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WA-22-4010

WEYERHAEUSER PAPER COMPANY (Cosmopolis Plant)
May, 1991 Class II Inspection

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by
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Water Body No. WA-22-4010
Segment No. 10-22-12

October 1992

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ABSTRACT

A Class II inspection was conducted at the Weyerhaeuser Paper Company Plant in Cosmopolis on May 28-31, 1991. The effluent from the 001 outfall met NPDES permit limits although the Ecology analytical result for BOD (qualified as estimated) was slightly greater than the monthly limit. No dioxin (2,3,7,8-TCDD) was detected in the effluent. Dissolved organic halides (DOX) was found in concentrations above the monthly maximum permit limit, effective 1995. Bioassay organism sensitivity to effluent and runoff samples was variable. Outfall 001 effluent showed toxic effects at various levels to fathead minnow, echinoderm, and bivalve larvae.

The effluent from outfall 002 met all NPDES permit limits. Samples collected from runoff near the production facilities and from ditches draining the area near the lagoons were of generally acceptable water quality.

Sediments from Grays Harbor contained dioxins and furans in low concentrations, and organics and metals in concentrations below criteria. *Rhepoxinius*, echinoderm embryo, and Microtox bioassays revealed toxic effects from Sediment-1 (near the outfall). The echinoderm embryo test also demonstrated some toxic effects from Sediment-3 (the background sample).

INTRODUCTION

A Class II inspection was conducted at the Weyerhaeuser Paper Company Cosmopolis Plant (Weyco) on May 28-31, 1991. Conducting the inspection were Rebecca Inmann and Marc Heffner of the Ecology Toxics, Compliance, and Ground Water Investigations Section and Don Kjosness, Arlene Army, and Marc Crooks of the Ecology Industrial Section. Bill Weaver represented Weyco and assisted during the inspection. Also, sediments were collected in Grays Harbor near the plant outfall on June 4, 1991. Bernie Strong and Marc Heffner of Ecology collected the sediment samples.

Weyco operates a bleached sulfite pulp mill in Cosmopolis. The plant discharges into Grays Harbor Estuary and the Chehalis River, Water Body No. WA-22-4010, Segment No. 10-22-12. Plant discharge is limited by NPDES permit WA-000080-9. The inspection focused on the wastewater treatment system, and water quality in ditches near the production area and ditches near the final settling ponds. Receiving water sediments were also collected. Specific objectives included:

1. Verify NPDES permit self monitoring.

2. Assess secondary wastewater treatment plant loading.

3. Assess effluent toxicity with bioassays and pollutant scans.

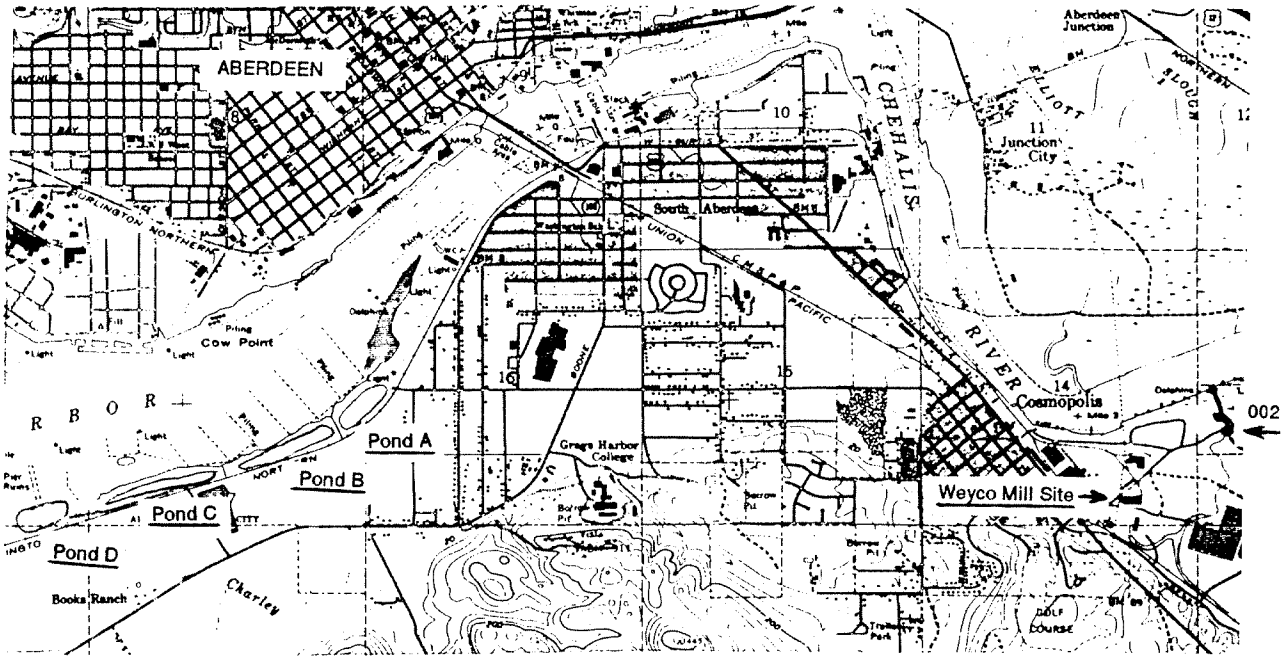
4. Assess dissolved organic halides (DOX) and dioxin concentrations in the wastewater treatment system and bleach plant effluent.

5. Assess water quality in ditches with chemical analyses and bioassays.

6. Assess impacts to receiving water sediments with chemical analyses and bioassays.

SETTING

The Weyco NPDES permit limits the combined load from two discharges; 001 and 002 (Figure 1). The 001 discharge is the principal discharge. The 001 treatment facilities include secondary treatment (aerated bioponds and secondary clarifiers) at the pulp mill site and settling ponds located approximately five miles away along the shore of Grays Harbor. Approximately 4 million gallons/day (MGD) is sent to the secondary treatment facility while the balance of the 001 flow (approximately 25-28 MGD) is sent along with the secondary effluent to a series of four settling ponds. During the inspection only Pond A and a small portion of Pond D were in use. The portion of Pond D in use was a diked-in area from which the pond discharges into the outfall line. The outfall line extends to a diffuser located in the old south channel of the harbor. Ponds B, C, and most of D were removed from regular service, serving only as emergency holding capacity.



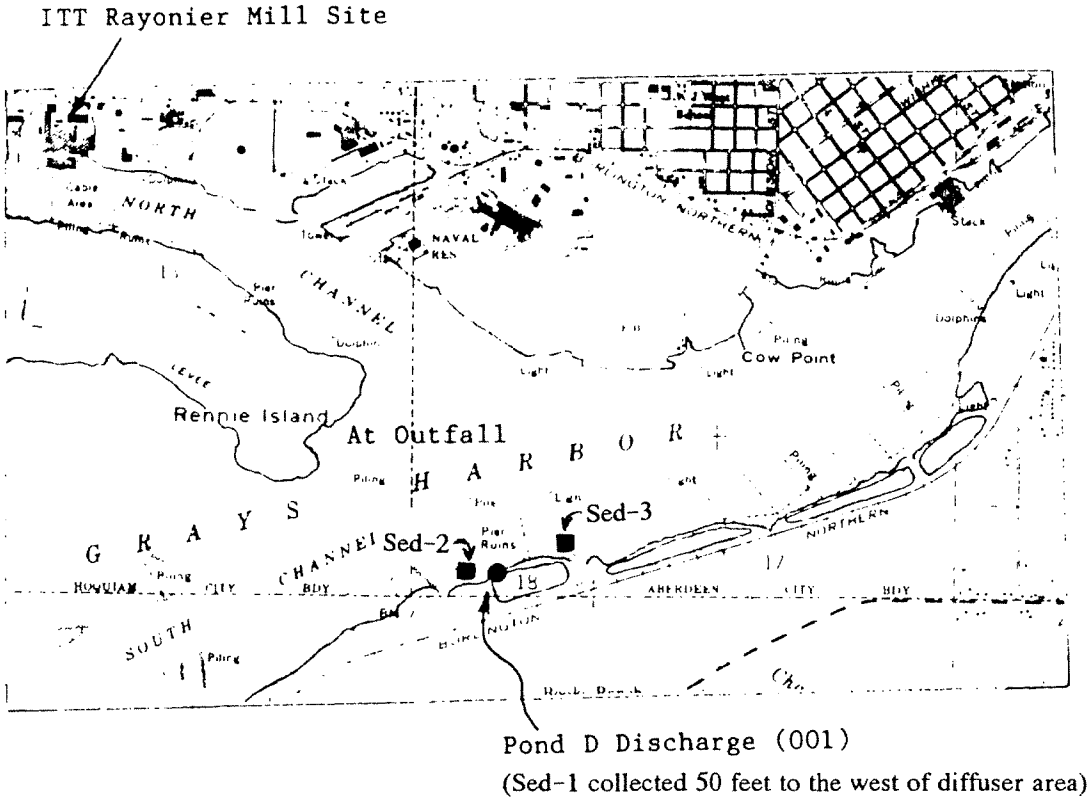


Figure 1 – Sampling Locations – Weyerhaeuser (Cosmopolis), May 1991.

Discharge 002, also referred to as the sweet sewer, presently discharges site runoff, filter plant backwash, and flow from a neighboring truckwash. The sweet sewer is an open waterway with two surface aerators stationed in the pool just upstream of a dam over which the discharge falls (Figures 2 and 3). The 002 discharge is estimated to be approximately 4-5 MGD.

Runoff from the mill site is also discharged from a pipe at the end of a ditch referred to as the "woodyard riverside drain" (Figure 3). The ditch was tidally influenced during the inspection, with tidal flow coming into the ditch at high tide.

The settling pond area is located adjacent to tidally influenced Grays Harbor. In addition to the settling ponds, there are two diked areas to which solids accumulating in the settling ponds have historically been pumped (Figure 4). There is a potential for leaching from the unlined spoils area near the settling ponds to nearby ditches. Citizen's complaints were received that frogs were absent in the ditches and that the ditches might be toxic. Prior to this inspection, a salmonid bioassay on a sample from the Highway 105 drainage ditch revealed acute toxicity (Kjosness, 1992).

Pulp mill operation during the inspection included some difficulty in the bleach plant area. During the inspection composite sampling period (May 29 - 0800 to May 30 - 0800), the bleach plant was down for approximately seven hours. Waste characteristics of the biopond influent are considerably different (weaker) during down periods. The bleach plant was also down from approximately 0830 to 1800 on May 30 forcing one de-aeration tank effluent (DAef) sample to be eliminated and a bleach plant grab composite sample to be sampled as a grab sample instead.

PROCEDURES

Ecology collected composite and grab samples of biopond influent, 001 effluent, and 002 effluent. Ecology Isco composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. Grab samples were also collected at several other locations including the bleach plant effluent, the de-aeration tank effluent, runoff at the "riverside woodyard drain," and the ditches near the final settling ponds. Sampling locations are summarized in Table 1 and Figures 1, 2, 3, and 4.

