 J	38 J	22

[ ] Indicates detected compounds.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value.

Appendix G. Resin/Fatty acid scans - James River, Camas - June 1990.

Station:	Primary Effluent	Acid Sewer	Final Effluent (001)
Type:	composite	composite	composite
Date:	6/5	6/5	6/5
Sample ID #:	238205	238209	238211
		(µg/l)	
Linoleic acid	97	0.9 U	3
Palmitoleic acid	35	0.9 U	110 J
Decanoic Acid, Hexa-	50	50 J	46
Oleic acid	26	0.9 U	85 J
Octadecanoic acid	5	3	2
Retene	0.8 U	0.9 U	1 U
Pimaric acid	13	2	1 J
Sandaracopimaric acid	12	3	1 U
Isopimaric acid	35	7	2
Palustric acid	30	0.9 U	1 U
Eicosatrienoic acid	0.8 U	0.9 U	1 U
Dehydroabietic acid	90	140 J	4
Abietic acid	68	8	3
Neoabietic Acid	7	0.9 U	1 U
9,10-Dichlorosteric acid	1	10	3
14-Chlorodehydroabietic	0.8 U	35	1 J
12-Chlorodehydroabietic	2	69 J	7
Dichlorodehydroabietic Acid	0.8 U	8	2

[ ] Indicates detected compounds
U Indicates compound was analyzed for but not detected at the given quantitation limit
J Indicates an estimated value

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS & LABORATORY SERVICES
Quality Assurance Section

June 11, 1990

TO: Jeanne Andreasson

THROUGH: Cliff Kirchmer

FROM: Stewart Lombard

SUBJECT: Lab Evaluation - James River Mill

On Tuesday, June 5, I evaluated the analytical laboratory at the James River Paper Mill in support of your Class II inspection of the facility. I met with Steve Young, the Environmental Supervisor; Ted Miller, the chemist who performs the biological oxygen demand (BOD_5) and total suspended solids (TSS) procedures; and Dan Radonski, the Ecology permit writer.

The lab has copies of the procedures for BOD_5 (Standard Methods, 16th Ed., Method No. 507); TSS (EPA 160.2); and pH (EPA 150.1) in a notebook at Mr. Miller's desk.

pH PROCEDURE

The pH results which are reported in the discharge monitoring reports (DMRs) are from the continuous monitoring equipment at the waste treatment plant (WTP). Mr. Miller routinely collects the daily composite sample for BOD and TSS analysis, observes the pH reading on the continuous monitor, and measures the pH of the composite sample immediately upon returning to the lab. In case of a discrepancy between the two pH values, Mr. Miller would investigate and correct the problem.

I used the attached checklist to review the lab procedure used to measure the pH of the daily composite samples.

An instrument technician calibrates and maintains the pH meter. The pH meter is calibrated using standards of pH approximately 7 and 10. The results for the WTP composite samples range from 6.1 to 6.9. Mr. Miller did not know if a check standard was used to verify the calibration of the instrument. Since these results are not reported on the DMRs, calibration with standards which bracket the expected values and the use of a check standard are optional, but recommended.

TSS PROCEDURE

A 24-Hr. composite sample is collected daily from the outfall of the WTP. I used the attached checksheet to review the lab procedure. The only problems that I noted have to do with quality control. I suggest that the lab analyze one sample in duplicate with each batch of samples. I also suggest that they maintain a control chart of the standard

deviation of the difference between the duplicate results. This would give an immediate warning of a problem with the procedure.

I have attached a copy of our draft Quality Assurance (QA) Manual for small wastewater labs. It contains information on the preparation and use of control charts and other useful QA procedures.

BOD PROCEDURE

Portions of the samples described above are analyzed daily for BOD. I used the attached checksheet to review the lab procedure.

The BOD bottles are cleaned by rinsing them with hot tap water. I am concerned that organic matter might build up on the inside surface of the bottles over time and begin to effect the results. The procedure calls for washing the bottles with detergent and I recommend that this be done.

The procedure calls for the samples to be at pH 6.5 to 7.5 for the test. The pH of many of the samples is slightly under 6.5. Since this is an operational test, it is important that the procedure be followed exactly. I recommend that the samples be neutralized with sodium hydroxide when necessary.

A glucose-glutamic acid standard is analyzed with each batch of samples. A control chart of the results for these standards would give a good indication of any serious problems with the procedure.

Dan noted that the some of the data are recorded in pencil and that corrections to the data were made using white-out. While there is no regulatory requirement for data recording and corrections, the recommended procedure is contained in the attached ASTM document. I suggest that the laboratory be urged to follow these standard practices for their own protection in the event that they might have to defend their data in litigation.

I should emphasize that the procedures recommended in our draft QA manual are not mandatory. They are simply examples of good QA procedures. I suggest that you send the manual along with the recommendations in this memo to Steve Young.

I hope that this information is useful to you. If you have any questions of concerns please call me anytime.

SML:sml

Attachments

cc: Dan Radonski

BOD CHECKSHEET

2703CHEK.SHT
3/20/90

Laboratory James River Paper Mill

Person Interviewed Steve Young & Ted Miller

Date of Audit 6/5/90

Auditor Stewart Lombard

24 Hr. Composite at outfall of WTP collected and analyzed daily.

Ref: SM (16th ed) 507 and (17th ed) 5210

	YES	NO	COMMENTS
1. Is approved method followed? Method SM-16 507	X	—	
2. Is incubator adequate (i.e., clean, excludes light)?	X	—	H2O Bath under counter
3. Are samples stored in a refrigerator at 4° C?	X	—	Frozen if held 48 Hrs
4. Is sample source and type (i.e., grab or composite) recorded?	X	—	Is the compositor coo
5. Are samples anayzed within 48 hours?	X	—	
6. If DO probe is used, is it calibrated--against air?	—	—	
--against Winkler titration?	—	—	
--against oxygen-saturated water?	—	—	
--before each day's use?	—	—	
7. If DO probe is used, is it properly maintained so--			
there are no bubbles under the membrane?	—	—	
the membrane is not allowed to dry out?	—	—	
there is no growth under the membrane?	—	—	
8. Are proper BOD bottles used--250 (300 mL) (or 125 mL for Hach kit)?	X	—	
Sealable?	—	—	
9. Is incubator set at 20 ± 1° C?	X	—	20.1 °C
10. Is incubator thermometer certified to ± 1° C?	X	—	
11. Is buffer added to dilution water only on day of used?	X	—	
12. Is buffer stored in refrigerator?	X	—	
13. Is deionized or distilled water used for dilution water?	X	—	C Filter, RO, Ion Exchange

Laboratory James River Mill

Date 6/5/90

BOD Checksheet
Page 2 of 3

	YES	NO	COMMENT
14. Is dilution water protected from atmospheric contamination?	X		
15. Are dilution water blanks analyzed?	X		0.15 - 0.25 mg/l
16. Is the blank depletion less than 0.2 mg/L?			usually
17. Are BOD bottles and glassware cleaned with non-phosphate detergent and acid rinsed?		X	Rinsed w/ hot tap water
18. Are samples neutralized to pH 6.5 - 7.5?		X	pH is usually 6.2 - 6.9
19. Is nitrification inhibitor added to dilution water or sample?		X	
20. Are reagents for dilution water properly prepared-- Ferric chloride (0.25 g/L)?	X		Use
Magnesium sulfate (22.5 g/L)?	X		Commercial
Calcium chloride (27.5 g/L)?	X		B Solutions
Sodium sulfite (1.575 g/L), prepared daily?			Not used
21. Are samples brought to 20 ± 1 deg C before dilution?	X		
22. Is reference solution (150 mg each of glucose & glutamic acid diluted w/distilled water to 1 L) run with each batch of samples?	X		In duplicate
23. Are BOD's of the reference solution 200 ± 37 mg/L?	X		
24. If residual chlorine is present, is chlorine removed with sodium sulfite and are samples properly seeded?			WTP Removes Cl_2
Source of seed----------final effluent from WWTP			
Artificial seed (e.g., Polybac)			
Frozen sewage			
Other Intermediate Effluent from STP			
25. Are proper dilution techniques used?	X		Final effluent is very consistent - 1 dilution
26. Do dilutions have depletions of at least 2 mg/L?	X		2.5 - 5
27. Are samples incubated for 5 days?	X		
29. Are calculations completed properly?	X		✓

Laboratory James River Paper Mill

Date 6/5/90

BOD Checksheet
Page 3 of 3

	YES	NO	COMMENT
30. Are records properly authenticated (i.e., signed/initialled by analyst and one other)?	X		
31. Are QC samples analyzed regularly?	X		Sugar Std. + all samples in duplicate
32. Is precision control chart available and used?		X	Send Cascade QA Manual

$$\text{BOD in mg/L} = \frac{D1 - D2}{P}, \text{ or if seeded, } \frac{(D1 - D2) - (B1 - B2)f}{P}$$

where D1 = DO of sample after preparation, mg/L
D2 = DO of sample after incubation
B1 = DO of seed control before incubation
B2 = DO of seed control after incubation
P = decimal volumetric fraction of sample used
f = ratio of seed in sample to seed in control (i.e., % seed in D/% seed in B)

HYDROGEN ION (pH) CHECKSHEET

1503CHEK.SHT
10/25/89

(Std Meth 423)

Laboratory James River Paper Mill

Person Interviewed Steve Young & Ted Miller

Date of Audit 6/5/90

Auditor Stewart M. Lombard

DMR value from continuous Monitor. 24-Hr Composite from WTP outfall and grab from outfall to Camas slough collected and analyzed daily.

	YES	NO	COMMENTS
1. Is approved method followed? Method EPA 150.1	X	—	
2. Is pH meter adequate (i.e., clean, functioning properly)?	X	—	
3. Are electrodes stored according to manufacturer's recommendations?	—	—	
4. Are electrodes properly filled with electrolyte?	X	—	
5. Are at least two buffers used to calibrate the meter?	X	—	pH 7 & pH 10
6. Do buffers bracket the expected sample pH?	—	X	Sample pH 6.1-6.9
7. Are fresh buffers used daily?	X	—	
8. Are buffer solutions (bulk) replaced at least every four weeks?	X	—	
9. Are polyethylene or TFE beakers used?	—	X	not for samples
10. Is plastic-coated stirrer used?	X	—	
11. Is temperature of buffer and sample measured and recorded and are they the same?	—	—	
12. Are buffer solutions replaced periodically (at least every 4 weeks)?	X	—	
13. Is temperature compensation used? Manual ___ Automatic X	X	—	
14. Are samples analyzed as soon as possible after being brought to the lab?	X	—	
15. Are records properly authenticated (i.e., checked and signed/ initialled by analyst and one other)?	X	—	
16. Are QC samples analyzed regularly?	—	—	? ✓ w/ Inst. Tech.
17. Is precision control chart available and used?	—	X	

TSS CHECKSHEET

1703CHEK.SHT
3/20/90

Laboratory James River Paper Mill

Person Interviewed Steve Young & Ted Miller

Date of Audit 6/5/90

Auditor Stewart Lombard

24 - Hr. Composite from WTP outfall collected and analyzed daily

Ref: SM (16th ed) 209C and (17th ed) 2540D; EPA 160.2	YES	NO	COMMENTS
1. Is approved method followed? Method EPA 160.2	X		
2. Is apparatus adequate (i.e., clean, functioning properly)?			
Balance?	X		
Funnel?	X		
Filters?	X		Watman 934 AH
Suction device?	X		
Oven (including thermometer)?	X		
Dessicator (dessicant dry)?	X		
3. Is glass fiber filter used?	X		
4. Is filter properly prewashed?	X		
5. Following filtration, is filter properly rinsed?	X		3 washes
6. Is residue dried at 103-5° C?	X		
7. Is residue dried for one hour or at least to constant weight?	X		1 Hr.
8. Are samples stored in a refrigerator at 4° C?	X		
9. Are samples analyzed within seven days?	X		Same Day
10. Are calculations completed properly?	X		
11. Are records properly authenticated (i.e., checked and signed/ initialled by analyst and one other)?	X		
12. Are all samples analyzed regularly?		X	Re-sample if result is out of normal range
13. Is precision control chart available and used?		X	

TSS (in mg/L) = [(A - B) x 1000]/sample volume (mL)
where A = weight of filter + residue (mg)
and B = weight of filter (mg)

Appendix I. Centrifuge study priority pollutant scans - James River, Camas - June 1990.

	Field Centrifuge Blank	Field Effluent Blank	Surrogate- (Lagoon Sludge)	Effluent Whole (1)	Effluent Whole (2)	Effluent Centrate*	Effluent Particulates**
	(µg/l)	(µg/l)	(µg/kg)	(µg/l)	(µg/l)	(µg/l)	(µg/kg)
Chloromethane	1 U	1 U	45 U	5 U	5 U	Not Tested	5 U
Bromomethane	1 U	1 U	45 U	5 U	5 U		5 U
Vinyl chloride	1 U	1 U	45 U	5 U	5 U		5 U
Chloroethane	1 U	1 U	45 U	5 U	5 U		5 U
Methylene chloride	2	2	45 U	5 U	5 U		12
Acetone	60	5	350 J	49 J	81		31,000 E
Carbon disulfide	1 U	1 U	91	5 U	5 U		5 U
1,1-Dichloroethene	1 U	1 U	45 U	5 U	5 U		5 U
1,1-Dichloroethane	1 U	1 U	45 U	5 U	5 U		5 U
Chloroform	1 U	1 U	45 U	17	19		5 U
1,2-Dichloroethane	1 U	1 U	45 U	5 U	5 U		5 U
2-Butanone	2 U	2 U	76	10 U	10 U		16,000 E
1,1,1-Trichloroethane	1 U	1 U	45 U	5 U	5 U		5 U
Carbon tetrachloride	1 U	1 U	45 U	5 U	5 U		5 U
Vinyl Acetate	1 U	1 U	45 U	5 U	5 U		5 U
Bromodichloromethane	1 U	1 U	45 U	5 U	5 U		5 U
1,2-Dichloropropane	1 U	1 U	45 U	5 U	5 U		5 U
Cis-1,3-Dichloropropene	1 U	1 U	45 U	5 U	5 U		5 U
Trichloroethene	1 U	1 U	45 U	5 U	5 U		5 U
Dibromochloromethane	1 U	1 U	45 U	5 U	5 U		5 U
1,1,2-Trichloroethane	1 U	1 U	45 U	5 U	5 U		5 U
Benzene	1 U	1 U	45 U	5 U	5 U		5 U
Trans-1,3-Dichloropropene	1 U	1 U	45 U	5 U	5 U		5 U
Bromoform	1 U	1 U	45 U	5 U	5 U		5 U
4-Methyl-2-pentanone	2 U	2 U	45 U	10 U	10 U		5 U
2-Hexanone	1 U	1 U	45 U	5 U	5 U		270
Tetrachloroethene	1 U	1 U	45 U	5 U	5 U		5 U
1,1,2,2-Tetrachloroethane	1 U	1 U	45 U	5 U	5 U		5 U
Toluene	1 U	1 U	150	5 U	5 U		15
Chlorobenzene	1 U	1 U	45 U	5 U	5 U		5 U
Ethyl benzene	1 U	1 U	45 U	5 U	5 U		5 U
Styrene	1 U	1 U	45 U	5 U	5 U		5 U
Xylene (total)	1 U	1 U	45 U	5 U	5 U		5 U

* Centrate – The portion of the whole effluent that passes through the centrifuge. Filtered through a 0.45µm filter prior to analysis.