Weyco also collected an effluent composite sample. The sampler was set to collect equal volumes of sample every 12 minutes for 24 hours. Selected samples were split (composite samples) or taken in pairs (grab samples) for Ecology and Weyco laboratory analysis. Samples collected, sampling times and parameters analyzed are summarized in Appendix A.

Sediment samples were collected from Grays Harbor by Ecology with a 0.1 m^2 van Veen grab sampler at three stations; one at a background site approximately 1200 feet NE of the diffuser (Sed-3), one within 50 feet west of the diffuser (Sed-1), and one approximately 300 feet west of the diffuser near the edge of the dilution zone (Sed-2 - Figure 1). At each station, the top

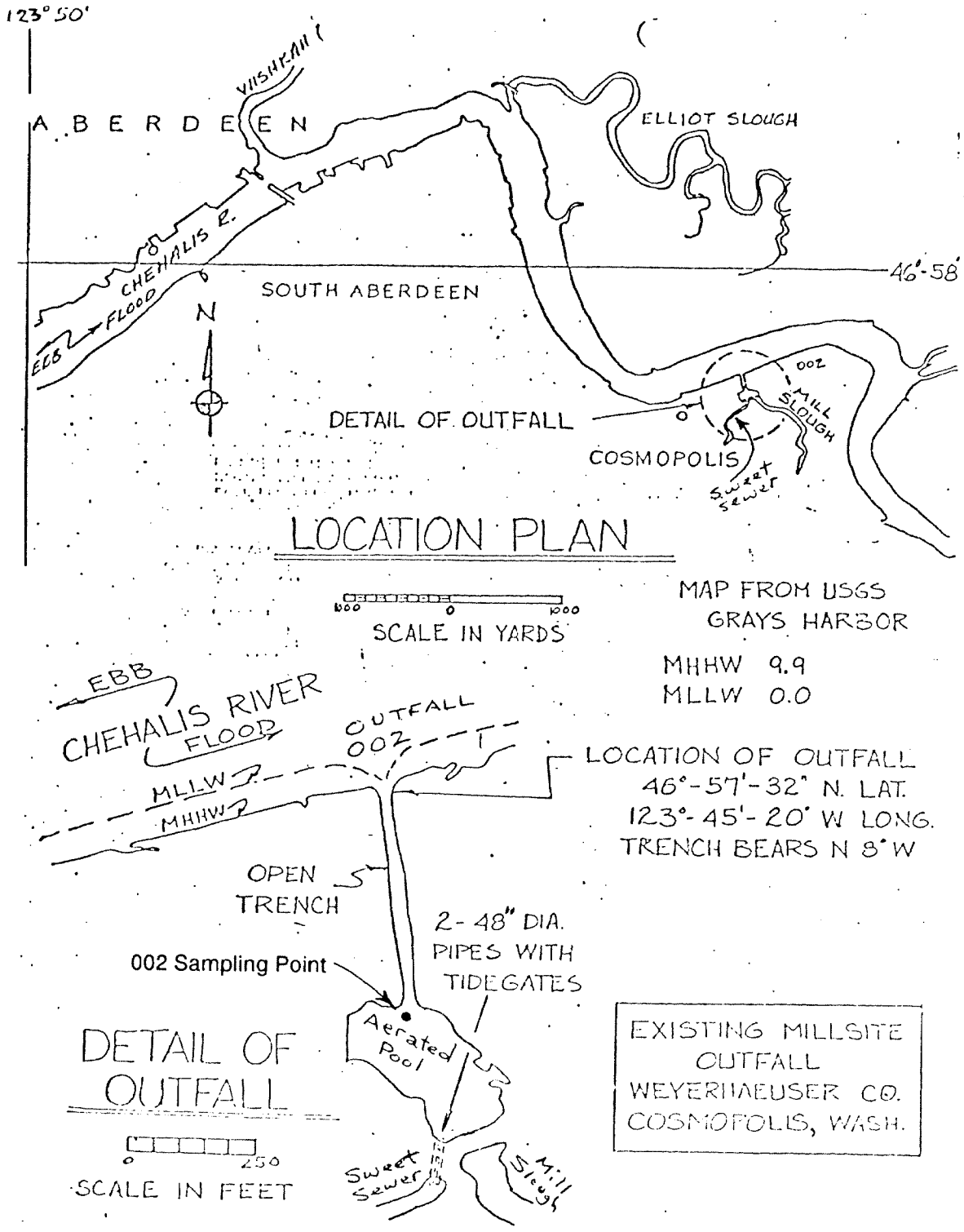


Figure 2 – Outfall 002 Location (Figure provided by Weyerhaeuser)
–Weyerhaeuser, Cosmopolis, May 1991.

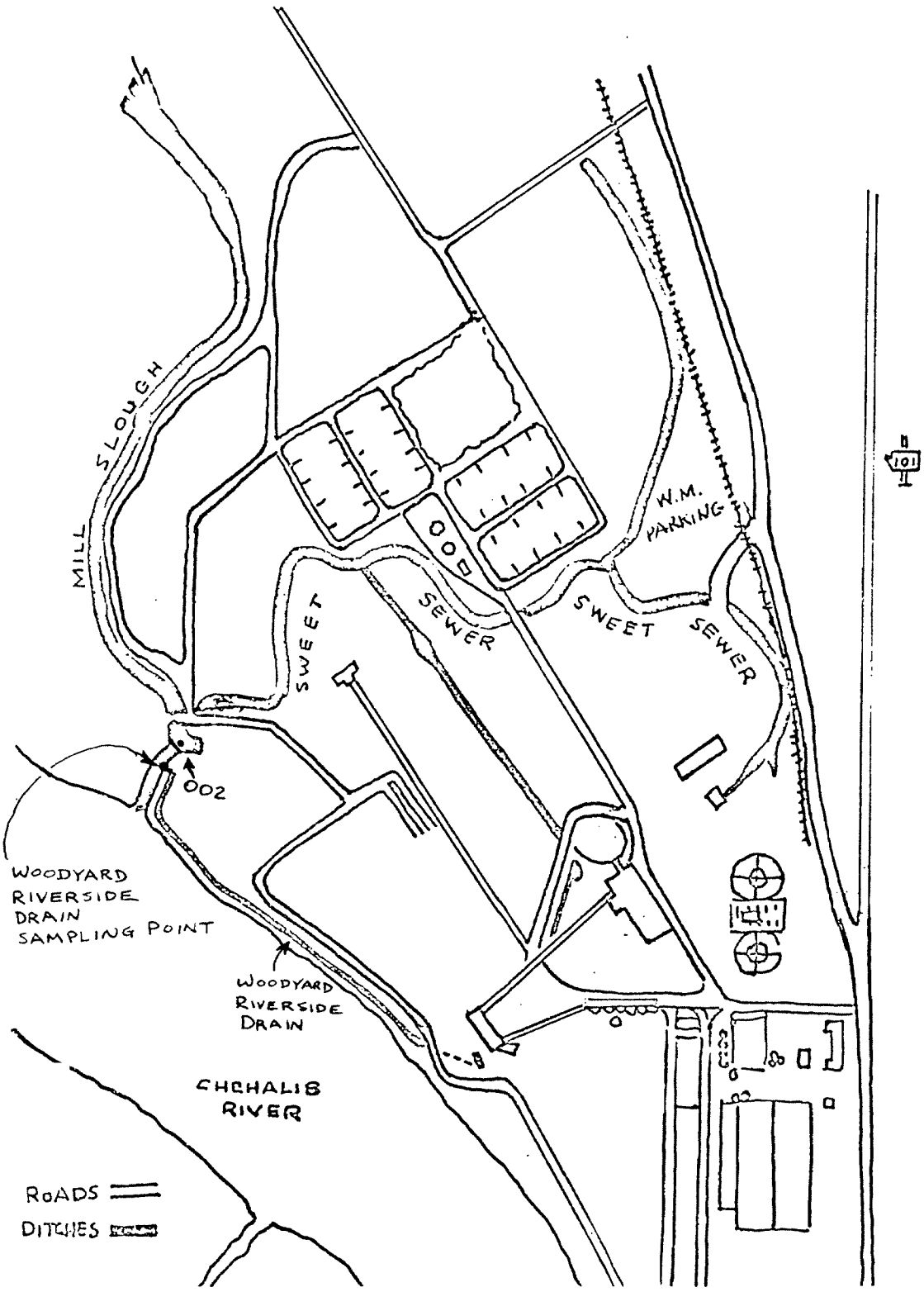


Figure 3 – Outfall 002 and Woodyard Riverside Drain Locations (Figure provided by Weyerhaeuser) – Weyerhaeuser (Cosmopolis), May 1991.

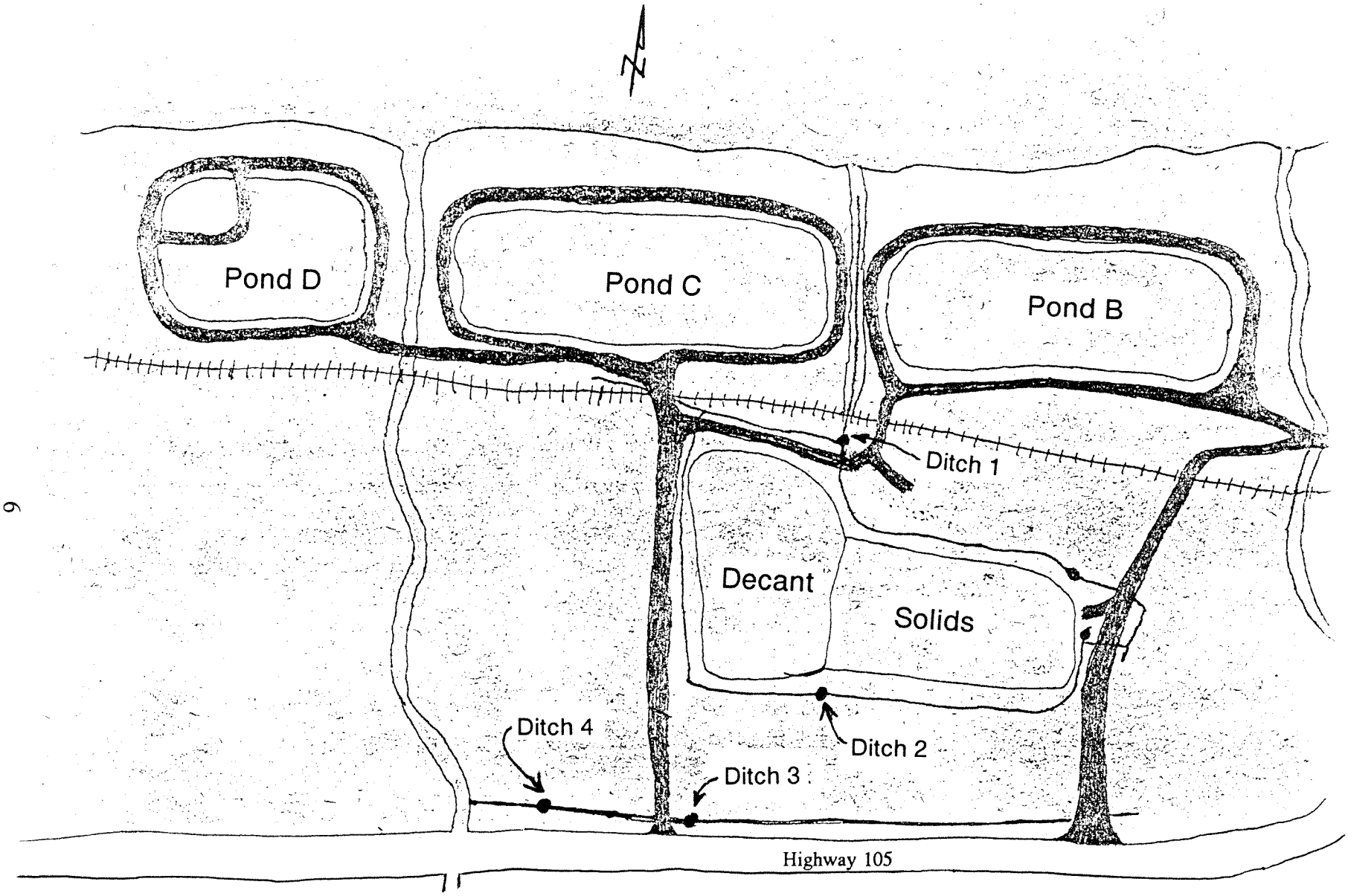


Figure 4 – Ditch Sample Locations – Weyerhaeuser (Cosmopolis), May 1991.

Table 1. Sampling Station Descriptions - Weyerhaeuser (Cosmopolis), May 1991.

Influent (Inf)

Influent to the bioponds. The sample was collected from the influent tap at the sampling gallery next to the biopond lab building. The composite sample was collected from a priority pollutant cleaned stainless steel bucket placed under the tap and allowed to overflow at a rate to prevent solids from settling.

Bleach Plant Effluent (Blch)

Bleach plant effluent prior to mixing with the secondary effluent in the de-aeration tank. the sample was collected on the ground floor of the pulp building from a line tap. The tap was allowed to run for approximately ten minutes to purge the line before sampling.

De-aeration Tank Effluent (DAef)

Effluent from the de-aeration tank. The bleach plant effluent plus the secondary effluent. The sample was taken from a line tap prior to the flow entering the wet well to be pumped to the ponds.

001

The 001 effluent. Samples collected from the lower walkway downstream of the screen in Pond 4. The composite sample intakes were positioned approximately four feet below the water surface (pond approximately 12 feet deep).

002

The 002 effluent, also called the sweetwater sewer. The samples were taken on the downstream side of the floating bridge, approximately 10 feet upstream of the dam. The composite sampler intakes were positioned approximately one and one-half feet below the water surface.

Runoff

Runoff from the ditch referred to as the "woodyard riverside drain." The sample was collected from the downstream side of the culvert pipe between the 002 discharge and the river. Sample was collected at low flow while culvert was free flowing.

Ditch-1

Sample taken from BC creek between the road and railroad (Figure 4). Sample was taken as the flow entered the south end of the culvert pipe. The sample was collected at low tide while the flow was towards Grays Harbor.

Ditch-2

Sample taken from the ditch across the dirt access road just to the SW of the dike separating the two solids ponds (Figure 4).

Table 1. (Continued)

Ditch-3	Sample taken from the ditch along Highway 105. Sample taken just to the east of the dirt access road running to the west of the solids pond (Figure 4).
Ditch-4	Sample taken from the ditch along Highway 105. Sample taken approximately 0.15 mile west of the ditch-3 sample at the pull off area (Figure 4).
Sed-1	Sample collected approximately 50 feet to the west of the two markers marking the diffuser area (Figure 1). Position was approximately half-way between the markers on the north-south axis. Sample was just to the west of the dip near the diffuser in 10 feet of water.
Sed-2	Sample collected approximately 100 yards to sea from the diffuser markers in 9.5 feet of water (Figure 1).
Sed-3	Sample collected approximately 400 yards NE of the diffuser markers in the south channel. Location was approximately 75 yards N of channel marker #2. Sample was collected in 11 feet of water (Figure 1).

two centimeters of sample from successive grab samples were collected. A VOA bottle was filled from the first grab while the remainder of the sample was put in a prepared stainless steel bucket. When the bucket was full, the contents of the bucket were homogenized by manual mixing, then put in appropriate containers for analysis. At stations Sed-1 and Sed-3, two additional grabs were taken, homogenized, and put in the appropriate containers for BNA, Pesticide/PCB, dioxin, and metals analysis. Sampling times and parameters analyzed appear in Appendix A.

Samples for Ecology analysis were placed on ice and delivered to the Ecology Manchester Laboratory. Analytical procedures and the laboratories doing the analysis are summarized in Appendix B.

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Sampling

Sampling quality assurance/quality control steps for water samples included special cleaning of the sampling equipment (Appendix C). Also, a field transfer/equipment blank was collected (Appendix C). Bottles for samples requiring dioxin analysis were rinsed with sample prior to filling.

For sediment samples, sampling quality assurance/quality control steps included collecting only sediment not in direct contact with the sampler and pre-inspection special cleaning of equipment that would touch the samples (Appendix C).

Chain-of-custody procedures were followed to assure the security of the samples (Huntamer and Hyre, 1991).

General Chemistry Analysis, Plant Samples

Color results are flagged with a J qualifier (indicating an estimated value) because no date of analysis, calibration or standardization curves were provided. BOD results are flagged with a J qualifier because seed correction was very significant. COD results are flagged with a J qualifier because there is no calibration or standardization provided to validate the results. The ammonia result for sample no. 228241 is flagged with a J qualifier because of poor peak shape. Oil and grease results are flagged with a J qualifier because there was no information concerning date of analysis. Analysis for other parameters was acceptable, and results can be used without qualifiers.

General Chemistry Analysis, Ditch Samples

Efficiency of the Cd coil dropped off after the samples had been run but before the NO_2+NO_3-N and final standards had been run. For this reason the NO_2-NO_3-N results are flagged with a J

qualifier, although the data are most likely correct. Sample no. 228252 was re-run after the problem was corrected, and the result can be used without a qualifier. Analysis for other parameters was acceptable, and results can be used without qualifiers.

General Chemistry Analysis, Sediment Samples

Analysis was acceptable and the results can be used without qualifiers.

DOX Analysis

Carbon blanks were below maximum criteria. Specified holding time before analysis was exceeded, but qualifiers have not been added. Although the percent breakthrough was not evaluated, it is unlikely that significant breakthrough occurred. The DOX data can be used without qualifiers.

VOA, BNA, and Pesticide/PCB Priority Pollutant Organics Analysis

Holding times, method blanks, matrix spikes, and surrogate recoveries for VOA, BNA, organochlorine pesticides and PCB's met standards for data use without qualification.

Metals Analysis

Holding times, method blanks, and matrix spike/spike duplicate data met Ecology standards for data use without qualification. Antimony (90 ug/L) and zinc (20 ug/L) were detected in the transfer blank.

Guaiacols/Catechols Analysis

Holding times and method blank data were acceptable. Surrogate recoveries ranged from 19% to 195%. Matrix spike recoveries ranged from 79% to 106%. No surrogate or matrix spike recovery limits have been set for this method. The results can be used without qualifiers.

Resin Acids/Fatty Acids Analysis

Surrogate recoveries ranged from 78% to 143%. Matrix spike recoveries ranged from 21% to 148%. No surrogate or matrix spike recovery limits have been established for this method. The results can be used without qualifiers.

Dioxin/Furan Analysis

All samples were extracted and analyzed within the specified holding times. No target analytes were detected in any of the method blanks. The continuing calibration standards were within the relative standard deviation limits. Internal standard recoveries are all above the lower limit. The results can be used without qualifiers.

RESULTS AND DISCUSSION

Split Sample Results

Ecology composite samples were split for Ecology and Weyco laboratory analysis, but as a result of miscommunication, Ecology did not receive a split sample from the Weyco 001 composite sampler. Sample split results compare well with the exception of BOD_5 and fecal coliforms for outfall 001 (Table 2). Ecology BOD_5 results are higher than Weyco results but are estimates, so a comparison is inconclusive. Fecal coliform results are compared in a separate section.

Effluent and Runoff

Flow

The 001 discharge flow rate was measured by Weyco. Flow rate was found to average 32.22 MGD from 0800 May 29 to 0800 May 30. Ecology was unable to verify the effluent flow at 001 which is measured in submerged pipes leading from pond 1 to pond 4. Weyerhaeuser should provide calibration records and manufacturer's recommendations for frequency of calibration for the 001 in-line meters.

Weyerhaeuser does not measure the 002 flow, but estimated the range as 4 - 5 MGD. The absence of a flow measuring device for the 002 discharge prevents accurate determination of the discharged BOD_5 load required by the current permit. A flow measurement device should be installed and maintained if the discharge is used.

General Chemistry Results/NPDES Permit Limits Comparison

Most permit parameters were within limits during the inspection (Table 3). BOD_5 and TSS from outfall 001 were within permit requirements. The pH was within the required range. Ecology BOD_5, COD, and TOC are consistent with expected results for influent, outfall 001, and outfall 002 (Table 4).

Two organic compounds have permit limits for the 001 discharge. The limits for dioxin (2,3,7,8-TCDD) will become effective in 1994 and the limits for DOX will become effective in 1995. Although no (2,3,7,8-TCDD) was detected in the 001 effluent, the 2 pg/L detection limit can be compared with the permit limit: At a flow rate of 32.22 MGD (during the inspection), 2 pg/L corresponds to 5×10^{-7} lbs/day 2,3,7,8-TCDD generated (daily average). This is below the permit limit of 6.1×10^{-7} lbs/day daily maximum (monthly basis). During the inspection, the total DOX discharged (2500 lbs/day) and the amount discharged per air dried ton of pulp production (7.0 lbs/ADT) exceeded the 1995 permitted monthly maximum (1850 lbs/day; 3.9 lbs/ADT) for outfall 001. While DOX samples were grab samples, permit limits for DOX are based on composite samples.

Table 2 – Weyerhaeuser, Ecology Sample Comparison– Weyerhaeuser (Cosmopolis), May 1991.