** Particulates – The portion of the whole effluent retained by the centrifuge.

U Indicates analyte not detected at given quantitation limit.

J Indicates an estimated value.

E Indicates an estimated value which exceeds known calibration range.

Appendix I. Centrifuge study priority pollutant scans - continued.

	Field Centrifuge Blank	Field Effluent Blank	Surrogate (Lagoon Sludge)	Effluent Whole	Effluent Centrate*	Effluent Particulates**
	(µg/l)	(µg/l)	(µg/kg)	(µg/l)	(µg/l)	(µg/kg)
Phenol	3 U	3 U	1,900 U	7	3 UJ	1,100 U
Bis(2-chloroethyl)Ether	2 U	2 U	1,200 U	2 U	2 UJ	700 U
2-Chlorophenol	3 U	3 U	2,000 U	3 U	3 UJ	1,100 U
1,3-Dichlorobenzene	3 U	3 U	1,800 U	3 U	3 UJ	1,000 U
1,4-Dichlorobenzene	3 U	3 U	1,700 U	3 U	3 UJ	990 U
Benzyl Alcohol	5 U	5 U	3,000 U	5 U	5 UJ	1,800 U
1,2-Dichlorobenzene	3 U	3 U	1,700 U	3 U	3 UJ	1,000 U
2-Methylphenol	4 U	4 U	2,700 U	5 U	5 UJ	1,600 U
Bis(2-Chloroisopropyl)Ether	2 U	2 U	1,600 U	3 U	3 UJ	900 U
4-Methylphenol	4 U	4 U	2,800 U	5 U	5 UJ	560 J
N-Nitroso-di-n-Propylamine	3 U	3 U	1,600 U	3 U	3 UJ	940 U
Hexachloroethane	3 U	3 U	1,800 U	3 U	3 UJ	1,100 U
Nitrobenzene	3 U	3 U	1,700 U	3 U	3 UJ	990 U
Isophorone	2 U	2 U	1,100 U	2 U	2 UJ	660 U
2-Nitrophenol	2 U	2 U	1,600 U	3 U	3 UJ	920 U
2,4-Dimethylphenol	4 U	4 U	2,200 U	4 U	4 UJ	1,300 U
Benzoic Acid	9 U	9 U	5,900 U	4 J	10 UJ	940 J
Bis(2-Chloroethoxy)Methane	2 U	2 U	1,500 U	2 U	2 UJ	850 U
2,4-Dichlorophenol	3 U	3 U	1,700 U	5	3 UJ	440 J
1,2,4-Trichlorobenzene	3 U	3 U	2,100 U	3 U	3 UJ	1,200 U
Naphthalene	3 U	3 U	1,700 U	3 U	3 UJ	1,000 U
4-Chloroaniline	2 U	2 U	1,300 U	2 U	2 UJ	750 U
Hexachlorobutadiene	4 U	4 U	2,300 U	4 U	4 UJ	1,300 U
4-Chloro-3-Methylphenol	4 U	4 U	2,800 U	5 U	5 UJ	1,600 U
2-Methylnaphthalene	3 U	3 U	1,900 U	3 U	3 UJ	1,100 U
Hexachlorocyclopentadiene	3 U	3 U	1,800 U	3 U	3 UJ	1,100 U
2,4,6-Trichlorophenol	3 U	3 U	1,900 U	29	16 J	1,700
2,4,5-Trichlorophenol	3 U	3 U	1,600 U	3 U	3 UJ	930 U
2-Chloronaphthalene	3 U	3 U	1,700 U	3 U	3 UJ	990 U
2-Nitroaniline	2 U	2 U	1,600 U	3 U	3 UJ	920 U
Dimethylphthalate	5 U	5 U	3,000 U	5 U	5 UJ	1,700 U
Acenaphthylene	2 U	2 U	1,100 U	2 U	2 UJ	620 U
3-Nitroaniline	3 U	3 U	1,800 U	3 U	3 UJ	1,000 U
Acenaphthene	3 U	3 U	1,700 U	3 U	3 UJ	970 U
2,4-Dinitrophenol	5 U	5 U	2,900 U	5 U	5 UJ	1,700 U
4-Nitrophenol	5 U	5 U	3,000 U	5 U	5 UJ	1,700 U
Dibenzofuran	3 U	3 U	1,600 U	3 U	3 UJ	950 U
2,4-Dinitrotoluene	2 U	2 U	1,200 U	2 U	2 UJ	720 U
2,6-Dinitrotoluene	2 U	2 U	1,200 U	2 U	2 UJ	710 U
Diethylphthalate	4 U	4 U	2,500 U	4 U	2 J	1,500 U
4-Chlorophenyl-phenylether	2 U	2 U	1,200 U	2 U	2 UJ	710 U
Fluorene	2 U	2 U	1,300 U	2 U	2 UJ	740 U
4-Nitroaniline	3 U	3 U	1,700 U	3 U	3 UJ	1,000 U
4,6-Dinitro-2-methylphenol	6 U	6 U	4,000 U	7 U	7 UJ	2,300 U
N-Nitrosodiphenylamine	1 U	1 U	710 U	1 U	1 UJ	410 U
4-Bromophenyl-phenylether	1 U	1 U	920 U	2 U	2 UJ	530 U
Hexachlorobenzene	1 U	1 U	510 U	1 U	1 UJ	300 U
Pentachlorophenol	9 U	9 U	5,900 U	10 U	10 UJ	3,400 U
Phenanthrene	1 U	1 U	770 U	1 U	1 UJ	450 U
Anthracene	1 U	1 U	590 U	1 U	1 UJ	340 U
Di-n-Butylphthalate	2 U	2 U	1,100 U	2 U	83 B	650 U
Fluoranthene	1 U	1 U	570 U	1 U	1 UJ	330 U
Pyrene	1 U	1 U	680 U	1 U	1 UJ	390 U
Butylbenzylphthalate	4 U	5	2,400 U	4 U	4 UJ	1,400 U
3,3'-Dichlorobenzidine	1 U	1 U	690 U	1 U	1 UJ	400 U
Benzo(a)anthracene	1 U	1 U	630 U	1 U	1 UJ	370 U
Bis(2-Ethylhexyl)Phthalate	2 J	7	1,400 BJ	3 U	3 UJ	980 U
Chrysene	1 U	1 U	500 U	1 U	1 UJ	290 U
Di-n-Octyl phthalate	1 U	1 U	690 U	1 U	1 UJ	400 U
Benzo(b)fluoranthene	2 U	2 U	1,200 U	2 U	2 UJ	680 U
Benzo(k)fluoranthene	2 U	2 U	1,000 U	2 U	2 UJ	610 U
Benzo(a)pyrene	1 U	1 U	710 U	1 U	1 UJ	410 U
Indeno(1,2,3-cd)pyrene	1 U	1 U	610 U	1 U	1 UJ	350 U
Dibenzo(a,h)anthracene	2 U	2 U	980 U	2 U	2 UJ	570 U
Benzo(ghi)perylene	1 U	1 U	620 U	1 U	1 UJ	360 U

* **Centrate** - The portion of the whole effluent that passes through the centrifuge. Filtered through a 0.45µm filter prior to analysis.
** **Particulates** - The portion of the whole effluent retained by the centrifuge.
U **Indicates** analyte not detected at given quantitation limit.
J **Indicates** an estimated value.
B **Indicates** method blank contamination.

Appendix I. Centrifuge study priority pollutant scans - continued.

	Field Centrifuge Blank	Field Effluent Blank	Surrogate- (Lagoon Sludge)	Effluent		
				Whole	Centrate*	Particulates**
	(µg/l)	(µg/l)	(µg/kg)	(µg/l)	(µg/l)	(µg/kg)
Aldrin	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
alpha-Chlordane	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
gamma-Chlordane	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
Dieldrin	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
4,4' DDT	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
4,4' DDE	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
4,4' DDD	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
Endosulfan I	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
Endosulfan II	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
Endosulfan sulfate	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
Endrin	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
Endrin Ketone	0.10 U	0.10 U	170 U	1.00 U	0.10 U	170 U
Heptachlor	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
Heptachlor epoxide	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
a-BHC	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
b-BHC	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
Lindane	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
d-BHC	0.05 U	0.05 U	84 U	0.50 U	0.05 U	84 U
Toxaphene	1.00 U	1.00 U	1,700 U	10.00 U	1.00 U	1,700 U
PCB 1016	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
PCB 1221	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
PCB 1232	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
PCB 1242	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
PCB 1248	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U
PCB 1254	1.00 U	1.00 U	1,700 U	10.00 U	1.00 U	1,700 U
PCB 1260	1.00 U	1.00 U	1,700 U	10.00 U	1.00 U	1,700 U
Methoxychlor	0.50 U	0.50 U	840 U	5.00 U	0.50 U	840 U

* Centrate – The portion of whole effluent that passes through the centrifuge. Filtered through a 0.45µm filter prior to analysis.

** Particulates – The portion of whole effluent retained by the centrifuge.

U Indicates analyte not detected at given quantitation limit.

Appendix I. Centrifuge study priority pollutant scans - continued.

Laboratory: 1 – AM Test
2 – Manchester

	Field Centrifuge Blank	Field Effluent Blank	Surrogate– (Lagoon Sludge)		Effluent			
					Whole	Centrate	Particulates**	
Laboratory:	(1)	(1)	(1)	(2)	(1)	(1)	(1)	(2)
	(µg/l)	(µg/l)	(mg/kg–dry)	(mg/kg–wet)	(µg/l)	(µg/l)	(mg/kg–dry)	(mg/kg–wet)
Antimony, Total	5 U		7.01 U	0.22 J		5 U	3.35	0.12 J
Antimony, Total recoverable		5 U			5 U	5 U		
Antimony, Dissolved					9	5 U		
Arsenic, Total	5 U		2.1	0.34 J		12	0.60	0.15 U
Arsenic, Total recoverable		5 U			5 U	10		
Arsenic, Dissolved					5 U	34		
Beryllium, Total	7 U		4.91 U	0.2 U		7 U	3.91 U	0.2 U
Beryllium, Total recoverable		7 U			7 U	7 U		
Beryllium, Dissolved					7 U	7 U		
Cadmium, Total	2 U		2.8	0.96 J		2 U	1.12	0.5 U
Cadmium, Total recoverable		2 U			2 U	2 U		
Cadmium, Dissolved					2 U	2 U		
Chromium, Total	66		18.9	2.7		8	6.15	1.2 J
Chromium, Total recoverable		6 U			9	8		
Chromium, Dissolved					9	8		
Copper, Total	7		564	59.7		11	87.7	16.3
Copper, Total recoverable		2 U			8	3		
Copper, Dissolved					2 U	2 U		
Lead, Total	3		16.1	5.0 U		7	8.38	5.0 U
Lead, Total recoverable		2			5 U	5		
Lead, Dissolved					14	2		
Mercury, Total	0.2 U		0.783	0.024		0.2	3.93	0.020
Mercury, Total recoverable		0.2 U			0.2 U	0.2 U		
Mercury, Dissolved					9.5	0.2		
Nickel, Total	10 U		7.0	4.0 U		10 U	5.6 U	4.0 U
Nickel, Total recoverable		10 U			10 U	10 U		
Nickel, Dissolved					10 U	20		
Selenium, Total	1		4.2	0.2 U		9	8.94	0.2 U
Selenium, Total recoverable		3			6	6		
Selenium, Dissolved					10 U	10 U		
Silver, Total	10 U		7.0 U	0.4 U		10 U	5.6 U	0.4 U
Silver, Total recoverable		10 U			10 U	10 U		
Silver, Dissolved					10 U	10 U		
Thallium, Total	10 U		7.0 U	0.25 U		10 U	5.6 U	0.25 U
Thallium, Total recoverable		10 U			10 U	10 U		
Thallium, Dissolved					10 U	10 U		
Zinc, Total	60 B		393	39.2		46 B	210	36.5
Zinc, Total recoverable		62 B			102 B	72 B		
Zinc, Dissolved					71 B	197 B		
Chromium (hexavalent), Total					50 U			

* Centrate – The portion of the whole effluent that passes through the centrifuge. Filtered through a 0.45 µm filter prior to analysis.

** Particulates – The portion of the whole effluent retained by the centrifuge.

U Indicates metal was not detected at the given quantitation limit.

J Indicates an estimated value.

B Indicates method blank contamination.

Table 11. Pollutants detected in sediments – Weyerhaeuser, Longview – April 1990.

Station:	S-1 (outfall)	S-2 (near outfall)	S-3 (background)
Type:	grab-comp	grab-comp	grab-comp
VOAs	(ug/kg)	(ug/kg)	(ug/kg)
Carbon Disulfide	0.4 J	0.5 J	0.4 J
Chloroform	2 U	1 J	2 U
BNAs	(ug/kg)	(ug/kg)	(ug/kg)
Isophorone	150 U	5 J	3 J
Resin/fatty acids	(ug/kg)	(ug/kg)	(ug/kg)
Isopimaric acid	410 U	26 J	410 U
Dehydroabietic acid	15 J	40 J	410 U
Abietic acid	410 U	28 J	410 U
Metals	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	0.48 J	1.23	0.58
Cadmium	0.052	0.186	0.053
Chromium	4.8 B	3.8 B	4.2 B
Copper	8.5	10.9	9.5
Lead	0.77	2.28	0.62
Mercury	0.011 *	0.018 *	0.008 J*
Nickel	10.9	5.3 J	4.0 U
Thallium	0.25 U	0.56 J	0.25 U
Zinc	17.7	24.4	14.8

* Sediment mercury results are in mg/kg-wet weight.
U Indicates compound was analyzed for but not detected at the given quantitation limit.
J Indicates an estimated value when result is less than the specified quantitation limit.
B Indicates method blank contamination.
[ ] Indictates compounds actually detected.