			Locatn:	001	002
			Date:	5/29	5/29
	Sample	Laboratory			
Production (air-dried metric tons/day)*	Weyco			325	
Flow (MGD)	Weyco			32.22	
BOD5 (mg/L)	Weyco	Weyco		45	1
	Ecology	Weyco		65	3
	Ecology	Ecology		99J	10J
TSS (mg/L)	Weyco	Weyco		32	6
	Ecology	Weyco		34	7
	Ecology	Ecology		39	9
pH	Weyco	Weyco		5.2 - 5.6	6.9
	Ecology	Ecology		5.6	6.9
Alkalinity (mg/L)	Ecology	Weyco		104	
	Ecology	Ecology		62	
Fecal coliform (#/100mL)	Weyco	Weyco	MF:	0	5
	Ecology	Ecology	MF/MPN:	2,500,000/14	10/49
			MF/MPN:	540,000/62	10/20
Oil and Grease (mg/L)	Ecology	Weyco			<1
	Ecology	Ecology		<1J; 2.4J	<1J; <1J
Rainbow Trout Bioassay (65% effl.)	Weyco	Weyco		80% survival	
	Ecology	Ecology		100% survival	
DOX (mg/L)	Ecology	Weyco		14;13	0.069
	Ecology	Ecology		8.9; 9.7	1.3; 23
Copper (ug/L)	Ecology	Weyco		9	<5
	Ecology	Ecology		<25	<25

* Average production for the month of May = 325 air dried metric tons/day

J indicates an estimated value.

Table 3 – NPDES Permit Limits and Inspection Results – Weyco (Cos) – May 1991.

	NPDES Limits		Inspection Results	
Outfall 001				
Parameter	Monthly average	Daily maximum	Laboratory	
BOD5 (lbs/day)	24,537	45,391 *	Ecology Weyco	26,600 J 17,500
TSS (lbs/day)	36,094	66,993	Ecology Weyco	10,500 9,100
Fecal Coliform (#/100ml)	5,000	20,000	Ecology Weyco	MF: 2,500,000; 540,000 MPN: 14; 62 0
pH	5.0 to 9.0 (continuous)		Ecology Weyco	5.6 6.05
Flow (MGD)	—	—		32.22**
Production (monthly average)	—	—		325 ADMT/day 358 ADT/day
Dioxin (2,3,7,8–TCDD) +	—	6.1X10^–7 lbs/day		<5X10^–7 lbs/day
DOX ++	3.9 lbs/ADT 1850 lbs/day	—	Ecology Weyco	7.0 lbs/ADT+++ 2500 lbs/day+++ 10.1 lbs/day+++ 3630 lbs/day+++
Copper (ug/L)	—	—	Ecology Weyco	<25 9

Outfall 002				
Parameter	Monthly average	Daily maximum		Inspection results
BOD5 (lbs/day)	—	500	Ecology Weyco	375*** 110***
Fecal Coliform (#/100ml)	5,000	20,000	Ecology Weyco	MF: 10; 10 MPN: 49; 20 5
pH	5.0 to 9.0 (continuous)		Ecology Weyco	6.9; 6.9 (grabs) 6.9
Oil and Grease (mg/l)	10	15	Ecology Weyco	<1 J; <2.4 J <1
Copper (ug/L)	—	—	Ecology Weyco	<25 <5
Flow (MGD)				4.5 (Weyco estimate)

* When the Chehalis River flow is less than 2000 cfs, the maximum daily BOD is reduced to 3500. River flow upstream at Montesano ranged from 2790 cfs (May 29) to 3040 cfs (May 30) during the survey (USGS data).

** Plant flow measured by Weyerhaeuser.

*** Based on Weyerhaeuser estimated flow of 4–5MGD

\+ Permit limits become effective in 1994. Annual avg. TCDD permit limit = 3.7 X10^–7 lbs/day.

++ Permit limits become effective in 1995. Annual avg. AOX permit limit = 3.0 lbs/ADT of bleached pulp. ADT = Avg. Daily Tons of Production

+++ daily average

ADMT Air Dried Metric Tons of production

ADT Air Dried Tons of production

J indicates an estimated value for a detected analyte.

Table 4 – General Chemistry Results – Weyerhaeuser (Cosmopolis), May 1991.

Parameter	Location:	Trns Blk	Inf–1	Inf–2	Inf–C	Blch–1	Blch–2	DAef–1	001–1	001–2	001–C	001–GC
	Type:	grab	grab	grab	comp	grab	grab	grab	grab	grab	comp	gr–comp
	Date:	5/28	5/29	5/29	5/29–30	5/29	5/31	5/29	5/29	5/29	5/29–30	5/29
	Time:	1345	1205	1120	0800–0800	1240	1105	1220	1040	1430	0800–0800	*
	Lab Log#:	228230	228231	228232	228233	228234	28235&6	228237	228239	228240	228241	228242
GENERAL CHEMISTRY												
Conductivity (umhos/cm)					10200**						18200**	1900
Alkalinity (mg/L CaCO3)					502						61.9	59.7
Hardness (mg/L CaCO3)					4280J						313	294
Color					1800J						700J	
TS (mg/L)					12200						1750	
TNVS (mg/L)					6640						1170	
TSS (mg/L)					44		13				39	
TNVSS (mg/L)					1						6	
% Solids												
% Volatile Solids												
BOD5 (mg/L)					REJ						99J	
COD (mg/L)					6700J		81 J				500J	
TOC (mg/L)					1880		129				196	
TOC (% dry wt)												
NH3–N (mg/L)											0.3J	
NO2+NO3–N (mg/L)											0.027	
Phosphorous – Total (mg/L)											1.5	
Oil and Grease (mg/L)									<1J	2.4J		
F–Coliform MF (#/100 mL)								<10	2500000	540000		
F–Coliform MPN (#/100 mL)								<10	14	62		
% Klebsiella (KES)								***	98	75		
ORGANICS												
DOX (mg/L)			8.2	6.9		48	22		8.9	9.7		
Phenolics Total(water–mg/L)		<0.01			<0.1		0.029				<0.5	
FIELD OBSERVATIONS												
Temp (C)			38.2	37.2		30.1	32.3	26.8	25.8	+++		
Temp cooled (C)					4.5						5.1	
pH (S.U.)			6	6.6	5.6	3	2.8	3.7	5.6	+++	5.9	
Conductivity (umhos/cm)			7000	6700	7700	1200	1400	2300	1900	2000	1900	
Sulfide (mg/L)			++	++		<0.1		<0.1	<0.1	<0.1		
Chlorine (total – mg/L)			++	++		5.5	3.5	1.5	<0.1	<0.1		

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample collected by Ecology
GC – grab composite sample
grab – grab sample
comp – composite sample
Blch – bleach plant effluent
DAef – de–aeration tank effluent
001 – the 001 effluent

* Grab composite samples consist of equal volumes of two grab subsamples

J indicates an estimated value for a detected analyte.

REJ indicates result is unusable because analyst used an unrepresentative subsample.

** Laboratory conductivity determination higher than expected.

*** no growth

++ color of sample interfered with test

+++ meter malfunctioned

Table 4 – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Parameter	Locatn:	002–1	002–2	002–C	002–GC	Runoff	Ditch–1	Ditch–2	Ditch–3	Ditch–4	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	comp	gr–comp	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	5/29	5/29	5/29–30	5/29	5/29	5/28	5/28	5/28	5/28	6/04	6/04	6/04
	Time:	1145	1545	0800–0800	*	0935	1020	1105	1130	1150	1235–1255	1340–1400	1400–1500
	Lab Log#:	228244	228245	228246	228247	228248	228249	228250	228251	228252	238261	238262	238263
GENERAL CHEMISTRY													
Conductivity (umhos/cm)				17200**	91	21000**	7760	4830	2930	1820			
Alkalinity (mg/L CaCO3)				29.3	26.2	47.3	44.8	293	25.8	21.8			
Hardness (mg/L CaCO3)				54.2	36.6	426	762	636	244	156			
Color				30J		100J	180	1200	450	650			
TS (mg/L)				132		2460	4660	3090	1600	1110			
TNVS (mg/L)				92		2070	4020	2550	1360	909			
TSS (mg/L)				9		48	19	111	14	27			
TNVSS (mg/L)				7		34	13	49	8	14			
% Solids											50	68	63
% Volatile Solids											8.5	4.0	4.3
BOD5 (mg/L)				10J		<10J							
COD (mg/L)				83J		83J	350	190	<10	250			
TOC (mg/L)				5.01		18.4	26.3	74.3	24.8	35.1			
TOC (% dry wt)											2.2	0.61	1.1
NH3–N (mg/L)				0.016		<0.005	1.1	12	<0.005	0.092			
NO2+NO3–N (mg/L)				<0.01J		0.012J	0.076J	0.39J	0.062J	0.29			
Phosphorous – Total (mg/L)				0.07		0.19	0.15	1.6	0.12	0.14			
Oil and Grease (mg/L)		<1J	<1J			<1							
F–Coliform MF (#/100 mL)		10	10			3700	1000	2300	<10	10			
F–Coliform MPN (#/100 mL)		49	20										
% Klebsiella (KES)		0	38										
ORGANICS													
DOX (ug/L)		1.3	23										
Phenolics Total(water–mg/L)				<0.01		0.014J							
FIELD OBSERVATIONS													
Temp (C)		13.4	13.8			13.5	14.3	16.3	14.0	12.1			
Temp cooled (C)				2.3									
pH (S.U.)		6.9	6.9	7.1		6.6	6.5	6.6	6.0	5.7			
Conductivity (umhos/cm)		163	200	115		4000	7100	5600	2800	1600			
Sulfide (mg/L)		<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1			
Chlorine (total – mg/L)		<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1			

002 – the 002 effluent
Runoff – runoff from the "woodyard riverside drain" ditch
Ditch – sampling locations from ditches near ponds B, C, and D
Sed – sediment sampling locations near the 001 outfall

Low nitrogen concentrations in the 001 discharge may be limiting to any biological treatment beyond that currently achieved, though this may not be a concern at present. As a general rule, the ratio of BOD_5 to nitrogen required for biological treatment has been estimated as 20:1 (and 100:1 for BOD_5 to phosphorous - WPCF, 1977). The 001 effluent BOD_5 (99 mg/L est.) and total inorganic nitrogen (NO_2+NO_3+NH_3-0.33 mg/L est.) ratio was 300:1, high in relationship to typical ratios (Table 4).

General chemistry data found 002 to be a fairly clean discharge (Table 4). BOD_5 (10 mg/L est.), TSS (9 mg/L), Fecal coliform (10/100mL - MF) and nutrients (0.07 mg/L or less) concentrations were all low. Measurements for all permitted parameters, BOD_5, fecal coliform, pH, and oil and grease, were well within permit requirements (Table 3). DOX concentrations from discharge 002 varied considerably between the two grab samples 002-1 (1.3 ug/L) and 002-2 (23 ug/L). The cause of the large variation is not known. Some follow-up DOX monitoring at 002 is suggested.

Runoff characteristics were similar to 002 with somewhat higher TSS (48 mg/L), fecal coliform (3700/100mL), and phosphorous concentrations (0.19 mg/L).

Fecal Coliform Results/NPDES Permit Limits Comparison

The Weyco fecal coliform permit limits were developed to protect commercial shellfish production. The Washington State Department of Health (Health) tests the waters of Grays Harbor for compliance with Water Quality Standards for Surface Waters of the State of Washington fecal coliform criteria (EPA, 1992). Health uses the most probable number (MPN) test. Several Health studies in the early 1980s indicated that Weyco effluent contributed to high fecal coliform counts which resulted in the temporary closure of areas to commercial shellfish production (Lilja, 1992).

Ecology fecal coliform counts using the MPN test (14; 62/100mL) for 001 effluent were well within the permit limits. Ecology membrane filter method (MF) counts (2,500,000; 540,000/100mL) greatly exceeded permit limits. This difference can be accounted for by the presence of an organism or organisms which appear in the MF test as large numbers of colonies, but that apparently do not produce gas in the MPN test for fecal coliform. Some *Klebsiella* do not produce gas in the MPN test (APHA, AWWA, and WPCF, 1989). The large percentage of *Klebsiella* (98% and 75%) found in the two Ecology grab samples from 001 suggest that *Klebsiella* may be responsible. It is also possible that the unknown organism may be a non-*Klebsiella* species growing in the final settling ponds (Van Donsel, 1992).

The dissimilarity between Ecology MF results in outfall 001 (2,500,000; 540,000/100mL) and Weyco MF results (0/100mL) can be accounted for by a disparity in laboratory procedures. Water Management Laboratories, performing Ecology fecal coliform analysis, counted all blue colonies of bacteria. Water Management Laboratories performed no verification tests, as none are required by Standard Methods (APHA, AWWA, and WPCF, 1989). Weyco, using Standard Methods quality control procedures for fecal coliform analyses to verify results, has found in

the past that there are many false positives from the 001 outfall. Weyco contends that with experience they can differentiate under the microscope those colonies that will verify from those that will not. Weyco only counts those colonies they predict will verify, actually verifying that individual colonies are fecal coliform only when the counts approach the permitted count. Weyco reports that these verifications always confirm the visual identifications (Benn, 1992). While Weyco has stated that it has eliminated false positives, there has been no evidence concerning the more important issue of the extent of false negatives.

The practice of reporting unverified tests as verified tests based on experience in visual evaluation of organisms does not meet APHA protocol. Of additional concern is the difference between MF and MPN results, suggesting that there are about 10,000 background blue colonies per true fecal coliform colony. The large background of blue colonies would create difficulties in preparing proper dilutions for visual verification of counts at permit limits. The use of the MPN test overcomes these problems. Consistent with the Department of Health use of the MPN test to determine fecal coliform counts in Grays Harbor, it is recommended that Weyco use the MPN test to determine fecal coliform counts.

No *Klebsiella* were found in the DAef sample compared to the high counts in the 001 effluent sample. This observation suggests the high counts may be the result of a resident population in the settling ponds rather than high concentrations sent to the ponds.

Priority Pollutants (VOA, BNA, Pesticide/PCB, and Metals Scans)

Several VOA organics were detected in the samples collected (Table 5). The compounds detected in the highest concentrations in the influent were acetone (12,000 - 35,000 ug/L) and 2-butanone (MEK) (1,600 - 2000 ug/L). In 001 effluent, acetone was below detection (< 110 ug/L est.) and the concentration of 2-butanone (MEK) was estimated slightly below accurate quantitation limits (estimated concentration 20 - 21 ug/L).

Chloroform (590 - 600 ug/L) and acetone (340 - 400 ug/L) were the organics found in highest concentration in bleach plant effluent. The 001 effluent chloroform concentration (430 ug/L) was only slightly lower than the bleach plant concentration. Of the few organics in the 002 effluent, chloroform (9.6 - 10 ug/L) was found in the highest concentration.

There were few VOA organics in runoff, and all were at low concentrations. Only toluene (35 ug/L) was found at a concentration greater than 1 ug/L.

Organics in effluents 001 and 002, and in runoff were well below toxicity criteria (Table 6, EPA 1986). Chloroform in 001 was 34% of the chronic freshwater criteria, the highest of organic compounds relative to criteria.

BNA compounds were found in low concentrations (Table 6). 4-Methylphenol (34 ug/L) was at the highest concentration in the 001 effluent. Bis(2-Ethylhexyl)phthalate from 002 (2.2 ug/L

Table 5 – VOA, BNA, Pesticide/PCB Compounds, Metals Detected – Weyerhaeuser (Cos), May, 1991.

Location:	Trns Blk	Inf–1	Inf–2	Blch–1	Blch–2	001–1
Type:	grab	grab	grab	grab	grab	grab
Date:	5/28	5/29	5/31	5/29	5/31	5/29
Time:	1345	1205	1120	1240	1105	1040
Lab Log#:	228230	228231	228232	228234	228235	228239
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Acetone	11	12000	35000	340	400	
1,1–Dichloroethane						
Chloroform		7.2		590	600	430
2–Butanone (MEK)		1600	2000			20 J
1,1,1–Trichloroethane						
Bromodichloromethane				9.7 J	10 J	5.3 J
2–Hexanone		2.9 J				
Toluene						3.6 J

Location:	Trns Blk	Inf–C	Blch–2	001–C
Type:	grab	comp	grab	comp
Date:	5/28	5/29–30	5/31	5/29–30
Time:	1345	0800–0800	1105	0800–0800
Lab Log#:	228230	228233	228236	228241
BNA Compounds	ug/L	ug/L	ug/L	ug/L
Phenol		26		3.1 J
4–Methylphenol				34
Benzoic Acid		16		
2,4–Dichlorophenol			2.7 NJ	2.3 J
Naphthalene				1 J
2–Methylnaphthalene				
2,4,6–Trichlorophenol		4.5 NJ	9.5 J	6.4
Acenaphthylene				
Acenaphthene				
Dibenzofuran				
Fluorene				
Phenanthrene		2.6 J		
Anthracene				
Di–n–Butyl Phthalate				
Fluoranthene				
Pyrene				
Benzo(a)Anthracene				
Bis(2–Ethylhexyl)Phthalate				
Chrysene				
Benzo(k)Fluoranthene				
Benzo(a)Pyrene				
Indeno(1,2,3–cd)Pyrene				
Benzo(g,h,i)Perylene				

Pesticide/PCB Compounds
(none detected)

Location:	Trns Blk	Inf–C	001–C
Type:	grab	comp	comp
Date:	5/28	5/29–30	5/29–30
Time:	1345	0800–0800	0800–0800
Lab Log#:	228230	228233	228241
Metals	ug/L	ug/L	ug/L
Antimony	90		120 TB
Beryllium			
Cadmium			
Chromium			
Copper		35	
Lead			
Mercury			
Nickel		40	7
Silver		12	
Zinc	20	130 TB	29 TB

J indicates an estimated value for a detected analyte.
NJ indicates their is evidence the analyte is present. The numerical result is an estimate.
TB analyte was also found in the field transfer blank indicating the sample may have been contaminated.

Trns Blk – transfer blank
Inf – influent to the bioponds
Blch – bleach plant effluent
C – composite sample collected by Ecology

001 – the 001 effluent
002 – the 002 effluent
Ditch – ditch sample
Sediment – sediment sample

Table 5 – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

	Location:	001–2	002–1	002–2	Runoff
	Type:	grab	grab	grab	grab
	Date:	5/29	5/29	5/29	5/30
	Time:	1430	1545	1545	935
	Lab Log#:	228240	228244	228245	228248
VOA Compounds		ug/L	ug/L	ug/L	ug/L
Acetone					
1,1–Dichloroethane					0.8 J
Chloroform		430	10	9.6	0.7 J
2–Butanone (MEK)		21 J			
1,1,1–Trichloroethane					0.7 NJ
Bromodichloromethane		5.6 J	1.9 J	1.7 J	
2–Hexanone					
Toluene		3.6 J			35

	Location:	002–C	Runoff
	Type:	comp	grab
	Date:	5/29–30	5/30
	Time:	0800–0800	0935
	Lab Log#:	228246	228248
BNA Compounds		ug/L	ug/L
Phenol			
4–Methylphenol			
Benzoic Acid			
2,4–Dichlorophenol			
Naphthalene			
2–Methylnaphthalene			
2,4,6–Trichlorophenol			
Acenaphthylene			
Acenaphthene			
Dibenzofuran			
Fluorene			
Phenanthrene			
Anthracene			
Di–n–Butyl Phthalate		0.4 J	
Fluoranthene			
Pyrene			0.7 J
Benzo(a)Anthracene			
Bis(2–Ethylhexyl)Phthalate		2.2 J	0.8 J
Chrysene			
Benzo(k)Fluoranthene			
Benzo(a)Pyrene			
Indeno(1,2,3–cd)Pyrene			
Benzo(g,h,i)Perylene			

Pesticide/PCB Compounds
(none detected)

	Location:	002–C	Runoff
	Type:	comp	grab
	Date:	5/29–30	5/30
	Time:	0800–0800	0935
	Lab Log#:	228246	228248
Metals		ug/L	ug/L
Antimony			
Beryllium			
Cadmium			
Chromium			
Copper			
Lead			
Mercury			
Nickel			
Silver			
Zinc			25 TB

Table 5 – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Ditch-1	Ditch-2	Ditch-3	Ditch-4	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	5/28	5/28	5/28	5/28	6/4	6/4	6/4
Time:	1020	1105	1130	1150	1235–1255	1340–1400	1440–1500
Lab Log#:	228249	228250	228251	228252	238261	238262	238263
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/Kg	ug/Kg	ug/Kg
Acetone					17 J	8.6 J	8.8 J
1,1-Dichloroethane							
Chloroform							
2-Butanone (MEK)		5.2 J					
1,1,1-Trichloroethane							
Bromodichloromethane							
2-Hexanone							
Toluene		95					

Location:	Ditch-1	Ditch-2	Ditch-3	Ditch-4	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	5/28	5/28	5/28	5/28	6/4	6/4	6/4
Time:	1020	1105	1130	1150	1235–1255	1340–1400	1440–1500
Lab Log#:	228249	228250	228251	228252	238261	238262	238263
BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/Kg	ug/Kg	ug/Kg
Phenol							
4-Methylphenol					130	34 NJ	32 J
Benzoic Acid							
2,4-Dichlorophenol							
Naphthalene					38 J	26 J	10 J
2-Methylnaphthalene					12 J	12 J	
2,4,6-Trichlorophenol							
Acenaphthylene					7.2 J	3.9 NJ	
Acenaphthene					56 J	41 J	
Dibenzofuran					32 J	28 J	
Fluorene					34 J	36 J	
Phenanthrene					150	170	21 J
Anthracene					31 J	30 J	
Di-n-Butyl Phthalate							
Fluoranthene					210	170	20 J
Pyrene					150	130	20 J
Benzo(a)Anthracene					42 NJ	50 J	
Bis(2-Ethylhexyl)Phthalate							
Chrysene					32 J	46 J	
Benzo(k)Fluoranthene					38 J	59 J	
Benzo(a)Pyrene					18 NJ	32 J	
Indeno(1,2,3-cd)Pyrene						15 NJ	
Benzo(g,h,i)Perylene						15 NJ	

Pesticide/PCB Compounds
(none detected)

Location:	Ditch-1	Ditch-2	Ditch-3	Ditch-4	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	5/28	5/28	5/28	5/28	6/4	6/4	6/4
Time:	1020	1105	1130	1150	1235–1255	1340–1400	1440–1500
Lab Log#:	228249	228250	228251	228252	238261	238262	238263
Metals	ug/L	ug/L	ug/L	ug/L	ug/Kg	ug/Kg	ug/Kg
Antimony							
Beryllium						0.35	0.35
Cadmium					2.8	2.1	2.0
Chromium		25			36	32	31
Copper					41	16	18
Lead					14	10	8.8
Mercury					0.21		
Nickel	9	6		8	31	32	27
Silver					4.8		
Zinc	27 TB	64 TB	22 TB	45 TB	73 TB	67 TB	66 TB

Table 6 – Comparison of Plant Sample Priority Pollutant Data to Toxicity Criteria – Weyerhaeuser (Cosmopolis), May 1991.