Table 11b. Grain size analysis – Weyerhaeuser, Longview – April 1990.

Station:	S-1 (outfall)		S-2 (near outfall)	S-3 (background)
Type:	grab-comp (duplicates)		grab-comp	grab-comp
	(%)		(%)	(%)
Gravel+				
>4750	0	0	0	0
4750-2000	2	1	6	1
Sand+				
2000-850	6	7	36	1
850-425	15	15	29	10
425-250	22	23	28	49
250-106	54	54	1	39
106-75	1	0	0	0
TOC	0.14%		0.13%	0.050%

\+ Grain sizes are in microns

Table 12a. Results of Ecology and Weyerhaeuser split sample analyses (General chemistry) – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent		A+C sump		Chlorine plant		Outfall 001/002				Radakovitch leachate	
Sample type:	composite		composite		grab		E-comp+		W-comp+		grab	
Laboratory:	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser*	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser*	Ecology	Weyerhaeuser
General Chemistry Parameters												
Hardness (mg/l)							143	83/111			783	722
Turbidity (NTU)							7	16				
Conductivity (umhos/cm)							2920	2635			6510	5540
Alkalinity (mg/l)							312	312				
Acidity (mg/l)							1 U	10 U				
Cyanide (ug/l)							2	10 U			16	20
Total solids (mg/l)							1900	1920				
TSS (mg/l)					1	0	28	10	51	40		
BOD5 (mg/l)							13	13	17	17		
COD (mg/l)							352	338			227	166
NH3-N (mg/l)							4.18	4.6			75.4	75
NO3+NO2-N (mg/l)							0.01 U	0.05 U			0.65	0.57
Total phosphate (mg/l)							2.69	2.6			1.80	0.61
Phenols (ug/l)	203	440	2320	3600			10.6	50			2.11	10 U
TOC (mg/l)							140	145				

	Sediments					
Station:	S-1(outfall)		S-2(nr outfall)		S-3(blground)	
Laboratory:	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser
General Chemistry Parameters						
Cyanide (mg/kg)						
total	0.134	0.50 U	0.136	0.50 U	0.136	0.50 U
weak and dissociable	0.134	0.50 U	0.135	0.50 U	0.136	0.50 U
Phenols (mg/kg)	1	0.03	1	0.06	1	0.07

Shading indicates permit parameter.
All Weyerhaeuser results are from the Weyerhaeuser Technology Center unless otherwise indicated.
* Weyerhaeuser, Longview laboratory results.
\+ E-comp indicates Ecology composite sampler, W-comp indicates Weyerhaeuser composite sampler.
U Indicates parameter was analyzed for but not detected at the given quantitation limit.

Table 12b. Results of Ecology and Weyerhaeuser split sample analyses (VOAs and BNAs) – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent			A+C sump		Outfall 001/002			S-1(outfall)		Sediments S-2(nr outfall)		S-3(bkground)	
Laboratory:	Ecology		Weyco	Ecology	Weyco	Ecology		Weyco	Ecology	Weyco	Ecology	Weyco	Ecology	Weyco
	(1)	(2)				(1)	(2)							
VOAs (ug/l)														
Methylene Chloride						97 U	50 U	11						
Acetone	230	120	330	2000	NR	50 U	50 U	160						
Carbon disulfide	3 J	10 U	10 U						0.4 J	5 U	0.5 J	5 U	0.4 J	5 U
Chloroform	890	1000	1100	8400	NR	470	430	430			1 J	5 U		
2-Butanone				1000	NR									
Bromodichloromethane	10 U	2 J	10 U	41 J	NR									
4-Methyl-2-Pentanone				140	NR									
Toluene				5 J	NR									
Ethylbenzene	10 U	1 J	10 U											
Total Xylenes	3 J	5 J	10 U											
BNAs (ug/l)														
Phenol		20	60	8 U	61									
Benzyl Alcohol		0.8 U	19	8 U	6 J									
2-Methylphenol		0.8 U	2 J											
4-Methylphenol		0.8 U	7 J											
Isophorone											5 J	810 U	3 J	830 U
Benzoic Acid		130	460				8 U	9 J						
2,4-Dichlorophenol		0.8	3 J	8	5 J									
Naphthalene		9	11 J											
2-Methylnaphthalene		0.8	2 J											
2,4,6-Trichlorophenol		14	6 J				8	4 J						
Phenanthrene		3	11 U											
Pyrene		2	11 U											

No Pesticides Were Detected In Any Ecology or Weyerhaeuser Analyses

NR No Results
U Indicates compound was analyzed for but not detected at the given quantitation limit.
J Indicates an estimated value when the result is less than the specified quantitation limit.

Table 12c. Results of Ecology and Weyerhaeuser split sample analyses (Non-PP Organics) - Weyerhaeuser, Longview - April 1990.

Station:	Primary effluent		A+C sump		Outfall 001/002		S-1(outfall)		Sediments S-2(nr outfall)		S-3(bkground)	
Laboratory:	Ecology (ug/l)	Weyco (ug/l)	Ecology (ug/l)	Weyco (ug/l)	Ecology (ug/l)	Weyco (ug/l)	Ecology (ug/kg)	Weyco (ug/kg)	Ecology (ug/kg)	Weyco (ug/kg)	Ecology (ug/kg)	Weyco (ug/kg)
Guaiacols/Catechols/Phenolics												
o-Chlorophenol	0.4 U	30 U	0.4 U	30 U	0.5 U	30 U	100 U		100 U		100 U	
2,4-Dichlorophenol	3	2.7 J	6	5.1 J	0.8	30 U	100 U	10 U	100 U	11 U	100 U	10 U
4-Chloroguaiacol	0.4 U	35 U	0.4 U	1.9 J	0.5 U	35 U	100 U		100 U		100 U	
2,4,6-Trichlorophenol	9	6.4 J	12	9	5	2.3 J	100 U	5 U	100 U	5 U	100 U	5 U
2,4,5-Trichlorophenol	2	30 U	0.4 U	30 U	0.5 U	30 U	100 U	5 U	100 U	5 U	100 U	5 U
4,5-Dichloroguaiacol	12	34 U	18	14	0.9	34 U	100 U	10 U	100 U	11 U	100 U	10 U
4-Chlorocatechol	0.4 U	30 U	2	30 U	0.04 J	30 U	100 U		100 U		100 U	
4,5-Dichlorocatechol	0.4 U	78	25	31	1	30 U	100 U	10 U	100 U	11 U	100 U	11 U
4,5,6-Trichloroguaiacol	8	34 U	6	4.4 J	4	34 U	100 U	10 U	100 U	11 U	100 U	10 U
Pentachlorophenol	0.4 U		0.6		0.5 U		100 U	1 U	100 U	1 U	100 U	1 U
3,4,5-Trichlorocatechol	0.4 U	30 U	120	30 U	6	30 U	100 U	10 U	100 U	11 U	100 U	10 U
Tetrachloroguaiacol	14	5.4 J	4	4 J	3	2.1 J	100 U	10 U	100 U	11 U	100 U	10 U
Trichlorosyringol	9	3.1 J	2	1.2 J	5	36 U	100 U	10 U	100 U	11 U	100 U	10 U
Tetrachlorocatechol	0.4 U	51	39	260	2	30 U	100 U	10 U	100 U	11 U	100 U	10 U
Resin/Fatty acids												
Linoleic acid	84	90	4	20 U	33	20 U	410 U	160 U	410 U	170 U	410 U	160 U
Oleic acid	240	130	0.9 U	20 U	39	20 U	750 U	160 U	410 U	170 U	730 U	160 U
Pimaric acid	140	400	0.9 U	20 U	34	20 U	410 U	160 U	410 U	170 U	410 U	160 U
Sandaracopimaric acid	37	240	0.9 U	20 U	6	23	410 U	160 U	410 U	170 U	410 U	160 U
Isopimaric acid	99	870	1	20 U	41	20 U	410 U	160 U	26 J	170 U	410 U	160 U
Palustric acid	88	630	0.9 U	20 U	10	20 U	410 U	160 U	410 U	170 U	410 U	160 U
Dehydroabietic acid	230	1600	3	20 U	57	50	15 J	160 U	40 J	170 U	410 U	160 U
Abietic acid	200	1200	0.9 U	20 U	69	57	410 U	160 U	28 J	170 U	410 U	160 U
Neoabietic Acid	39	120	0.9 U	20 U	2	20 U	410 U	160 U	410 U	170 U	410 U	160 U
9,10-Dichlorosteric acid	19	80 U	21	54	1 U	20 U	410 U	160 U	410 U	170 U	410 U	160 U
14-Chlorodehydroabietic	0.8 U	80 U	0.9 U	20 U	1 U	20 U	410 U	160 U	410 U	170 U	410 U	160 U
12-Chlorodehydroabietic	0.8 U	80 U	0.9 U	20 U	1 U	20 U	410 U	160 U	410 U	170 U	410 U	160 U
Dichlorodehydroabietic Acid	0.8 U	80 U	0.9 U	20 U	1 U	20 U	410 U	160 U	410 U	170 U	410 U	160 U

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limit.

Table 12d. Results of Ecology and Weyerhaeuser split sample analyses (Metals) – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent		A+C sump		Outfall 001/002			Radakovitch Leachate	
Sample type:	composite		composite		E-comp+			grab	
Laboratory:	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser duplicates		Ecology	Weyerhaeuser
Analysis type:	recoverable	total	recoverable	total	recoverable	total		recoverable	total
Metals (ug/l)									
Antimony	200 U	5 U	200 U	5 U	200 U	5 U	5 U	200 U	5 U
Arsenic	1.5 UJ	4	1.5 UJ	2 U	1.5 UJ	2 U	2 U	2.3 J	2 U
Beryllium	2 U	1 U	2 U	1 U	2 U	1 U	1 U	2 U	1 U
Cadmium	10 U	1 U	10 U	1 U	10 U	1 U	1 U	10 U	1 U
Chromium (total)	5 U	13	679	568	86	68	85	5 U	3
Copper	18 B	18	6.3 JB	6	8.3 JB	10	9	2 U	9
Lead	60 U	6	60 U	4	60 U	3	2	60 U	2 U
Mercury	0.02 U	0.4 U	0.02 U	0.4 U	0.02 U	0.5	0.5	0.02 U	0.4 U
Nickel	40 U	5	40 U	4	40 U	3 U	3	40 U	13
Selenium	200 U	2 U	200 U	2 U	200 U	2 U	2 U	200 U	2 U
Silver	3 UR	1 U	3 UR	1 U	3 UR	1 U	1 U	3 UR	1 U
Thallium	250 U	2 U	250 U	2 U	250 U	2 U	2 U	250 U	2 U
Zinc	89.3 B	68	37 B	25	69.5 B	35	46	5.1 JB	26

Sediments

Station:	S-1(outfall)		S-2(nr outfall)		S-3(bkground)		
Laboratory:	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser	Ecology	Weyerhaeuser duplicates	
Analysis type:	total	total	total	total	total	total	
Metals (mg/kg)							
Antimony	0.10 U	10 U	0.10 U	10 U	0.10 U	10 U	10 U
Arsenic	0.48 J	0.7	1.23	1.2	0.58	0.5 U	0.5 U
Beryllium	0.2 U	2 U	0.2 U	2 U	0.2 U	2 U	2 U
Cadmium	0.052	2 U	0.186	2 U	0.053	2 U	2 U
Chromium (total)	4.8 B	7	3.8 B	7	4.2 B	6	7
Copper	8.5	10	10.9	11	9.5	15	12
Lead	0.77	1.4	2.28	2.3	0.62	1.0	1.0
Mercury	0.011 *	0.1 U	0.018 *	0.1 U	0.008 J*	0.1 U	0.1 U
Nickel	10.9	8	5.3 J	7	4.0 U	8	8
Selenium	0.20 U	0.5 U	0.20 U	0.5 U	0.20 U	0.5 U	0.5 U
Silver	0.3 U	2 U	0.3 U	2 U	0.3 U	2 U	2 U
Thallium	0.25 U	0.5 U	0.56 J	0.5 U	0.25 U	0.5 U	0.5 U
Zinc	17.7	25	24.4	26	14.8	25	24

\+ E-comp indicates Ecology composite sampler.
U Indicates metal was not detected at given quantitation limit.
J Indicates an estimated value when the result is less than the specified quantitation limit.
* Mercury results are in mg/kg-wet.
R Indicates unusable data due to poor MS/MSD recoveries.
B Indicates method blank contamination.

Table 12e. Results of Ecology and Weyerhaeuser split sample analyses (Bioassays) – Weyerhaeuser, Longview – April 1990.

Comparison of effluent bioassay endpoints

Species	Test duration	End point	Results	
			Ecology	Weyerhaeuser
Rainbow trout	96 hr	% survival in 65% effluent	100	100
Microtox	15 minutes	EC50	>100	>100
Daphnia magna	7 days	NOEC/LOEC (reproduction)	30/100	100/100
Fathead minnow	7 days	NOEC/LOEC (growth)	100/100	100/100

Comparison of sediment bioassay endpoints

Species	Test duration	End point	Sample	Results	
				Ecology	Weyerhaeuser
Hyalella azteca	10 days	% survival	S-1	91	70 S
			S-2	89	93 S
			S-3	92	100
			Control	91	
Microtox (saline extract)	15 minutes	EC50	S-1	94.7	>100
			S-2	*	>100
			S-3	97.7	>100

* Toxicity not detected

S Significantly different from control

Table 13. Centrifuge study pollutants detected – Weyerhaeuser, Longview – April 1990.