	Location:	001-1	001-2	002-1	002-2	Runoff	EPA Water Quality Criteria Summary (EPA, 1986)			
	Type:	grab	grab	grab	grab	grab				
	Date:	5/29	5/29	5/29	5/29	5/29				
	Time:	1040	1430	1145	1545	0935				
	Lab Log#:	228239	228240	228244	228245	228248	Acute Fresh	Chronic Fresh	Acute Marine	Chronic Marine
VOA Compounds		ug/L	ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)	(ug/L)	(ug/L)
1,1-Dichloroethane		5 U	5 U	1 U	1 U	0.8 J				
Chloroform		430	430	10	9.6	0.7 J	28,900 *	1,240 *	12,000 *(a)	6,400 *(a)
2-Butanone (MEK)		20 J	21 J	7.5 U	7.5 U	7.5 U				
1,1,1-Trichloroethane		5 U	5 U	1 U	1 U	0.7 NJ				
Bromodichloromethane		5.3 J	5.6 J	1.9 J	1.7 J	1 U	11,000 *(a)		12,000 *(a)	6,400 *(a)
Toluene		3.6 J	3.6 J	1 U	1 U	35	17,500 *		6,300 *	5,000 *

	Location:	001-C	002-C	Runoff	EPA Water Quality Criteria Summary (EPA, 1986)			
	Type:	comp	comp	grab				
	Date:	5/29-30	5/29-30	5/29				
	Time:	0800-0800	0800-0800	0935				
	Lab Log#:	228241	228246	228248	Acute Fresh	Chronic Fresh	Acute Marine	Chronic Marine
BNA Compounds		ug/L	ug/L	ug/L	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Phenol		3.1 J	2 U	2 U	10,200 *	2,560 *	5,800 *	
4-Methylphenol		34	1 U	1 U				
2,4-Dichlorophenol		2.3 J	3 U	3 U	2,020 *	365 *		
Naphthalene		1 J	1 U	1 U	2,300 *	620 *	2,350 *	
2,4,6-Trichlorophenol		6.4	5 U	5 U		970 *		
Di-n-Butyl Phthalate		1 U	0.4 J	1 U	940 *(i)	3 *(i)	2.944 *(i)	3.4 *(i)
Pyrene		1 U	1 U	0.7 J				
Bis(2-Ethylhexyl)Phthalate		1 U	2.2 J	0.8 J	940 *(i)	3 *(i)	2.944 *(i)	3.4 *(i)
Pesticide/PCB Compounds (none detected)								
Metals								
Antimony		120	60 U	60 U	9,000 *	1,600 *		
Nickel		7	5 U	5 U	842 +	94 +	75	8.3
Zinc		29	20 U	25	69 +	63 +	95	86

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

001-1 – 001 effluent grab sample 1
001-2 – 001 effluent grab sample 2
001-C – 001 effluent Ecology composite sample
002-1 – 002 effluent grab sample 1
002-2 – 002 effluent grab sample 2
002-C – 002 effluent Ecology composite sample
Runoff – runoff from woodyard riverside drain

U indicates the analyte was not detected at the given detection limit.
J indicates an estimated value for a detected analyte.
NJ indicates there is evidence the analyte is present The numerical result is an estimate.

*insufficient data to develop criteria – Lowest Observed Effect Level (LOEL) presented
+calculation based on hardness (54 mg/L) as CaCO3 for outfall 002. Criteria for outfall 001 and runoff would be somewhat higher.
(a) Total Halomethanes
(i) Total Phthalate Esters

est.) was the only BNA compound found in concentrations approaching EPA criteria (73% of the chronic freshwater criteria and 65% of the chronic marine criteria - EPA, 1986).

No Pesticide/PCB compounds were detected.

Copper, nickel, silver and zinc were detected in the influent (Table 6). All metals in the effluent were less than EPA criteria (EPA, 1986). Nickel in outfall 001 (7 ug/L) was 84% of the chronic marine criteria. Antimony found in outfall 001 (120 ug/L) was in a concentration well below EPA criteria. The detection of antimony in 001 may be in error as antimony was found in the transfer blank at a concentration of 90 ug/L. Zinc concentrations from outfall 001 and runoff were a small fraction of the chronic marine criteria. Copper and cadmium criteria were below detection limits. Freshwater metals criteria were based on 100 mg/L hardness as $CaCO_3$. The greater hardness of 001 (313 mg/L) and runoff samples (426 mg/L) would correspond to higher criteria levels than those listed in Table 6.

Complete priority pollutant scan results with detection limits are included in Appendix D - VOA's, Appendix E - BNA's, Appendix F - Pesticides/PCB's, and Appendix G - metals.

Several TICs were found in 001 at concentrations less than 190 ug/L est. No TICs were identified in the 002 effluent or runoff. Appendix H summarizes TICs found.

Guaiacols/Catechols & Resin Acids-Fatty/Acids

The guaiacol/catechol scan found several compounds present (Table 7). In the influent, guaiacol (2-methoxyphenol), (145 ug/L), was present in the highest concentration. In the 001 effluent, the phenolic compound 4-methylphenol (45 ug/L est.) was the compound found in the highest concentration. All other target compounds were found at concentrations of 8 ug/L or less.

Eleven resin acid/fatty acid compounds were found in the influent at concentrations ranging from 57 ug/L to 1700 ug/L. Concentrations in the effluent were reduced, apparently a result of secondary treatment. The highest concentration in the 001 effluent was Dehydroabietic acid (43 ug/L). This concentration is well below salmonid LC_{50} data (500 - 1760 ug/L) for dehydroabietic acid (Verschueren, 1983).

In 002 effluent, guaiacol/catechol compounds were not detected. Only two resin acid/-fatty acid compounds were detected at estimated concentrations of 0.2 ug/L.

Dioxin/Furan

Dioxins were not detected in the 001 or 002 effluent (Table 8). Total TCDDs were the only dioxin compounds detected in the bleach plant effluent (6 pg/L).

TCDFs (total) were the only furans detected (Bleach plant (22 pg/L); Outfall 001 (15 pg/L); Outfall 002 (5.2 pg/L)).

Table 7 – Resin Acid/Fatty Acid and Guaiacol/Catechol Scan Results – Weyco (Cos), May 1991.

Location:	Inf–C	001–C	002–C
Type:	comp	comp	comp
Date:	5/29–30	5/29–30	5/29–30
Time:	800–800	0800–0800	0800–0800
Lab Log#:	228233	228241	228246
GUAIACOLS/CATECHOLS	ug/L	ug/L	ug/L
4–Chloro–3–Methylphenol	0.4 U	0.4 U	0.6 U
Pentachlorophenol	2 U	2 U	2 U
2,4,6–Trichlorophenol	0.8 U	0.8 U	1 U
2–Nitrophenol	0.4 U	0.4 U	0.6 U
Guaiacol (2–methoxyphenol)	145 J	2 J	0.6 U
2–Methylphenol	6	0.8 U	1 U
o–Chlorophenol	0.8 U	0.8 U	1 U
2,4,5–Trichlorophenol	0.8 U	0.8 U	1 U
4–Allylguaiacol (eugenol)	18 J	0.5 J	1 U
4–Propenylguaiacol	10 U	0.8 U	1 U
4–Nitrophenol	0.8 U	0.8 U	1 U
2,4–Dimethylphenol	0.8 U	0.2 J	1 U
4–Methylphenol	8	45 J	1 U
Phenol	17 J	5 J	4 U
2,4–Dichlorophenol	3 J	3 J	1 U
2,3,6–Trichlorophenol	7	8	1 U
Tetrachloroguaiacol	2 U	2 U	2 U
Tri–Cl–tri–MeO–benzene	0.8 U	0.8 U	1 U
Tetrachlorocatechol	2 U	2 U	2 U
4–Chlorocatechol	0.4 U	0.4 U	0.6 U
4,5–Dichloroguaiacol	6 J	2 J	1 U
Trichlorosyringol	0.8 U	0.8 U	1 U
4,5,6–Trichloroguaiacol	0.8 U	2 J	1 U
4,5–Dichlorocatechol	0.8 U	0.8 U	1 U
a–Terpeneol	0.8 U	1 J	1 U
2,3,4–Trichlorophenol	0.8 U	0.8 U	1 U
4–Chloroguaiacol	0.4 U	0.5 U	0.6 U
5,6–Dichlorovanillin	2 U	0.7 J	2 U
6–Chlorovanillin	0.8 U	2 J	1 U
3,4,5–Trichlorocatechol	2 U	0.4 J	2 U
3,4,5–Trichloroguaiacol	0.8 U	0.8 U	1 U
RESIN ACIDS/FATTY ACIDS			
Linoleic acid	320	3 U	5 U
Palmitoleic acid	35 U	3 U	5 U
Decanoic Acid, Hexa–	970	5 U	5 U
Oleic acid	230	3 U	5 U
Octadecanoic acid	340	8 U	5 U
Retene	35 U	3 U	5 U
Pimaric acid	35 U	3 U	5 U
Sandaracopimaric acid	57	0.9 J	5 U
Isopimaric acid	92	1 J	0.2 J
Palustric acid	35 U	3 U	5 U
Eicosatrienoic acid			
Dehydroabietic acid	1700	43	0.2 J
Abietic acid	66	0.5 J	5 U
Neoabietic Acid	35 U	3 U	5 U
9,10–Dichlorosteric acid	29 J	3 U	5 U
14–Chlorodehydroabietic	72	8	5 U
12–Chlorodehydroabietic	160	19	5 U
Dichlorodehydroabietic Acid	35 U	3 U	5 U

U indicates compound was analyzed but not detected at the given detection limit

J indicates an estimated value when result is less than specified detection limit