	Effluent Concentrations (grams/1,000,000 gallons)		
	Whole	Centrate*	Particulates**
VOLATILES			
Methylene chloride	189 U	NOT TESTED	0.18
Acetone	189 U		1.4
Carbon disulfide	189 U		0.004 U
Chloroform	1630		0.33
2-Butanone	189 U		1.4
1,2-Dichloropropane	189 U		0.004 U
2-Hexanone	189 U		0.011
Tetrachloroethene	189 U		0.0021 J
Toluene	189 U		0.0015 J
Xylene (total)	189 U		0.0021 J
BNAs			
Phenol^	8 U	4	1.0 U
4-Methylphenol^	8 U	3.0 U	8
Isophorone	8 U	3.0 U	1.2
2,4-Dichlorophenol	8 U	3.0 J	1.0 U
Naphthalene^	8 U	3.0 U	1.0 U
2,4,6-Trichlorophenol	30	4	1.0 U
Pentachlorophenol	30 U	1.9 J	5 U
Pyrene^	8 U	3.0 U	1.0 U
NO PESTICIDES/PCBs DETECTED			
METALS			
Arsenic, Total	0	0	0.23 J
Arsenic, Total recoverable	5.7 UJ	0	0.00
Arsenic, Dissolved	0	380 U	0.00
Cadmium, Total	0	0	0.05
Cadmium, Total recoverable	38 U	0	0.00
Cadmium, Dissolved	0	38 U	0
Chromium, Total	0	0	40
Chromium, Total recoverable	330	0	0
Chromium, Dissolved	0	330	0
Copper, Total^	0	0	5
Copper, Total recoverable^	31 JB	0	0
Copper, Dissolved	0	72 B	0
Mercury, Total	0	0	0.009
Mercury, Total recoverable^	0.08 U	0	0
Mercury, Dissolved	0.076 U	0.076 U	0
Nickel, Total	0	0	5 J
Nickel, Total recoverable	150 U	0	0
Nickel, Dissolved	0	150 U	0
Zinc, Total^	0	0	10
Zinc, Total recoverable^	263 B	0	0
Zinc, Dissolved	0	9,010	0
Hexavalent Chromium, Total	0	0	0
Hexavalent Chromium, Dissolved	92.4 J	95.4	0

[ ] Indicates detected compounds.

* Centrate – The portion of the whole effluent that passes through the centrifuge.

** Particulates – The portion of the whole effluent retained by the centrifuge.

^ Indicates centrifuge and/or effluent field blank contamination.

U Indicates analyte not detected at quantitation limit given.

J Estimated amount, concentration is below quantitation limit.

B Indicates method blank contamination.

Table 14. Centrifuge particulates and surrogate priority pollutants - Weyerhaeuser, Longview - April 1990.

	Particulates+	Surrogate-(RAS)++	Surrogate-(Sludge)++	P/S ratio+++ (RAS)	P/S ratio+++ (Sludge)
VOLATILES (mg/Kg-TOC) Laboratory - Manchester					
Methylene chloride	4	7 U	0.26 UJ	--	--
Acetone	32	0.6 U	0.07 U	--	--
Carbon disulfide	0.08 U	0.6 U	0.06 J	--	0
Chloroform	8	90	25	0.1	0.3
2-Butanone	32	0.6 U	0.08 UJ	--	--
1,2-Dichloropropane	0.08 U	0.08 J	0.07 U	0	--
2-Hexanone	0.24	0.6 U	0.07 U	--	--
Tetrachloroethene	0.05 J	0.3 J	0.07 U	0.2	--
Toluene	0.03 J	0.6 U	0.07 U	--	--
Xylene (total)	0.05 J	0.6 U	0.07 U	--	--
BNAs (mg/Kg-TOC) Laboratory - Manchester					
Phenol^	23 U	29 U	49	--	0
4-Methylphenol^	180	29 U	18 U	--	--
Isophorone	27	13 J	18 U	2.1	--
Naphthalene^	23 U	29 U	51	--	0.5
Pyrene^	23 U	13 J	23	0	0
PESTICIDES/PCBs (mg/Kg-TOC) Laboratory - Manchester	NONE DETECTED	NONE DETECTED	NONE DETECTED	NA	NA
METALS (mg/Kg-dry) Laboratory - Manchester					
Arsenic, Total	2.1 J	12 U	1.3 U	--	--
Cadmium, Total	0.4900	2.0 J	0.3 J	0.24	1.4
Chromium, Total	335	1,430	94.5	0.235	3.55
Copper, Total^	46	193 B	36.2 B	0.24	1.3
Mercury, Total	0.084	0.2 U	0.02 U	--	--
Nickel, Total	48 J	400 J	35 U	0.12	--
Zinc, Total^	94.8	448	90.1	0.212	1.05
Hexavalent Chromium, Total	NOT TESTED	2000	NOT TESTED		

\+ Particulates – The portion of the whole effluent retained by the centrifuge.

++ Surrogate – A readily available sludge material which may approximate the effluent particulates in chemical make-up and contaminant concentration.

+++ Particulate to Surrogate ratio.

^ Indicates transfer blank contamination.

U Indicates analyte not detected at quantitation limit given.

J Estimated amount, concentration is below quantitation limit.

B Indicates method blank contamination.

APPENDICES

Appendix A1 – Results of VOA Matrix Spikes – Weyerhaeuser, Longview – April 1990.

	Water Samples (% Recoveries)			Sediment Samples (% Recoveries)		
Parameter	Matrix Spike Sample # 168247	Matrix Spike Duplicate Sample # 168247	RPD*	Matrix Spike Sample # 158039	Matrix Spike Duplicate Sample # 158039	RPD*
Chloromethane	98	92	6.3	59	52	12.6
Bromomethane	85	69	20.8	70	64	9.0
Vinyl Chloride	90	78	14.3	62	52	17.5
Chloroethane	97	82	16.8	89	79	11.9
Methylene Chloride	78	82	5.0	1 U	1 U	
Acetone	70	98	33.3	1 U	1 U	
Carbon Disulfide	80	70	13.3	61	57	6.8
1,1-Dichloroethene	86	72	17.7	68	68	0.0
1,1-Dichloroethane	86	80	7.2	80	80	0.0
Chloroform	93	84	10.2	96	88	8.7
1,2-Dichloroethane	95	78	19.7	120	110	8.7
2-Butanone	112	104	7.4	84	46	58.5
1,1,1-Trichloroethane	92	71	25.8	110	94	15.7
Carbon Tetrachloride	84	66	24.0	110	110	0.0
Vinyl Acetate	NAR	NAR		5 U	5 U	
Bromodichloromethane	86	78	9.8	110	100	9.5
1,2-Dichloropropane	92	82	11.5	110	100	9.5
trans-1,3-Dichloropropene	85	82	3.6	120	120	0.0
Trichloroethene	92	76	19.0	120	110	8.7
Dibromochloromethane	85	80	6.1	120	110	8.7
1,1,2-Trichloroethane	92	91	1.1	120	120	0.0
Benzene	95	74	24.9	110	110	0.0
cis-1,3-Dichloropropene	84	82	2.4	150	140	6.9
Bromoform	80	78	2.5	130	130	0.0
4-Methyl-2-Pentanone	106	128	18.8	190	160	17.1
2-Hexanone	114	103	10.1	160	160	0.0
Tetrachloroethene	96	71	29.9	94	96	2.1
1,1,2,2-Tetrachloroethane	98	95	3.1	140	130	7.4
Toluene	94	77	19.9	93	94	1.1
Chlorobenzene	94	79	17.3	100	100	0.0
Ethylbenzene	90	68	27.8	88	84	4.7
Styrene	87	75	14.8	89	85	4.6
Total Xylenes	93	70	28.2	88	85	3.5
1,2-Dichloroethene (Trans)	96	68	34.1	80	80	0.0

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentage.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

NAR No analytical result.

Appendix A2 - Results of BNA Matrix Spikes - Weyerhaeuser, Longview - April 1990.

	Water Samples (% Recoveries)			Sediment Samples (% Recoveries)		
	Matrix Spike	Matrix Spike Duplicate		Matrix Spike	Matrix Spike Duplicate	
Parameter	Sample # 168233	Sample # 168233	RPD*	Sample # 158035	Sample # 158035	RPD*
Phenol	107	123	13.9	73	93	24.1
Bis(2-Chloroethyl)Ether	73	86	16.4	61	74	19.3
2-Chlorophenol	84	92	9.1	73	92	23.0
1,3-Dichlorobenzene	50	54	7.7	64	77	18.4
1,4-Dichlorobenzene	50	57	13.1	66	80	19.2
Benzyl Alcohol	99	123	21.6	NAR	NAR	
1,2-Dichlorobenzene	52	64	20.7	65	79	19.4
2-Methylphenol	113	110	2.7	61	77	23.2
Bis(2-chloroisopropyl)ether	66	73	10.1	63	77	20.0
4-Methylphenol	132	115	13.8	60	74	20.9
N-Nitroso-Di-n-Propylamine	81	87	7.1	47	72	42.0
Hexachloroethane	46	39	16.5	54	64	16.9
Nitrobenzene	91	89	2.2	73	83	12.8
Isophorone	94	91	3.2	74	95	24.9
2-Nitrophenol	84	80	4.9	76	95	22.2
2,4-Dimethylphenol	226	206	9.3	77	107	32.6
Benzoic Acid	67	94	33.5	NAR	NAR	
Bis(2-Chloroethoxy)Methane	84	82	2.4	62	79	24.1
2,4-Dichlorophenol	342	316	7.9	80	98	20.2
1,2,4-Trichlorobenzene	56	62	10.2	75	92	20.4
Naphthalene	67	71	5.8	71	89	22.5
4-Chloroaniline	NAR	NAR		306	316	3.2
Hexachlorobutadiene	43	31	32.4	70	88	22.8
4-Chloro-3-Methylphenol	157	160	1.9	70	88	22.8
2-Methylnaphthalene	62	66	6.3	65	83	24.3
Naphthalene, 1-Methyl-	NAR	NAR		NAR	NAR	
Hexachlorocyclopentadiene	38	29	26.9	33 U	33 U	0.0
2,4,6-Trichlorophenol	99	96	3.1	95	114	18.2
2,4,5-Trichlorophenol	80	74	7.8	68 J	82	18.7
2-Chloronaphthalene	86	86	0.0	76	94	21.2
2-Nitroaniline	166	146	12.8	75 J	92	20.4
Dimethyl Phthalate	70	62	12.1	74	91	20.6
Acenaphthylene	88	87	1.1	73	91	22.0
3-Nitroaniline	NAR	NAR		167 J	171 J	2.4
Acenaphthene	85	78	8.6	74	92	21.7
2,4-Dinitrophenol	680	620	9.2	102	108	5.7
4-Nitrophenol	NAR	NAR		118 J	82 J	36.0
Dibenzofuran	94	83	12.4	78	95	19.7
2,4-Dinitrotoluene	99	87	12.9	85	98	14.2
2,6-Dinitrotoluene	113	103	9.3	76	90	16.9
Diethyl Phthalate	88	69	1.5	77	93	18.8
4-Chlorophenyl-Phenylether	92	74	21.7	81	99	20.0
Fluorene	79	78	1.3	76	92	19.0
4-Nitroaniline	NAR	NAR		246	284	14.3
4,6-Dinitro-2-Methylphenol	138	137	0.7	90	111	20.9
N-Nitrosodiphenylamine	NAR	NAR		NAR	NAR	
4-Bromophenyl-Phenylether	98	92	6.3	84	106	23.2
Hexachlorobenzene	100	97	3.0	84	104	21.3
Pentachlorophenol	1100	970	12.6	67 J	49 J	31.0
Phenanthrene	116	103	11.9	82	104	23.7
Anthracene	75	80	6.5	79	103	26.4
Carbazole	NAR	NAR		NAR	NAR	
Di-n-Butyl Phthalate	76	80	5.1	83	104	22.5
Fluoranthene	89	86	3.4	85	106	22.0
Pyrene	70	80	13.3	94	121	25.1
Retene	NAR	NAR		NAR	NAR	
Butylbenzylpthalate	74	84	12.7	88	110	22.2
3,3'-Dichlorobenzidine	NAR	NAR		NAR	NAR	
Benzo(a)Anthracene	90	83	8.1	87	116	28.6
Bis(2-Ethylhexyl)Phthalate	77	85	9.9	86	108	22.7
Chrysene	87	83	4.7	89	111	22.0
Di-n-Octyl Phthalate	82	74	10.3	86	111	25.4
Benzo(b)Fluoranthene	87	82	5.9	96	129	29.3
Benzo(k)Fluoranthene	84	75	11.3	73	94	25.1
Benzo(a)Pyrene	86	80	7.2	91	116	24.2
Indeno(1,2,3-cd)Pyrene	98	95	3.1	79	97	20.5
Dibenzo(a,h)Anthracene	103	92	11.3	96	115	18.0
Benzo(g,h,i)Perylene	119	109	8.8	73	86	16.4

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentage.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when the result is less than the specified quantitation limit.

NAR No analytical result

Appendix A3 - Results of Pesticides/PCBs Matrix Spikes - Weyerhaeuser, Longview - April 1990.

	Water Samples (% Recoveries)			Sediment Samples (% Recoveries)		
Parameter	Matrix Spike Sample # 168233	Matrix Spike Duplicate Sample # 168233	RPD*	Matrix Spike Sample # 158037	Matrix Spike Duplicate Sample # 158037	RPD*
alpha-BHC	103	118	13.6	43.8	77.1	55.1
beta-BHC	101	113	11.2	89.1	95.1	6.5
delta-BHC	134	153	13.2	83.1	71.1	15.6
gamma-BHC (Lindane)	78.3	91.3	15.3	62.9	84.1	28.8
Heptachlor	65.6	66.6	1.5	59.9	79.2	27.7
Aldrin	65	66.3	2.0	68.5	84.1	20.4
Heptachlor Epoxide	92.2	99.3	7.4	88.8	92.7	4.3
Endosulfan I	88	94.4	7.0	94.7	94.7	0.0
Dieldrin	87.4	93.5	6.7	98.9	95.3	3.7
4,4'-DDE	77.4	75	3.1	98.9	96.3	2.7
Endrin	88.5	97.4	9.6	98.5	96.8	1.7
Endosulfan II	83.7	94.4	12.0	99.4	97.3	2.1
4,4'-DDD	84.5	89.1	5.3	99.4	94.4	5.2
Endosulfan Sulfate	85	87.3	2.7	96.8	100	3.3
4,4'-DDT	77.3	80.4	3.9	102	94.9	7.2
Methoxychlor	82.2	95.4	14.9			
Endrin Aldehyde	67.6	69.7	3.1	48.2	54.7	12.6

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentage.

Appendix A4 - Results of Guaiacols/Catechols/Phenolics and Resin/Fatty Acids Matrix Spikes
Weyerhaeuser, Longview - April 1990.

	Water Samples (% Recoveries)			Sediment Samples (% Recoveries)		
Parameter	Matrix Spike Sample # 168233	Matrix Spike Duplicate Sample # 168233	RPD*	Matrix Spike Sample # 158037	Matrix Spike Duplicate Sample # 158037	RPD*
Phenol	93	109	15.8	78 J	98 J	22.7
Ethanone, 1-phenyl-	91	105	14.3	81 J	100 J	21.0
2-Methylphenol	96	113	16.3	97 J	110 J	12.6
4-Methylphenol	91	107	16.2	92 J	105 J	13.2
a-Terpeneol	83	105	23.4	108 J	114 J	5.4
2,4-Dimethylphenol	96	115	18.0	92 J	95 J	3.2
2-Cyclopenten-1-one, 2-methyl	155	212	31.1	52 J	108 J	70.0
Guaiacol (2-methoxyphenol)	109	123	12.1	62 J	63 J	1.6
2,4-Dichlorophenol	93	109	15.8	103 J	105 J	1.9
2,4,6-Trichlorophenol	98	108	9.7	100 J	95 J	5.1
2,4,5-Trichlorophenol	102	108	5.7	101 J	104 J	2.9
4-Allylguaiacol (eugenol)	106	110	3.7	52 J	51 J	1.9
4,5-Dichloroguaiacol	106	109	2.8	93 J	90 J	3.3
4-Chlorocatechol	106	110	3.7	6 J	3 J	66.7
4-Propenylguaiacol	98	104	5.9	3 J	2 J	40.0
6-Chlorovanillin	93	103	10.2	85 J	87 J	2.3
4,5-Dichlorocatechol	94	104	10.1	7 J	4 J	54.5
4,5,6-Trichloroguaiacol	103	110	6.6	83 J	76 J	8.8
9,10-Dichlorosteric acid	103	108	4.7	99 J	94 J	5.2
5,6-Dichlorovanillin	141	148	4.8	125 J	111 J	11.9
Pentachlorophenol	96	107	10.8	59 J	68 J	14.2
3,4,5-Trichlorocatechol	92	107	15.1	2 J	1	66.7
Tetrachloroguaiacol	102	107	4.8	80 J	73 J	9.2
Trichlorosyringol	127	131	3.1	118 J	98 J	18.5
Tetrachlorocatechol	91	113	21.6	NAR	NAR	
				Sample # 158035	Sample # 158035	
Linoleic acid	116	101	13.8	139	144	3.53
Palmitoleic acid	138	85	47.5	271	237	13.39
Decanoic Acid, Hexa-	46	144	103.2	104	67	43.27
Oleic acid	141	122	14.4	114	105	8.22
Octadecanoic acid	129	116	10.6	138	122	12.31
Pimaric acid	102	84	19.4	98	90	8.51
Sandaracopimaric acid	108	91	17.1	92	81	12.72
Isopimaric acid	92	73	23.0	76	69	9.66
Palustric acid	23	38	49.2	NAR	6	
Eicosatrienoic acid	122	107	13.1	108	107	0.93
Dehydroabietic acid	128	101	23.6	92	79	15.20
Retene	126	110	13.6	88	79	10.78
Abietic acid	110	53	69.9	NAR	46	
Neoabietic Acid	27	14	63.4	NAR	10	
9,10-Dichlorosteric acid	102	92	10.3	98	94	4.17
14-Chlorodehydroabietic	105	93	12.1	72	68	5.71
12-Chlorodehydroabietic	103	87	16.8	71	64	10.37
Dichlorodehydroabietic Acid	87	78	10.9	62	55	11.97

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentage.
J Indicates an estimated value when the result is less than the specified quantitation limit.
NAR No analytical result.

Appendix A5 – Results of Metals Matrix Spikes – Weyerhaeuser, Longview – April 1990.

	Water Samples (% Recoveries)			Sediment Samples (% Recoveries)		
Parameter	Matrix Spike Sample # 168237	Matrix Spike Duplicate Sample # 168237	RPD*	Matrix Spike Sample # 158037	Matrix Spike Duplicate Sample # 158037	RPD*
Antimony	91	71	24.7	27	17	45.5
Arsenic	61	61	0.0	81	81	0.0
Beryllium	99	100	1.0	82	87	5.9
Cadmium	109	89	20.2	80	100	22.2
Chromium (total)	100	99	1.0	108	109	0.9
Chromium (hexavalent)	34 +	73 +	72.9			
Chromium (hexavalent)	47 ++	28 ++	50.7			
Copper	104	102	1.9	83	87	4.7
Lead	103	97	6.0	48	53	9.9
Mercury	87 **	88 **	1.1	117	108	8.0
Nickel	88	97	9.7	90	97	7.5
Selenium		98		104	109	4.7
Silver		94 R		70	73	4.2
Thallium		92		82	81	1.2
Zinc		98		77	83	7.5

* RPD – relative percent difference is the absolute difference between samples divided by their average expressed as a percentag
** Sample 168247
\+ Sample 168404 (Weyco Centrifuge Study Output Sample)
++ Sample 168257
R Unusable results

Appendix A6 – Volatile Organic (VOA) Surrogate Recoveries – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent		A+C sump	Outfall 001/002		Total effluent	Radakovitch leachate	Transfer blank	Sediments S-1	S-2	S-3
Sample ID#:	168231	168232	168244	168234	168235	168239	168247	168249	158035	158037	158039
						% Recovery					
Surrogate											
1-Bromo-2-Fluoroethane	106	100	107	100	101	100	94	94	152*	130	172*
D8-Toluene	100	98	106	98	97	93	96	89	98	96	91
1,4-Bromofluorobenzene	100	101	108	98	95	92	99	91	103	102	96
d4-1,2-Dichloroethane	96	95	107	98	87	84	94	90	133	135	157
Matrix Spike #1											
1-Bromo-2-Fluoroethane							98				104
D8-Toluene							95				97
1,4-Bromofluorobenzene							94				100
d4-1,2-Dichloroethane							96				96
Matrix Spike #2											
1-Bromo-2-Fluoroethane							109				88
D8-Toluene							93				98
1,4-Bromofluorobenzene							90				99
d4-1,2-Dichloroethane							92				95

[ ] Indicates surrogate recovery outside CLP control limits.

* Advisory limit.

Appendix A7 – Semi-volatile (BNA) Surrogate Recoveries – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002 E-comp+	Outfall 001/002 W-comp+	Total effluent	Radakovitch leachate	Transfer blank	Sediments S-1	Sediments S-2	Sediments S-3
Sample ID#:	168230	168243	168233	168237	168238	168247	168249	158035	158037	158039
					% Recovery					
Surrogate										
D5-Nitrobenzene	95	68	83	85	88	91	78	72	76	68
2-Fluorobiphenyl	68	66	82	101	92	83	91	72	86	72
D14-Terphenyl	[21]	38	80	76	66	82	111	96	114	98
D10-Pyrene	42	74	77	85	68	86	120	93	115	94
D5-Phenol	25	41	38	33	25	30	27	51	52	52
2-Fluorophenol	69	[111]	71	84	61	58	62	76	79	75
Matrix Spike #1										
D5-Nitrobenzene			78					71		
2-Fluorobiphenyl			77					81		
D14-Terphenyl			74					95		
D10-Pyrene			79					90		
D5-Phenol			67					54		
2-Fluorophenol			[106]					75		
Matrix Spike #2										
D5-Nitrobenzene			79					91		
2-Fluorobiphenyl			53					103		
D14-Terphenyl			83					122		
D10-Pyrene			78					114		
D5-Phenol			74					68		
2-Fluorophenol			[120]					100		

\+ E–comp indicates Ecology composite sampler, W–comp indicates Weyerhaeuser composite sampler.

[ ] Indicates surrogate recovery outside CLP control limits.

Appendix A8 – Pesticide/PCB Surrogate and Internal Standard Recoveries – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002 E-comp+	Outfall 001/002 W-comp+	Total effluent	Radakovitch leachate	Transfer blank	Sediments S-1	Sediments S-2	Sediments S-3
Sample ID#:	168230	168243	168233	168237	168238	168247	168249	158035	158037	158039
					% Recovery					
Surrogate										
Octachloronaphthalene	IS	10	28	137	80	95	140	24	NT	24
Dibutylchlorendate	127	130	111	IS	131	104	155	92	90	105
Internal Standard										
4,4-Dibromooctafluorobiphenyl	130	IS	123	IS	125	133	134	72	9	91
Matrix Spike #1										
Surrogate										
Octachloronaphthalene			90						22	
Dibutylchlorendate			128						103	
Internal Standard										
4,4-Dibromooctafluorobiphenyl			97						37	
Matrix Spike #2										
Surrogate										
Octachloronaphthalene			90						98	
Dibutylchlorendate			111						75	
Internal Standard										
4,4-Dibromooctafluorobiphenyl			94						101	

NT Not Tested.
IS Interferring substance.
\+ E–comp indicates Ecology composite sampler, W–comp indicates Weyerhaeuser composite sampler.
[ ] Indicates surrogate recovery outside CLP control limits.

Appendix A9 - Guaiacols/Catechols/Phenolics and Resin/Fatty Acid Surrogate and Internal Standard Recoveries
Weyerhaeuser, Longview - April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002	Total effluent	Sediments S-1	Sediments S-2	Sediments S-3
Sample ID#:	168230	168243	168233	168238	158035	158037	158039
				% Recovery			
GUAIACOLS/CATECHOLS/PHENOLICS							
Internal Standard							
2,6-Dibromophenol	36	31	59	54	39	41	31
Surrogates							
2-Ethoxyphenol	99	121	88	76	67	64	75
2-Fluorophenol	90	74	83	71	100	114	120
D5-Phenol	97	91	76	64	103	115	128
D5-Nitrobenzene	92	107	85	70	90	110	115
2-Fluorobiphenyl	102	114	88	91	103	118	113
D6-Resorcinol	76	81	62	50	97	82	94
2,4,6-Tribromophenol	53	78	92	77	109	101	112
RESIN/FATTY ACIDS							
Surrogates							
Heptadecanoic acid	112	135	269	273	165	174	189
1-Fluorenecarboxylic acid	119	158	119	164	90	119	117
Et-o-Methylpodocarpi	52	85	107	118	65	78	75
MATRIX SPIKE #1							
GUAIACOLS/CATECHOLS/PHENOLICS							
Internal Standard							
2,6-Dibromophenol			82			83	
Surrogates							
2-Ethoxyphenol			101			63	
2-Fluorophenol			87			84	
D5-Phenol			95			90	
D5-Nitrobenzene			82			91	
2-Fluorobiphenyl			26			110	
D6-Resorcinol			138			74	
2,4,6-Tribromophenol			102			89	
RESIN/FATTY ACIDS							
Surrogates							
Heptadecanoic acid			78		184		
1-Fluorenecarboxylic acid			100		96		
Et-o-Methylpodocarpi			63		78		
MATRIX SPIKE #2							
GUAIACOLS/CATECHOLS/PHENOLICS							
Internal Standard							
2,6-Dibromophenol			85			84	
Surrogates							
2-Ethoxyphenol			113			55	
2-Fluorophenol			102			107	
D5-Phenol			112			113	
D5-Nitrobenzene			96			110	
2-Fluorobiphenyl			30			112	
D6-Resorcinol			138			82	
2,4,6-Tribromophenol			102			82	
RESIN/FATTY ACIDS							
Surrogates							
Heptadecanoic acid			64		167		
1-Fluorenecarboxylic acid			84		105		
Et-o-Methylpodocarpi			57		73		

Appendix A10 - Dioxin/Furan Surrogate and Internal Standard Recoveries - Weyerhaeuser, Longview - April 1990.

Station:	A+C sump (4 hour) (acid bleach)	Primary influent (4 hour) (alkaline bleach)
Sample ID#:	168245	168254
	% Recovery	
Surrogate Recovery Summary		
37C1-TCDD	93.2	70.8
13C12-PeCDF 234	81.5	68.6
13C12-HxCDF 478	77.4	47.5
13C12-HxCDD 478	81.7	82.7
13C12-HpCDF 789	86.0	51.5
Alternate Standards Recovery Summary		
13C12-HxCDF 789	92.4	75.8
13C12-HxCDF 234	99.0	77.2
Internal Standards Recovery Summary		
13C12-2378-TCDF	86.2	61.6
13C12-2378-TCDD	82.5	63.5
13C12-PeCDF 123	74.0	50.0
13C12-PeCDD 123	83.5	51.6
13C12-HxCDF 678	70.4	40.1
13C12-HxCDD 678	77.9	65.6
13C12-HpCDF 678	78.7	41.8
13C12-HpCDD 678	76.5	37.9
13C12-OCDD	33.6	23.8

Appendix B. Volatile organic priority pollutant scan – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent		A+C sump	Outfall 001/002		Total effluent	Radakovitch leachate	Transfer blank
Type:	grab	grab	grab	grab	grab	grab	grab	grab
Date:	4/17	4/17	4/17	4/17	4/17	4/17	4/16	4/16
Time:	AM	PM	AM	AM	PM	AM	PM	PM
Sample ID #:	168231	168232	168244	168234	168235	168239	168247	168249
	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)
Chloromethane	10 U	10 U	63 U	50 U	50 U	20 U	50 U	1 U
Bromomethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Vinyl Chloride	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Chloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Methylene Chloride	10 U	10 U	50 U	97 U	50 U	20 U	96 U	1 U
Acetone	230	120	2000	50 U	50 U	20 U	50 U	1 U
Carbon Disulfide	3 J	10 U	50 U	50 U	50 U	20 U	50 U	1 U
1,1-Dichloroethene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
1,1-Dichloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Chloroform	890	1000	8400	470	430	360	7 J	1 U
1,2-Dichloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
2-Butanone	10 U	10 U	1000	50 U	50 U	20 U	50 U	1 U
1,1,1-Trichloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Carbon Tetrachloride	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Vinyl Acetate	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Bromodichloromethane	10 U	2 J	41 J	50 U	50 U	2 J	50 U	1 U
1,2-Dichloropropane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
trans-1,3-Dichloropropene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Trichloroethene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Dibromochloromethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
1,1,2-Trichloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Benzene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
cis-1,3-Dichloropropene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Bromoform	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
4-Methyl-2-Pentanone	10 U	10 U	140	50 U	50 U	20 U	50 U	1 U
2-Hexanone	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Tetrachloroethene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
1,1,2,2-Tetrachloroethane	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Toluene	10 U	10 U	5 J	50 U	50 U	20 U	50 U	1 U
Chlorobenzene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Ethylbenzene	10 U	1 J	50 U	50 U	50 U	20 U	50 U	1 U
Styrene	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
Total Xylenes	3 J	5 J	50 U	50 U	50 U	20 U	50 U	1 U
1,2-Dichloroethene (cis)	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U
1,2-Dichloroethene (trans)	10 U	10 U	50 U	50 U	50 U	20 U	50 U	1 U

[ ] Indicates detected compounds.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limits.