Inf–C – the composite influent sample

001–C – the 001 composite sample

002–C – the 002 composite sample

Table 8 – Dioxin/Furan Results – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Trns Blk	Inf–C	Blch–2	001–C	002–C	Sed–1	Sed–2	Sed–3
Type:	grab	comp	grab	comp	comp	grab	grab	grab
Date:	5/28	5/29–30	5/31	5/29–30	5/29–30	6/4	6/4	6/4
Time:	1345	0800–0800	1105	0800–0800	0800–0800	1235–1255	1340–1400	1440–1500
Lab Log#:	228230	228233	228236	228241	228246	238261	238262	238263
	(pg/L)	(pg/L)	(pg/L)	(pg/L)	(pg/L)	(pg/g)	(pg/g)	(pg/g)
Furans								
TCDFs (total)	1.8 U	7.7 U	22	15	5.2	7.7	5.7	7.0
2,3,7,8–TCDF	1.8 U	1.8 U	5.2 U	3.7 U	2.1 U	2.6	3.5	1.4
PeCDFs (total)	1.5 U	1.6 U	14 U	8.6 U	8.5 U	1.5 U	0.9 U	1.8 U
1,2,3,7,8–PeCDF	1.5 U	0.8 U	1.6 U	0.25 U	1 U	0.17 U	0.23 U	0.19 U
2,3,4,7,8–PeCDF	1.5 U	1.6 U	1.8 U	1.8 U	2 U	0.3 U	0.37 U	0.34 U
HxCDFs (total)	4.3 U	5.9 U	5.4 U	9.4 U	11 U	7.5 U	4.3 U	4.9 U
1,2,3,4,7,8–HxCDF	0.91 U	0.7 U	0.58 U	1.1 U	0.85 U	0.34 U	0.12 U	0.22 U
1,2,3,6,7,8–HxCDF	1.2 U	0.56 U	0.56 U	1.1 U	1 U	0.13 U	0.09 U	0.25 U
1,2,3,7,8,9–HxCDF	1.7 U	1.1 U	1.1 U	2 U	1.6 U	0.12 U	0.1 U	0.41 U
2,3,4,6,7,8–HxCDF	3.6 U	4.3 U	4.2 U	4.9 U	5.4 U	0.89 U	0.77 U	0.82 U
HpCDFs (total)	1.9 U	2.8 U	3.7 U	10 U	8.7 U	12 U	4.5 U	7.2 U
1,2,3,4,6,7,8–HpCDF	1.4 U	2.2 U	2.6 U	3.6 U	3.9 U	2.4 U	1.6 U	3.1 U
1,2,3,4,7,8,9–HpCDF	1.9 U	1.6 U	1.5 U	1.5 U	3.5 U	0.19 U	0.12 U	0.14 U
OCDF	8.4 U	7.3 U	2.3 U	4.6 U	6.6 U	7.2 U	4.9 U	6 U
Dioxins								
TCDDs (Total)	1.5 U	5.8 U	6	2 U	2.1 U	0.88 U	1.2	1.3
2,3,7,8–TCDD	1.5 U	2.1 U	2.5 U	2 U	2.1 U	0.88 U	0.93 U	0.96 U
PeCDDs (total)	1.2 U	1.3 U	2.7 U	1.4 U	1.4 U	2.8 U	1.9 U	3.8 U
1,2,3,7,8–PeCDD	1.2 U	1.3 U	2.7 U	1.4 U	1.4 U	0.45 U	0.65 U	0.79 U
HxCDDs (total)	3 U	2.8 U	2.4 U	1.5 U	3 U	0.93 U	4.4 U	14
1,2,3,4,7,8–HxCDD	2.4 U	0.7 U	1.8 U	1.1 U	1.6 U	0.41 U	1.2 U	0.84 U
1,2,3,6,7,8–HxCDD	3 U	2.7 U	1.6 U	1.1 U	2.9 U	0.9 U	1.2 U	1.2 U
1,2,3,7,8,9–HxCDD	2.6 U	0.87 U	2.4 U	1.5 U	1.7 U	0.83 U	1.1 U	1.2 U
HpCDDs (total)	4.7 U	11 U	3.7 U	10 U	13 U	17	24	26
1,2,3,4,6,7,8–HpCDD	4.7 U	11 U	3.7 U	10 U	6.7 U	6.8	8.6	12
OCDD	16 U	67 U	22 U	70 U	40 U	46	60	71

U indicates compound was analyzed for but not detected at the given detection limit.

Trns Blk – transfer blank
Inf – influent to the bioponds
C –composite sample collected by Ecology

Blch – Bleach plant effluent
001 – the 001 effluent
Sed – Sediment sampling locations near the outfall

Bioassays

Bioassay organism sensitivity to Weyco samples was variable (Table 9). Outfall 001 effluent showed the most acute and chronic toxicity to invertebrates, with relatively little toxicity to fish. Outfall 002 effluent revealed no toxicity. Runoff showed toxicity to Microtox.

Rainbow trout and *Daphnia magna* survival tests revealed no acute toxicity in the 001 effluent, 002 effluent, or runoff samples.

Fathead minnow survival was reduced by exposure to 100% effluent (71.4% survival), but growth was not significantly affected. The Microtox tests indicated toxicity for outfall 001 effluent (EC_{50}: 35.9% effluent concentration) and runoff (at EC_{50}: 46.8% sample concentration).

The echinoderm sperm cell and bivalve larvae survival and development tests for outfall 001 effluent were most sensitive. The echinoderm sperm cell test indicated considerable toxicity in the 001 effluent (NOEC: 5%). The bivalve larvae survival and development test found no acute toxicity in the 001 effluent, but considerable effect on development. The chronic toxicity NOEC was 1% and EC_{50} was 2.08%.

Ditches

General Chemistry

Higher alkalinity (293 mg/L), TSS (111 mg/L), TOC (74.3 mg/L), NH_3-N (12 mg/L), and total P (1.6 mg/L) were found in the Ditch-2 sample than in the other three ditches (Table 4). The Ditch-2 sample was collected near the dike surrounding the solids holding/disposal lagoon (Figure 4, Table 1). Results from the other three ditch sample sites were generally uniform. Fecal coliform in Ditch-1 (1000/100mL) and Ditch-2 (2300/100mL) were fairly high with the MF test.

Priority Pollutants (VOA, BNA, Pesticide/PCB, and Metals Scans)

The only organic compounds detected in the ditch samples were 2-butanone(MEK - estimated concentration 5.2 ug/L) and toluene (95 ug/L) in Ditch-2 (Table 10). These concentrations were well within EPA water quality criteria (EPA, 1986). Toluene was also found in the runoff sample at the plant site. Chromium was found only in Ditch-2. The total chromium concentration (25 ug/L) in Ditch-2 exceeded the acute fresh and chronic fresh criteria for hexavalent chromium, but was considerably below criteria for trivalent chromium. Nickel was found in ditch 1, 2, and 4 samples (6-9 ug/L), at concentrations approximating the EPA chronic marine water quality criteria. The Ditch-1 concentration (9 ug/L) was the only one exceeding the criteria concentration (8.3 ug/L). Zinc was found in all four ditches at concentrations less than EPA water quality criteria.

Table 9 – Effluent Bioassay Results – Weyerhaeuser (Cosmopolis), May 1991.

Microtox

Sample	Sample No.	EC50 (% effluent) 5 minutes	15 minutes
001GC	228242	31	35.9
002GC	228247	a	a
Runoff	228248	59.3	46.8
Ditch 1	228249	a	a
Ditch 2	228250	53.6	50.9
Ditch 3	228251	a	a
Ditch 4	228252	>100	>100

a Statistical analysis resulted in a large number of negative gammas. Negative gammas are interpreted as a lack of toxicity.

Daphnia magna - 48-hour survival test
(Daphnia magna)

Sample	Sample No.*	# Tested **	Percent Survival
001GC	228242	19	95
002GC	228247	20	100
Runoff	228248	20	100
Ditch 1	228249	21	100
Ditch 2	228250	20	100
Ditch 3	228251	20	100
Ditch 4	228252	20	100

* 100% concentration

** 4 replicates of 5 organisms

Table 9 – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Bivalve Larvae - 48 hour survival and development test

Pacific oyster *(Crassostrea gigas)*

Sample 228242 - 001GC

Sample Conc.*	% Abnormal or Dead	% Mortality Actual	% Mortality Adjusted**
20 % Effluent	99.7	19.2	18.7
10 % Effluent	99.4	5.6	5.0
5 % Effluent	95.2	6.2	5.6
2 % Effluent	46.4	11.5	11.0
1 % Effluent	10.9	1.5	0.9
0.5 % Effluent	1.6	1.5	0.9
0.1 % Effluent	-5.4	-5.0	-5.6
0.02 % Effluent	3.7	4.1	3.5
Control	1.0	0.6	--

Chronic	Acute
NOEC = 1.0 % effluent	LC50 = >20 % effluent
LOEC = 2.0% effluent	NOEC = 20 % effluent
EC50 = 2.08% effluent	LOEC = >20 % effluent

* 3 replicates per test concentration, average initial count of 113 embryos per replicate.

** corrected for control response using Abbott's formula.

Echinoderm Sperm Cell Toxicity Test

(Strongylocentrotus purpuratus)

Sample 228242 - 001GC

Sample Concentration	% Unfertilized Eggs: Salinity Control * Actual	Salinity Control * Adjusted	Effluent ** Actual	Effluent ** Adjusted***
40 % Effluent	25.2	3.7	98.8	98.4
20% Effluent	20.6	-2.2	83.2	77.7
10 % Effluent	22.6	0.4	33.2	11.3
5 % Effluent	22.9	0.8	27.6	3.8
2 % Effluent	23.0	0.9	25.8	1.5
1 % Effluent	23.8	1.9	21.1	-4.8
0.5 % Effluent	25.1	3.6	23.6	-1.5
Seawater control	22.3	--	24.7	--

EC50 = 15.1 % effluent
NOEC = 5 % effluent
LOEC = 10 % effluent

* average of 2 replicates - 156 to 188 organisms counted per replicate

** average of 4 replicates - 143 to 198 organisms counted per replicate

Salinity adjusted with filtered Yaquina Bay water.

***corrected for control response using Abbott's formula.

Table 9 – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Fathead Minnow - 7 day survival and growth test
(Pimephales promelas)
Sample 228242 - 001GC

Sample Conc.	# Tested *	Percent Survival	Average Growth per Fish (mg)
100 % Effluent	40	71.4	0.30
50 % Effluent	40	97.5	0.33
25 % Effluent	40	97.6	0.35
12.5 % Effluent	40	90.0	0.40
6.25 % Effluent	40	100	0.39
3.13 % Effluent	40	100	0.38
1.56 % Effluent	40	97.5	0.30
Control	40	100	0.33

Acute	Chronic
NOEC = 50 % effluent	NOEC = 100 % effluent
LOEC = 100 % effluent	
LC50 = >100 % effluent	

* four replicates of 10 organisms

Rainbow Trout - 96 hour survival test
(Oncorhynchus mykiss)

Sample	Sample No.	% Effluent	# Tested	Percent Survival
	Control	--	30	100
001GC	8242	65	30	100
001GC	8242	100	30	100
002GC	8247	100	30	100
Runoff	8248	100	30	100

NOEC - no observable effects concentration
LOEC - lowest observable effects concentration
LC50 - lethal concentration for 50% of the organisms
EC50 - effect concentration for 50% of the organisms

Table 10 – Comparison of Ditch Data to Toxicity Criteria – Weyerhaeuser (Cosmopolis), May 1991.