Appendix B. Volatile organic priority pollutant scan (continued).

	Sediments		
Station:	S-1(outfall)	S-2(nr outfall)	S-3(bkground)
Type:	grab-comp	grab-comp	grab-comp
Date:	4/10	4/10	4/10
Time:			
Sample ID #:	158035	158037	158039
	(ug/kg-dry)	(ug/kg-dry)	(ug/kg-dry)
Chloromethane	2 U	0.2 UJ	0.2 UJ
Bromomethane	2 U	1 UJ	0.5 UJ
Vinyl Chloride	2 U	2 U	2 U
Chloroethane	2 U	2 U	2 U
Methylene Chloride	6 UJ	5 UJ	6 UJ
Acetone	10 UJ	2 U	11 UJ
Carbon Disulfide	0.4 J	0.5 J	0.4 J
1,1-Dichloroethene	2 U	2 U	2 U
1,1-Dichloroethane	2 U	2 U	2 U
Chloroform	2 U	1 J	2 U
1,2-Dichloroethane	2 U	2 U	2 U
2-Butanone	2 U	2 U	4 UJ
1,1,1-Trichloroethane	2 U	2 U	2 U
Carbon Tetrachloride	2 U	2 U	2 U
Vinyl Acetate	2 U	2 U	2 U
Bromodichloromethane	2 U	2 U	2 U
1,2-Dichloropropane	2 U	2 U	2 U
trans-1,3-Dichloropropene	2 U	2 U	2 U
Trichloroethene	2 U	2 U	2 U
Dibromochloromethane	2 U	2 U	2 U
1,1,2-Trichloroethane	2 U	2 U	2 U
Benzene	2 U	2 U	2 U
cis-1,3-Dichloropropene	2 U	2 U	2 U
Bromoform	2 U	2 U	2 U
4-Methyl-2-Pentanone	2 U	2 U	2 U
2-Hexanone	2 U	2 U	2 U
Tetrachloroethene	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane	2 U	2 U	2 U
Toluene	2 U	2 U	2 U
Chlorobenzene	2 U	2 U	2 U
Ethylbenzene	2 U	2 U	2 U
Styrene	2 U	2 U	2 U
Total Xylenes	0.08 UJ	2 U	2 U
1,2-Dichloroethene (cis)	2 U	2 U	2 U
1,2-Dichloroethene (trans)	2 U	2 U	2 U

[ ] Indicates detected compounds.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limit.

Appendix C. BNA priority pollutant scan – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002		Total effluent	Radakovitch leachate	Transfer blank
Type:	composite	composite	E-comp+	W-comp+	composite	grab	grab
Date:	4/18	4/18	4/18	4/18	4/18	4/16	4/16
Sample ID #:	168230	168243	168233	168237	168238	168247	168249
	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)
Phenol	20	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Bis(2-Chloroethyl)Ether	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2-Chlorophenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
1,3-Dichlorobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
1,4-Dichlorobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzyl Alcohol	0.8 U	8 U	2 U	REJ	0.8 U	0.8 U	1 U
1,2-Dichlorobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2-Methylphenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Bis(2-chloroisopropyl)ether	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
4-Methylphenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
N-Nitroso-Di-n-Propylamine	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Hexachloroethane	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Nitrobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Isophorone	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2-Nitrophenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2,4-Dimethylphenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzoic Acid	130	40 U	8 U	4 U	4 U	4 U	5 U
Bis(2-Chloroethoxy)Methane	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2,4-Dichlorophenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
1,2,4-Trichlorobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Naphthalene	9	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
4-Chloroaniline	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Hexachlorobutadiene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
4-Chloro-3-Methylphenol	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2-Methylnaphthalene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Hexachlorocyclopentadiene	2 U	16 U	3 U	2 U	2 U	2 U	2 U
2,4,6-Trichlorophenol	14	8 U	8	9	4	0.8 U	1 U
2,4,5-Trichlorophenol	4 U	40 U	8 U	4 U	4 U	4 U	5 U
2-Chloronaphthalene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2-Nitroaniline	4 U	40 U	8 U	4 U	4 U	4 U	5 U
Dimethyl Phthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Acenaphthylene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
3-Nitroaniline	4 UJ	40 UJ	8 UJ	4 UJ	4 UJ	4 UJ	5 UJ
Acenaphthene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2,4-Dinitrophenol	4 U	40 U	8 U	4 U	4 U	4 U	5 U
4-Nitrophenol	4 U	40 U	8 U	4 U	4 U	4 U	5 U
Dibenzofuran	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2,4-Dinitrotoluene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
2,6-Dinitrotoluene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Diethyl Phthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
4-Chlorophenyl-Phenylether	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Fluorene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
4-Nitroaniline	4 U	40 U	8 U	4 U	4 U	4 U	5 U
4,6-Dinitro-2-Methylphenol	4 U	40 U	8 U	4 U	4 U	4 U	5 U
N-Nitrosodiphenylamine	0.8 UJ	8 UJ	2 UJ	0.8 UJ	0.8 UJ	0.8 UJ	1 UJ
4-Bromophenyl-Phenylether	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Hexachlorobenzene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Pentachlorophenol	4 U	40 U	8 U	4 U	4 U	4 U	5 U
Phenanthrene	3	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Anthracene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Di-n-Butyl Phthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	0.2 J
Fluoranthene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Pyrene	2	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Butylbenzylpthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
3,3'-Dichlorobenzidine	0.8 UJ	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzo(a)Anthracene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Chrysene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Bis(2-Ethylhexyl)phthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.4 J	25
Di-n-Octyl Phthalate	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzo(b)Fluoranthene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzo(k)Fluoranthene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzo(a)Pyrene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Indeno(1,2,3-cd)Pyrene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Dibenzo(a,h)Anthracene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U
Benzo(g,h,i)Perylene	0.8 U	8 U	2 U	0.8 U	0.8 U	0.8 U	1 U

[ ] Indicates detected compounds.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicated an estimated value when result is less than specified quantitation limit.

REJ Rejected analytical results.

\+ E-comp indicates Ecoloty composite sampler.
W-comp indicates Weyerhaeuser composite sampler.

Appendix C. BNA priority pollutant scan (continued).

	Sediments		
Station:	S-1(outfall)	S-2(nr outfall)	S-3(bkground)
Type:	grab-comp	grab-comp	grab-comp
Date:	4/10	4/10	4/10
Sample ID #:	158035	158037	158039
	(ug/kg)	(ug/kg)	(ug/kg)
Phenol	150 U	160 U	150 U
Bis(2-Chloroethyl)Ether	150 U	160 U	150 U
2-Chlorophenol	150 U	160 U	150 U
1,3-Dichlorobenzene	150 U	160 U	150 U
1,4-Dichlorobenzene	150 U	160 U	150 U
Benzyl Alcohol	REJ	REJ	REJ
1,2-Dichlorobenzene	150 U	160 U	150 U
2-Methylphenol	150 U	160 U	150 U
Bis(2-chloroisopropyl)ether	150 U	160 U	150 U
4-Methylphenol	150 U	160 U	150 U
N-Nitroso-Di-n-Propylamine	150 U	160 U	150 U
Hexachloroethane	150 U	160 U	150 U
Nitrobenzene	150 U	160 U	150 U
Isophorone	150 U	5 J	3 J
2-Nitrophenol	150 U	160 U	150 U
2,4-Dimethylphenol	150 U	160 U	150 U
Benzoic Acid	750 U	760 U	740 U
Bis(2-Chloroethoxy)Methane	150 U	160 U	150 U
2,4-Dichlorophenol	150 U	160 U	150 U
1,2,4-Trichlorobenzene	150 U	160 U	150 U
Naphthalene	150 U	160 U	150 U
4-Chloroaniline	150 U	160 U	150 U
Hexachlorobutadiene	150 U	160 U	150 U
4-Chloro-3-Methylphenol	150 U	160 U	150 U
2-Methylnaphthalene	150 U	160 U	150 U
Hexachlorocyclopentadiene	310 U	320 U	310 U
2,4,6-Trichlorophenol	150 U	160 U	150 U
2,4,5-Trichlorophenol	750 U	760 U	740 U
2-Chloronaphthalene	150 U	160 U	150 U
2-Nitroaniline	750 U	760 U	740 U
Dimethyl Phthalate	150 U	160 U	150 U
Acenaphthylene	150 U	160 U	150 U
3-Nitroaniline	750 UJ	760 UJ	740 UJ
Acenaphthene	150 U	160 U	150 U
2,4-Dinitrophenol	750 U	760 U	740 U
4-Nitrophenol	REJ	REJ	REJ
Dibenzofuran	150 U	160 U	150 U
2,4-Dinitrotoluene	150 U	160 U	150 U
2,6-Dinitrotoluene	150 U	160 U	150 U
Diethyl Phthalate	150 U	160 U	150 U
4-Chlorophenyl-Phenylether	150 U	160 U	150 U
Fluorene	150 U	160 U	150 U
4-Nitroaniline	750 U	760 U	740 U
4,6-Dinitro-2-Methylphenol	750 U	760 U	740 U
N-Nitrosodiphenylamine	150 UJ	160 UJ	150 UJ
4-Bromophenyl-Phenylether	150 U	160 U	150 U
Hexachlorobenzene	150 U	160 U	150 U
Pentachlorophenol	750 UJ	760 UJ	740 UJ
Phenanthrene	150 U	160 U	150 U
Anthracene	150 U	160 U	150 U
Di-n-Butyl Phthalate	150 U	160 U	150 U
Fluoranthene	150 U	160 U	150 U
Pyrene	150 U	160 U	150 U
Butylbenzylpthalate	150 U	160 U	REJ
3,3'-Dichlorobenzidine	REJ	REJ	150 U
Benzo(a)Anthracene	150 U	160 U	150 U
Chrysene	150 U	160 U	150 U
Bis(2-Ethylhexyl)phthalate	150 U	160 U	150 U
Di-n-Octyl Phthalate	150 U	160 U	150 U
Benzo(b)Fluoranthene	150 U	160 U	150 U
Benzo(k)Fluoranthene	150 U	160 U	150 U
Benzo(a)Pyrene	150 U	160 U	150 U
Indeno(1,2,3-cd)Pyrene	150 U	160 U	150 U
Dibenzo(a,h)Anthracene	150 U	160 U	150 U
Benzo(g,h,i)Perylene	150 U	160 U	150 U

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicated an estimated value when result is less than specified quantitation limit.

REJ Rejected analytical results.

[ ] Indicates detected compounds.

Appendix D. Pesticide/PCB priority pollutant scan – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002		Total effluent	Radakovitch leachate	Transfer blank
Type:	composite	composite	E-comp+	W-comp+	composite	grab	grab
Date:	4/18	4/18	4/18	4/18	4/18	4/16	4/16
Sample ID #:	168230	168243	168233	168237	168238	168247	168249
	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)
alpha-BHC	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
beta-BHC	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
delta-BHC	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
gamma-BHC (Lindane)	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Heptachlor	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Aldrin	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Endosulfan I	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Dieldrin	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
4,4'-DDE	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Endrin	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Endosulfan II	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
4,4'-DDD	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Endosulfan Sulfate	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
4,4'-DDT	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Methoxychlor	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Endrin Aldehyde	0.03 U	0.04 U	0.05 U	0.03 U	0.03 U	0.02 U	0.02 U
Chlordane	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Toxaphene	0.70 U	0.70 U	1.4 U	0.70 U	0.60 U	0.70 U	0.70 U
Aroclor-1016	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1221	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1232	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1242	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1248	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1254	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U
Aroclor-1260	0.07 U	0.07 U	0.14 U	0.07 U	0.06 U	0.07 U	0.07 U

U Indicates compound was analyzed for but not detected at the given quantitation limit.

\+ E-comp indicates Ecology sampler.
W-comp indicates Weyerhaeuser sampler.

Appendix D. Pesticide/PCB priority pollutant scan (continued).

	Sediments		
Station:	S-1(outfall)	S-2(nr outfall)	S-3(blground)
Type:	grab-comp	grab-comp	grab-comp
Date:	4/10	4/10	4/10
Sample ID #:	158035	158037	158039
	(ug/kg)	(ug/kg)	(ug/kg)
alpha-BHC	10 U	10 U	10 U
beta-BHC	10 U	10 U	10 U
delta-BHC	10 U	10 U	10 U
gamma-BHC (Lindane)	10 U	10 U	10 U
Heptachlor	10 U	10 U	10 U
Aldrin	10 U	10 U	10 U
Heptachlor Epoxide	10 U	10 U	10 U
Endosulfan I	10 U	10 U	10 U
Dieldrin	10 U	10 U	10 U
4,4'-DDE	10 U	10 U	10 U
Endrin	10 U	10 U	10 U
Endosulfan II	10 U	10 U	10 U
4,4'-DDD	10 U	10 U	10 U
Endosulfan Sulfate	10 U	10 U	10 U
4,4'-DDT	10 U	10 U	10 U
Methoxychlor	10 U	10 U	10 U
Endrin Aldehyde	10 U	10 U	10 U
Chlordane	50 U	50 U	50 U
Toxaphene	500 U	500 U	500 U
Aroclor-1016	50 U	50 U	50 U
Aroclor-1221	50 U	50 U	50 U
Aroclor-1232	50 U	50 U	50 U
Aroclor-1242	50 U	50 U	50 U
Aroclor-1248	50 U	50 U	50 U
Aroclor-1254	50 U	50 U	50 U
Aroclor-1260	50 U	50 U	50 U

U Indicates compound was analyzed for but not detected at the given quantitation limit.

Appendix E. Metals priority pollutant scan – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent		A+C sump	Outfall 001/002				Chlorine plant		Total effluent	
Sample type:	composite	grab	composite	E-comp+	E-comp+	grab	W-comp+	composite	composite	composite	grab
Analysis type:	recoverable	total	recoverable	recoverable	dissolved	total	recoverable	recoverable	total	recoverable	total
Date:	4/18	4/16	4/18	4/18	4/18	4/16	4/18	4/18	4/18	4/18	4/16
Sample #:	168230	168255	168243	168233	168233	168256	168237	168241	168241	168238	168257
	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)
Antimony	200 U		200 U	200 U			200 U	200 U		200 U	
Arsenic	1.5 UJ		1.5 UJ	1.5 UJ			1.5 UJ	1.5 UJ		1.5 UJ	
Beryllium	2 U		2 U	2 U			2 U	2 U		2 U	
Cadmium	10 U		10 U	10 U			10 U	10 U		10 U	
Chromium (total)	5 U		679	86			94	5 U		64	
(hexavalent)	1.7 JB	2.2 JB	61.2 J		24.4 J	30.7	26.8 J	1.0 UJ		18.3 J	23.1
Copper	18 B		6.3 JB	8.3 JB			8.2 JB	2 U	2.3 JB	6.2 JB	
Lead	60 U		60 U	60 U			60 U	60 U	20 U	60 U	
Mercury	0.02 U		0.02 U	0.02 U	0.02 U		0.02 U	0.02 U	0.048 J	0.02 U	
Nickel	40 U		40 U	40 U			40 U	40 U	10 U	40 U	
Selenium	200 U		200 U	200 U			200 U	200 U		200 U	
Silver	3 UR		3 UR	3 UR			3 UR	3 UR		3 UR	
Thallium	250 U		250 U	250 U			250 U	250 U		250 U	
Zinc	89.3 B		37 B	69.5 B			674	16 JB		7.9 JB	

Station:	Radakovitch leachate	RW to ditch 3	Transfer blank	Sediments S-1(outfall)	S-2(nr outfall)	S-3(bkground)
Sample type:	grab	grab		grab-comp	grab-comp	grab-comp
Analysis type:	recoverable	recoverable	recoverable	total	total	total
Date:	4/18	4/16	4/16	4/10	4/10	4/10
Sample #:	168247	168247/8	168249/60	158035	158037	158039
	(ug/L)	(ug/L)	(ug/L)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	200 U	200 U	200 U	0.10 U	0.10 U	0.10 U
Arsenic	2.3 J	2.5 J	1.5 UJ	0.48 J	1.23	0.58
Beryllium	2 U	2 U	2 U	0.2 U	0.2 U	0.2 U
Cadmium	10 U	10 U	10 U	0.052	0.186	0.053
Chromium (total)	5 U	5 U	5 U	4.8 B	3.8 B	4.2 B
(hexavalent)	1.0 UJ	1.0 U	1.0 U			
Copper	2 U	7 JB	3.9 JB	8.5	10.9	9.5
Lead	60 U	60 U	60 U	0.77	2.28	0.62
Mercury	0.02 U	0.03 J	0.04 J	0.011 *	0.018 *	0.008 J*
Nickel	40 U	40 U	40 U	10.9	5.3 J	4.0 U
Selenium	200 U	200 U	200 U	0.20 U	0.20 U	0.20 U
Silver	3 UR	3 UR	3 UR	0.3 U	0.3 U	0.3 U
Thallium	250 U	250 U	250 U	0.25 U	0.56 J	0.25 U
Zinc	5.1 JB	50.2 B	18 JB	17.7	24.4	14.8

\+ E-comp indicates Ecology sampler.
W-comp indicates Weyerhaeuser sampler.

* Mercury results are in mg/Kg-wet.

U Indicates metal was not detected at given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limit.

B Indicates method blank contamination.

R Indicates unusable data.

Metals detected are indicated by [ ]

Appendix F. Guaiacols/Catechols/Phenolics scans – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002	Total effluent	Sediments S-1(outfall)	S-2(nr outfall)	S-3(bkground)
Type:	composite	composite	composite	composite	grab-comp	grab-comp	grab-comp
Date:	4/18	4/18	4/18	4/18	4/10	4/10	4/10
Sample ID #:	168230	168243	168233	168238	158035	158037	158039
	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/kg)	(ug/kg)	(ug/kg)
Phenol	100	54	1 U	1 U	120 U	140 U	140 U
Ethanone, 1-phenyl-	13	12	0.7 U	0.6 U	110 U	120 U	140 U
2-Methylphenol	2	6	0.5 U	0.04 J	100 U	100 U	100 U
4-Methylphenol	5	0.4 U	0.4 J	0.2 J	100 U	100 U	100 U
a-Terpeneol	500	1600	0.3 U	0.3 U	100 U	100 U	100 U
o-Chlorophenol	0.4 U	0.4 U	0.5 U	0.4 U	100 U	100 U	100 U
2,4-Dimethylphenol	0.2 J	6	0.1 J	0.09 J	100 U	100 U	100 U
2-Cyclopenten-1-one, 2-methyl	0.4 U	220	0.5 U	0.4 U	100 U	100 U	100 U
2-Cyclopenten-1-one, 3-methyl	0.4 U	0.4 U	0.5 U	0.4 U	1700 U	100 U	100 U
Guaiacol (2-methoxyphenol)	160	4200	0.2 J	0.1 J	100 U	100 U	100 U
4-Chloro-3-Methylphenol	0.4 U	0.4 U	0.5 U	0.4 U	100 U	100 U	100 U
2,4-Dichlorophenol	3	6	0.8	0.5	100 U	100 U	100 U
2-Nitrophenol	0.4 U	0.4 U	0.5 U	0.08 U	100 U	100 U	100 U
4-Chloroguaiacol	0.4 U	0.4 U	0.5 U	0.4 U	100 U	100 U	100 U
2,4,6-Trichlorophenol	9	12	5	3	100 U	100 U	100 U
4-Nitrophenol	0.4 U	0.4 U	0.5 U	0.4 U	100 U	100 U	100 U
2,4,5-Trichlorophenol	2	0.4 U	0.5 U	0.4 U	100 U	100 U	100 U
4-Allylguaiacol (eugenol)	150	48	0.5 U	0.08 J	100 U	100 U	100 U
4,5-Dichloroguaiacol	12	18	0.9	0.5	100 U	100 U	100 U
4-Chlorocatechol	0.4 U	2	0.04 J	0.4 U	100 U	100 U	100 U
4-Propenylguaiacol	0.8	9	0.2 J	0.4 U	100 U	100 U	100 U
6-Chlorovanillin	8	10	0.4 J	0.3 J	100 U	100 U	100 U
4,5-Dichlorocatechol	0.4 U	25	1	0.7	100 U	100 U	100 U
4,5,6-Trichloroguaiacol	8	6	4	3	100 U	100 U	100 U
9,10-Dichlorosteric acid	32	13	4	3	100 U	100 U	100 U
5,6-Dichlorovanillin	10	7	0.6	0.5	100 U	100 U	100 U
Pentachlorophenol	0.4 U	0.6	0.5 U	0.4 U	100 U	100 U	100 U
3,4,5-Trichlorocatechol	0.4 U	120	6	3	100 U	100 U	100 U
Tetrachloroguaiacol	14	4	3	2	100 U	100 U	100 U
Trichlorosyringol	9	2	5	3	100 U	100 U	100 U
Tetrachlorocatechol	0.4 U	39	2	1	100 U	100 U	100 U

[ ] Indicates detected compounds.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limit.

Appendix G. Resin/Fatty acids scans – Weyerhaeuser, Longview – April 1990.

Station:	Primary effluent	A+C sump	Outfall 001/002	Total effluent	Sediments S-1(outfall)	S-2(nr outfall)	S-3(bkground)
Type:	composite	composite	composite	composite	grab-comp	grab-comp	grab-comp
Date:	4/18	4/18	4/18	4/18	4/10	4/10	4/10
Sample ID #:	168230 (ug/l)	168243 (ug/l)	168233 (ug/l)	168238 (ug/l)	158035 (ug/kg)	158037 (ug/kg)	158039 (ug/kg)
Linoleic acid	84	4	33	28	410 U	410 U	410 U
Palmitoleic acid	71	0.9 U	120	120	1100 U	820 U	1200 U
Decanoic Acid, Hexa-	99	100	140	160	5200 U	1300 U	4700 U
Oleic acid	240	0.9 U	39	290	750 U	410 U	730 U
Octadecanoic acid	21	10	12	13	870 U	410 U	700 U
Retene	0.8 U	0.9 U	1 U	0.9 U	410 U	410 U	410 U
Pimaric acid	140	0.9 U	34	38	410 U	410 U	410 U
Sandaracopimaric acid	37	0.9 U	6	7	410 U	410 U	410 U
Isopimaric acid	99	1	41	46	410 U	26 J	410 U
Palustric acid	88	0.9 U	10	9	410 U	410 U	410 U
Eicosatrienoic acid	32	0.9 U	1 U	0.9 U	410 U	410 U	410 U
Dehydroabietic acid	230	3	57	64	15 J	40 J	410 U
Abietic acid	200	0.9 U	69	77	410 U	28 J	410 U
Neoabietic Acid	39	0.9 U	2	3	410 U	410 U	410 U
9,10-Dichlorosteric acid	19	21	1 U	0.9 U	410 U	410 U	410 U
14-Chlorodehydroabietic	0.8 U	0.9 U	1 U	0.9 U	410 U	410 U	410 U
12-Chlorodehydroabietic	0.8 U	0.9 U	1 U	0.9 U	410 U	410 U	410 U
Dichlorodehydroabietic Acid	0.8 U	0.9 U	1 U	0.9 U	410 U	410 U	410 U

[ ] Indicates detected compounds.
U Indicates compound was analyzed for but not detected at the given quantitation limit
J Indicates an estimated value when result is less than specified quantitation limit

Appendix H. Dioxin/furan analysis of sediments – Weyerhaeuser, Longview – April 1990.

Station:	S-1 (outfall)		S-2 (near outfall)		S-3 (background)	
	Concentration (ppt)	EMPC (ppt)	Concentration (ppt)	EMPC (ppt)	Concentration (ppt)	EMPC (ppt)
2378-TCDD	0.09 U		0.4 U		0.7 U	
12378-PeCDD	0.2 U		0.5 U		0.9 U	
123478-HxCDD	0.2 U		0.5 U		0.5 U	
123678-HxCDD	0.1 U		0.5 U		0.5 U	
123789-HxCDD	0.2 U		0.6 U		0.6 U	
1234678-HpCDD	EMPC	0.80	0.8 U		1.2 U	
OCDD	EMPC	7.2	39.1		5.7	
2378-TCDF	0.36		0.4 U		0.5 U	
12378-PeCDF	0.1 U		0.5 U		0.7 U	
23478-PeCDF	0.1 U		0.5 U		0.8 U	
123478-HxCDF	0.1 U		0.5 U		0.6 U	
123678-HxCDF	0.1 U		0.4 U		0.6 U	
234678-HxCDF	EMPC	0.37	0.6 U		0.9 U	
123789-HxCDF	0.2 U		0.8 U		1.1 U	
1234678-HpCDF	0.1 U		0.5 U		0.7 U	
1234789-HpCDF	0.3 U		0.9 U		1.2 U	
OCDF	0.4 U		1.7 U		2.9 U	
Total TCDD	0.09 U		0.4 U		0.7 U	
Total PeCDD	0.2 U		0.5 U		0.9 U	
Total HxCDD	0.2 U		0.5 U		0.5 U	
Total HpCDD	1.0	1.8	1.9		1.2 U	
Total TCDF	0.36	0.91	0.4 U		0.5 U	
Total PeCDF	0.1 U		0.5 U		0.7 U	
Total HxCDF	EMPC	0.32	0.5 U		0.8 U	
Total HpCDF	0.2 U		0.6 U		0.9 U	

ppt parts per trillion.
EMPC Estimate Maximum Possible Concentration.
U Indicates compound was analyzed for but not detected at the given detection limit.

Table 1. Survival of Hyalella azteca exposed for ten days to freshwater sediments in Test No. 381-1.

Sample No.	Repl.	Number of amphipods		Percent survival	Mean* percent survival
		Exposed	Surviving		
Control	1	15	15	100.0	
	2	15	13	86.6	
	3	15	15	100.0	
	4	15	13	86.6	
	5	15	12	80.0	90.7
15-8035	1	15	14	93.3	
	2	15	12	80.0	
	3	15	14	93.3	
	4	15	13	86.6	
	5	15	15	100.0	90.7
15-8037	1	15	14	93.3	
	2	15	13	86.6	
	3	15	13	86.6	
	4	15	14	93.3	
	5	15	13	86 6	89.3
15-8039	1	15	14	93.3	
	2	15	13	86.6	
	3	15	13	86.6	
	4	15	15	100.0	
	5	15	14	93.3	92.0

* An asterisk (*) next to the treatment mean indicates that the latter was significantly ($P<0.05$) different from the control mean.

Appendix I. Sediment Bioassays - continued.

SAMPLE	INITIAL READING	5 MINUTE READING	15 MINUTE READING	% DECREASE IN LUMINESCENCE 5 MINUTES	% DECREASE IN LUMINESCENCE 15 MINUTES
S1 - DI Extract					
BLANK	96	82	79		
BLANK	95	80	76		
R5				0.85	
R15				0.81	
6.2%	100	85	80	-0.22	1.42
6.2%	91	77	73	0.24	1.15
12.4%	110	94	88	-0.75	1.42
12.4%	92	78	73	0.04	2.22
24.8%	100	82	77	3.32	5.12
24.8%	94	78	75	2.17	1.68
49.5%	122	93	89	10.12	10.11
49.5%	97	73	71	11.27	9.80
S2 - DI Extract					
BLANK	98	90	84		
BLANK	100	86	78		
R5				0.89	
R15				0.82	
6.2%	98	83	77	4.72	3.97
6.2%	99	84	79	4.55	2.47
12.4%	98	80	75	8.16	6.46
12.4%	100	86	80	3.25	2.22
24.8%	86	69	65	9.74	7.62
24.8%	94	75	71	10.24	7.68
49.5%	96	72	70	15.62	10.88
49.5%	103	76	72	16.99	14.56

Appendix I. Sediment Bioassays - continued.

MICROTOX DATA SHEET

SAMPLE	INITIAL READING	5 MINUTE READING	15 MINUTE READING	% DECREASE IN LUMINESCENCE 5 MINUTES	% DECREASE IN LUMINESCENCE 15 MINUTES
S3 - DI Extract					
BLANK	195	175	167		
BLANK	97	90	86		
R5				0.91	
R15				0.87	
6.2%	92	80	74	4.18	7.17
6.2%	95	82	76	4.89	7.67
12.4%	96	83	78	4.73	6.23
12.4%	100	89	84	1.93	3.05
24.8%	94	84	80	1.53	1.77
24.8%	94	82	79	3.88	3.00
49.5%	98	78	75	12.30	11.67
49.5%	94	81	78	5.05	4.23

Appendix J. Laboratory Evaluation - Weyerhaeuser, Longview - April 1990.

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS & LABORATORY SERVICES
Quality Assurance Section

May 4, 1990

TO: Jeanne Andreasson

THROUGH: Cliff Kirchmer

FROM: Stewart Lombard

SUBJECT: Evaluation of Weyerhaeuser Laboratory

On Tuesday, April 17, 1990, I visited the analytical laboratory at the Weyerhaeuser Co. facility in Longview in support of the Class II Inspection which you were conducting. I was greeted by Mr. Jim Yount, the laboratory manager and we were joined by Mr. Jim Miltimore, Weyerhaeuser Quality Assurance Officer and Mr. Rolland Vannelli, the chemist who performs the BOD and TSS analyses for the DMRs.

On my arrival, I was presented with a folder containing SOPs for both procedures. The SOPs were based on the appropriate procedures in Standard Methods but were expanded to provide more detail and additional information pertinent to the analysis of samples from their plant. A competent chemist could follow the SOPs and conduct the analyses correctly.

Mr. Vannelli was very knowledgeable about the procedures and the problems specific to the samples from the facility. His records documenting analytical and quality control results were available and complete. The laboratory facility was orderly and clean and all equipment used for BOD and TSS analyses was well maintained. The incubator, drying oven and balance were examined and found to be working well.

I discussed each procedure step-by-step with Mr. Vannelli and am satisfied that he has the knowledge and capability to perform them properly. I found no deficiencies in this laboratory. I also noted that this laboratory reported "acceptable" results for these analyses in DMR-QA Study #9 (1989).

If you have any questions or concerns, please call me.

SML:sml

Appendix K. Centrifuge study VOA laboratory data – Weyerhaeuser, Longview – April 1990.

	Field Centrifuge Blank (ug/L)	Field Effluent Blank (ug/L)	Laboratory Data Surrogate (RAS) (ug/Kg)	Surrogate (Sludge) (ug/Kg)	Laboratory - Manchester Effluent Whole (ug/L)	Centrate* (ug/L)	articulates** (ug/Kg)
Chloromethane	1 U	1 U	210 U	39 U	50 U	NOT TESTED	34 U
Bromomethane	1 U	1 U	210 U	39 U	50 U		34 UJ
Vinyl chloride	1 U	1 U	210 U	39 U	50 U		34 U
Chloroethane	1 U	1 U	210 U	39 U	50 U		34 U
Methylene chloride	38	1 U	2,300 U	150 UJ	50 U		1,700
Acetone	91	1 U	210 U	39 U	50 U		13,000
Carbon disulfide	1 U	1 U	210 U	36 J	50 U		34 U
1,1-Dichloroethene	1 U	1 U	210 U	39 U	50 U		34 U
1,1-Dichloroethane	1 U	1 U	210 U	39 U	50 U		34 U
cis 1,2-Dichloroethene							
trans 1,2-Dichloroethene							
Chloroform	1 U	1 U	31,000	14,000	430		3,100
1,2-Dichloroethane	1 U	1 U	210 U	39 U	50 U		34 U
2-Butanone	1 U	1 U	210 U	44 UJ	50 U		13,000
1,1,1-Trichloroethane	1 U	1 U	210 U	39 U	50 U		34 U
Carbon tetrachloride	1 U	1 U	210 U	39 U	50 U		34 U
Vinyl Acetate	1 U	1 U	210 U	39 U	50 U		34 U
Bromodichloromethane	1 U	1 U	210 U	39 U	50 U		34 U
1,2-Dichloropropane	1 U	1 U	26 J	39 U	50 U		34 U
Cis-1,3-Dichloropropene	1 U	1 U	210 U	39 U	50 U		34 U
Trichloroethene	1 U	1 U	210 U	39 U	50 U		34 U
Dibromochloromethane	1 U	1 U	210 U	39 U	50 U		34 U
1,1,2-Trichloroethane	1 U	1 U	210 U	39 U	50 U		34 U
Benzene	1 U	1 U	210 U	39 U	50 U		34 U
Trans-1,3-Dichloropropene	1 U	1 U	210 U	39 U	50 U		34 U
Bromoform	1 U	1 U	210 U	39 U	50 U		34 U
4-Methyl-2-pentanone	1 U	1 U	210 U	39 U	50 U		34 U
2-Hexanone	1 U	1 U	210 U	39 U	50 U		100
Tetrachloroethene	1 U	1 U	94 J	39 U	50 U		20 J
1,1,2,2-Tetrachloroethane	1 U	1 U	210 U	39 U	50 U		34 U
Toluene	1 U	1 U	210 U	39 U	50 U		14 J
Chlorobenzene	1 U	1 U	210 U	39 U	50 U		34 U
Ethyl benzene	1 U	1 U	210 U	39 U	50 U		17 U
Styrene	1 U	1 U	210 U	39 U	50 U		34 U
Xylene (total)	1 U	1 U	210 U	39 U	50 U		20 J

U Indicates compound was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when result is less than specified quantitation limit.

* Centrate – The portion of the whole effluent that passes through the centrifuge.

** Particulates – The portion of the whole effluent retained by the centrifuge.

Appendix K. Centrifuge study BNA laboratory data - Weyerhaeuser, Longview - April 1990.

	Field Centrifuge Blank (ug/L)		Field Effluent Blank (ug/L)		Laboratory Data Surrogate (RAS) (ug/Kg)		Laboratory Data Surrogate (Sludge) (ug/Kg)		Laboratory - Manchester Effluent Whole (ug/L)		Laboratory - Manchester Effluent Centrate* (ug/L)		Laboratory - Manchester Effluent Particulates** (ug/Kg)	
Phenol	0.6	J	1	U	9,500	U	28,000		2	U	1		9,500	U
Bis(2-chloroethyl)Ether	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2-Chlorophenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
1,3-Dichlorobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
1,4-Dichlorobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Benzyl Alcohol	0.8	U	1	U		NR		NR	2	U	0.8	U		NR
1,2-Dichlorobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2-Methylphenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Bis(2-Chloroisopropyl)Ether	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
4-Methylphenol	0.1	J	1	U	9,500	U	10,000	U	2	U	0.8	U	73,000	
N-Nitroso-di-n-Propylamine	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Hexachloroethane	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Nitrobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Isophorone	0.8	U	1	U	4,200	J	10,000	U	2	U	0.8	U	11,000	
2-Nitrophenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2,4-Dimethylphenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Benzoic Acid	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
Bis(2-Chloroethoxy)Methane	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2,4-Dichlorophenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	J	9,500	U
1,2,4-Trichlorobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Naphthalene	0.06	J	1	U	9,500	U	29,000		2	U	0.8	U	9,500	U
4-Chloroaniline	0.8	U	1	U	9,500	U	10,000	U	2	U		NR	9,500	U
Hexachlorobutadiene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
4-Chloro-3-Methylphenol	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2-Methylnaphthalene	0.02	J	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Hexachlorocyclopentadiene	2	U	2	U	19,000	U	21,000	U	3	U	2	U	19,000	U
2,4,6-Trichlorophenol	0.8	U	1	U	9,500	U	10,000	U	8		1		9,500	U
2,4,5-Trichlorophenol	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
2-Chloronaphthalene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2-Nitroaniline	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
Dimethylphthalate	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Acenaphthylene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
3-Nitroaniline		NR	5	UJ	46,000	UJ	50,000	UJ	8	UJ		NR	46,000	UJ
Acenaphthene	0.01	J	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2,4-Dinitrophenol	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
4-Nitrophenol	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
Dibenzofuran	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2,4-Dinitrotoluene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
2,6-Dinitrotoluene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Diethylphthalate	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
4-Chlorophenyl-phenylether	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Fluorene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
4-Nitroaniline		NR	5	U	46,000	U	50,000	U	8	U		NR	46,000	U
4,6-Dinitro-2-methylphenol	4	U	5	U	46,000	U	50,000	U	8	U	4	U	46,000	U
N-Nitrosodiphenylamine	0.8	UJ	1	UJ	9,500	UJ	10,000	UJ	2	UJ	0.8	UJ	9,500	UJ
4-Bromophenyl-phenylether	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Hexachlorobenzene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Pentachlorophenol	4	U	5	U	46,000	U	50,000	U	8	U	0.5	J	46,000	U
Phenanthrene	0.06	J	1	U	9,500	U	11,000		2	U	0.8	U	9,500	U
Anthracene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Di-n-Butylphthalate	0.8	U	0.2	J	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Fluoranthene	0.2	J	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Pyrene	0.2	J	1	U	4,200	J	13,000		2	U	0.8	U	9,500	U
Butylbenzylphthalate	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
3,3'-Dichlorobenzidine		NR	1	U		NR		NR	2	U		NR		NR
Benzo(a)anthracene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Bis(2-Ethylhexyl)Phthalate	2	U	25		9,500	U	10,000	U	2	U	0.8	U	9,500	U
Chrysene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Di-n-Octyl phthalate	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	UJ	9,500	U
Benzo(b)fluoranthene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Benzo(k)fluoranthene	0.1	J	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Benzo(a)pyrene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Indeno(1,2,3-cd)pyrene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Dibenzo(a,h)anthracene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U
Benzo(ghi)perylene	0.8	U	1	U	9,500	U	10,000	U	2	U	0.8	U	9,500	U

* Centrate - The portion of the whole effluent that passes through the centrifuge.
** Particulates - The portion of the whole effluent retained by the centrifuge.
NR No analytical result
U Indicates compound was analyzed for but not detected at the given quantitation limit.
J Indicates an estimated value when result is less than specified quantitation limit.

Appendix K. Centrifuge study Pesticides/PCBs laboratory data - Weyerhaeuser, Longview - April 1990.

	Field Centrifuge Blank (ug/L)	Field Effluent Blank (ug/L)	Laboratory Data Surrogate (Return Sludge) (ug/Kg)	Laboratory Data Surrogate (Sludge) (ug/Kg)	Laboratory - Manchester Effluent Whole (ug/L)	Laboratory - Manchester Effluent Centrate* (ug/L)	Laboratory - Manchester Effluent articulates** (ug/Kg)
Aldrin	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Chlordane	0.10 U	0.07 U	1600 U	680 U	0.14 U	0.07 U	500 U
Dieldrin	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
4,4' DDT	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
4,4' DDE	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
4,4' DDD	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Endosulfan I	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Endosulfan II	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Endosulfan sulfate	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Endrin	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Endrin Aldehyde	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Heptachlor	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Heptachlor epoxide	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
a-BHC	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
b-BHC	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Lindane	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
d-BHC	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U
Toxaphene	1.0 U	0.70 U	16,000 U	6,800 U	1.4 U	0.70 U	5,000 U
PCB 1016	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
PCB 1221	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
PCB 1232	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
PCB 1242	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
PCB 1248	0.10 U	0.07 U	1600 U	680 U	0.14 U	0.07 U	500 U
PCB 1254	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
PCB 1260	0.10 U	0.07 U	1,600 U	680 U	0.14 U	0.07 U	500 U
Methoxychlor	0.02 U	0.02 U	320 U	140 U	0.05 U	0.03 U	200 U

* Centrate – The portion of the whole effluent that passes through the centrifuge.

** Particulates – The portion of the whole effluent retained by the centrifuge.

U Indicates compound was analyzed for but not detected at the given quantitation limit.

Appendix K. Centrifuge study Metals laboratory data - Weyerhaeuser, Longview - April 1990.

			Laboratory Data		Laboratory – Manchester		
	Field Centrifuge Blank (ug/L)	Field Effluent Blank (ug/L)	Surrogate (RAS) (mg/Kg-wet)	Surrogate (Sludge) (mg/Kg-wet)	Effluent Whole (ug/L)	Centrate* (ug/L)	Particulates** (mg/Kg-wet)
Antimony, Total	200 U		0.1 U	0.1 U			0.1 U
Antimony, Total recoverable		200 U			200 U		
Antimony, Dissolved						200 U	
Arsenic, Total	100 U		0.15 U	0.15 U			0.33 J
Arsenic, Total recoverable		1.5 UJ			1.5 UJ		
Arsenic, Dissolved						100 U	
Beryllium, Total	2 U		0.2 U	0.2 U			0.2 U
Beryllium, Total recoverable		2.0 U			2.0 U		
Beryllium, Dissolved						2 U	
Cadmium, Total	10 U		0.026 J	0.039 J			0.0760
Cadmium, Total recoverable		10 U			10 U		
Cadmium, Dissolved						10 U	
Chromium, Total	5 U		18.3	10.7			52.0
Chromium, Total recoverable		5.0 U			86		
Chromium, Dissolved						88	
Copper, Total	6.8 JB		2.47 B	4.1 B			7.2
Copper, Total recoverable		3.9 JB			8.3 JB		
Copper, Dissolved						19 B	
Lead, Total	60 U		6.0 U	6.0 U			6.0 U
Lead, Total recoverable		60 U			60 U		
Lead, Dissolved						60 U	
Mercury, Total			0.002 U	0.002 U			0.013
Mercury, Total recoverable		0.04 J			0.02 U		
Mercury, Dissolved					0.020 U	0.020 U	
Nickel, Total	40 U		5.1 J	4.0 U			7.5 J
Nickel, Total recoverable		40 U			40 U		
Nickel, Dissolved						40 U	
Selenium, Total	200 U		0.2 U	0.2 U			0.2 U
Selenium, Total recoverable		200 U			200 U		
Selenium, Dissolved						200 U	
Silver, Total	3 U		0.3 U	0.3 U			0.3 U
Silver, Total recoverable		3.0 UR			3.0 UR		
Silver, Dissolved						3 U	
Thallium, Total	250 U		0.25 U	0.25 U			0.25 U
Thallium, Total recoverable		250 U			250 U		
Thallium, Dissolved						250 U	
Zinc, Total	16.0 JB		5.73	10.2			14.7
Zinc, Total recoverable		18 JB			69.5 B		
Zinc, Dissolved						2,380	
Hexavalent Chromium, Total	1.0 U		25				
Hexavalent Chromium, Dissolved					24.4 J	25.2	

* Centrate – The portion of the whole effluent that passes through the centrifuge.

** Particulates – The portion of the whole effluent retained by the centrifuge.

U Indicates metal was analyzed for but not detected at the given quantitation limit.

J Indicates an estimated value when the result is less than the specified quantitation limit.

B Indicates method blank contamination.

R Indicates unusable results due to poor MS/MSD recoveries.