	Location:	Ditch–1	Ditch–2	Ditch–3	Ditch–4	EPA Water Quality Criteria Summary			
	Type:	grab	grab	grab	grab				
	Date:	5/28	5/28	5/28	5/28				
	Time:	1020	1105	1130	1150	Acute Fresh	Chronic Fresh	Acute Marine	Chronic Marine
	Lab Log#:	228249	228250	228251	228252				
VOA Compounds		ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)	(ug/L)	(ug/L)
2–Butanone (MEK)		7.5 U	5.2 J	7.5 U	7.5 U				
Toluene		1 U	95	1 U	1 U	17,500 *		6,300 *	5,000 *
BNA Compounds (none detected)									
Pesticide/PCB Compounds (none detected)									
Metals									
Chromium		10 U	25	10 U	10 U				
	hexavalent					16	11	1,100	50
	trivalent					3064 +	365 +	10,300 *	
Nickel		9	6	5 U	8	2,549 +	283 +	75	8.3
Zinc		27	64	22	45	211 +	191 +	95	86

U indicates compound was analyzed for but detected at the given detection limit.

J indicates an estimated value for a detected analyte.

*insufficient data to develop criteria – Lowest Observed Effect Level (LOEL) presented

+calculation based on hardness (156 mg/L as CaCO3)

Bioassays

The Microtox test showed no toxicity in three of the four ditch samples (Table 9). The sample from Ditch-2 had an EC_{50} of 53.6 after 5 minutes, and 50.9 after 15 minutes. The *Daphnia magna* survival test showed no toxicity for any of the ditch samples.

Summary

Water quality based on the ditch stations sampled was generally acceptable. Pollutant constituents in the ditch samples were generally lower than those from outfall 001. Priority pollutants were below water quality criteria, and little toxicity was evident. Microtox and *Daphnia magna* bioassays showed no toxicity with the exception of some Microtox toxicity in Ditch-2.

Sediment

General Chemistry

Sed-2 (edge of dilution zone) and Sed-3 (background) general chemistry results were similar. Sediments 2 and 3 ranges were from 63 - 68% solids, 4.0 - 4.3% volatile solids and 0.61 - 1.1% TOC (Table 4). Grain size analysis results were primarily sand (71 - 79%) with some silt (15-20 % - Table 11). Sed-1, collected near the outfall had higher TOC (2.2%) and volatile solids (8.5%). The grain size distribution was more even, indicating a higher silt content than Sed-2 and Sed-3 (Table 11).

Priority Pollutants (VOA, BNA, Pesticide/PCB, and Metals Scans)

Most of the priority pollutant organics detected in sediment samples were PAH's (Table 12). Concentrations in Sed-1 and Sed-2 were roughly similar while Sed-3 concentrations were less than quantitation limits or less than detection limits. No compounds exceeded Department of Ecology Marine Sediment Quality Standards (Ecology, 1991).

Nine metals were found in the sediment samples, all in concentrations less than established criteria (Ecology, 1991).

Dioxin/Furan

TCDFs (total: 5.7 - 7.7 pg/g) and 2,3,7,8-TCDF (1.4 - 3.5 pg/g) were detected in all three sediment samples (Table 8). Total TCDDs (<0.88 - 1.3 pg/g) and four dioxin compounds (not including 2,3,7,8-TCDD) were detected. Comparable concentrations of the compounds detected were found in all three sediment samples.

Table 11 – Sediment Grain Size Analysis and General Chemistry Results

Weyerhaeuser (Cosmopolis), May 1991.

Station:	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab
Date:	6/4	6/4	6/4
Time:	1235-1255	1340-1400	1440-1500
Lab Log#:	238261	238262	238263
Grain Size Analysis*	(%)	(%)	(%)
Gravel			
>4750	21	0	0
4750-2000	4	1	1
	25	1	1
Sand			
2000-850	2	2	2
850-425	3	7	6
425-250	11	35	24
250-106	8	31	33
106-75	1	3	4
75-62.5	1	1	2
	26	79	71
Silt			
62.5-31.2	7	5	5
31.2-15.6	14	5	7
15.6-7.8	9	3	5
7.8-3.9	5	2	3
	35	15	20
Clay			
3.9-1.9	4	2	2
1.9-0.9	3	1	1
0.9-0.4	7	2	5
<0.4	0	0	0
	14	5	8
% Solids	50	68	63
% Volatile Solids	8.5	4.0	4.3
% TOC (dry wt. basis)	2.2	0.61	1.1

* Grain sizes are in microns.

Sed-1 - near outfall
Sed-2 - edge of dilution zone
Sed-3 - background

Table 12 – Comparison of Sediment Sample Data to Toxicity Criteria – Weyerhaeuser (Cosmopolis), May 1991.

	Dry Weight Basis			Organics Data Normalized to TOC			Criteria*	
Location:	Sed-1	Sed-2	Sed-3	Sed-1	Sed-2	Sed-3		
Type:	grab	grab	grab	grab	grab	grab		
Date:	6/4	6/4	6/4	6/4	6/4	6/4		
Time:	1235-1255	1340-1400	1440-1500	1235-1255	1340-1400	1440-1500	Dry Wt.	TOC
Lab Log#:	238261	238262	238263	238261	238262	238263	Basis	Basis
VOA Compounds	ug/Kg	ug/Kg	ug/Kg	mg/Kg	mg/Kg	mg/Kg	(ug/Kg)	(mg/Kg)
Acetone	17 J	8.6 J	8.8 J					
BNA Compounds								
4-Methylphenol	130	34 NJ	32 J				670	
LPAH (total)	260 J	307 J	31 J	11.8 J	50.3 J	2.82 J		370
Napthalene	38 J	26 J	10 J	1.7 J	4.3 J	0.91 J		99
2-Methylnapthalene	12 J	12 J	15 U	0.55 J	2 J	1.4 J		38
Acenaphthylene	7.2 J	3.9 NJ	15 U	0.33 J	0.64 NJ	1.4 J		66
Acenaphthene	56 J	41 J	15 U	2.6 J	6.7 J	1.4 J		16
Dibenzofuran	32 J	28 J	15 U	1.5 J	4.6 J	1.4 J		15
Fluorene	34 J	36 J	15 U	1.6 J	5.9 J	1.4 J		23
Phenanthrene	150	170	21 J	6.8	28	1.9 J		100
Anthracene	31 J	30 J	15 U	1.4 J	4.9 J	1.4 U		220
HPAH (total)	490 J	517 J	40 J	22.3 J	84.8 J	3.6 J		
Fluoranthene	210	170	20 J	9.6	28	1.8 J		160
Pyrene	150	130	20 J	6.8	21.3	1.8 J		1000
Benzo(a)Anthracene	42 NJ	50 J	15 U	1.9 NJ	8.2 J	1.4 U		110
Chrysene	32 J	46 J	15 U	1.5 J	7.5 J	1.4 U		110
Benzo(k)Fluoranthene	38 J	59 J	15 U	1.7 J	9.7 J	1.4 U		
Benzo(a)Pyrene	18 NJ	32 J	15 U	0.82 NJ	5.2 J	1.4 U		99
Ideno(1,2,3-cd)Pyrene	17 U	15 NJ	15 U	0.77 U	2.5 NJ	1.4 U		34
Benzo(g,h,i)Perylene	17 U	15 NJ	15 U	0.77 U	2.5 NJ	1.4 U		31
Pesticide/PCB Compounds (none detected)							Dry Wt. Basis	
Metals	mg/Kg	mg/Kg	mg/Kg				mg/Kg	
Beryllium	0.25 U	0.35	0.35					
Cadmium	2.8	2.1	2.0				5.1	
Chromium	36	32	31				260	
Copper	41	16	18				390	
Lead	14	10	8.8				450	
Mercury	0.21	0.1 U	0.1 U				0.41	
Nickel	31	32	27					
Silver	4.8	0.99 U	0.99 U				6.1	
Zinc	73	67	66				410	

*Department of Ecology Marine Sediment Quality Standards

U – indicates the analyte was not detected at the given detection limit.

J – indicates an estimated value for a detected analyte.

NJ – indicates there is evidence the analyte is present. The numerical result is an estimate.

Sed-1 – Sediment sample collected approximately 50 feet west of the diffuser area.

Sed-2 – Sediment sample collected approximately 100 yards to sea from the diffuser markers.

Sed-3 – Sediment sample collected approximately 400 yards NE of the diffuser markers.

LPAH – sum of Low Molecular Weight Polynuclear Aromatic Hydrocarbons

HPAH – sum of High Molecular Weight Polynuclear Aromatic Hydrocarbons

These results can be compared with those of a previous sediment survey at the Weyco outfall on May 23, 1988 (Johnson, 1989). An analysis of the sediments revealed no total TCDDs, 25 pg/g HpCDDs (total), 11 pg/g 1,2,3,4,6,7,8-HpCDD, and 120 pg/g OCDD (total). No furans were detected. The Johnson dioxin results were similar to the Class II sediment results.

The most toxic congeners -- 2,3,7,8 substituted tetra- and pentachlorinated -- were not detected except for a trace amount of 2,3,7,8-TCDF. The higher chlorinated dioxin and furan compounds detected are not extremely toxic (Schoof, *et al.*, 1990). Although there are no applicable guidelines for dioxins or furans, a comparison with sediment data from other stations in Grays Harbor (Word and Ward, 1989) shows that the concentrations in the sediment samples are low.

Bioassays

The Sed-1 sample, collected near the outfall, was fairly toxic to *Rhepoxinius abronius* (75% mortality), echinoderm embryos (91.3% mortality, 100% abnormal or dead) , and Microtox (EC_{50} 76% extract - Table 13). *Rhepoxinius abronius* mortality in Sed-2 and Sed-3 was less than 25%, thus would not be classified as demonstrating that the sediments have an adverse effect on biological resources based on Sediment Management Standards (173-204-320(3)(a) - Ecology, 1991). Sediment 3 had a minimal effect on Microtox (EC_{50} > 100% extract), and some effect on echinoderm embryos (28.8% mortality, 42.1% abnormal or dead). Sediment 2 had minimal effects on both Microtox and echinoderm embryos. It is unclear if the observed greater mortality in the Sed-1 sample was related to its different physical composition, evident from the grain size analysis, or chemical pollutants.

RECOMMENDATIONS AND CONCLUSIONS

Split Sample Results

Weyco sampling and laboratory analysis appeared acceptable during the inspection with the exception of BOD_5 and 001 fecal coliform. Ecology BOD_5 results are higher than Weyco results but are estimates, so a comparison is inconclusive.

Effluent and Runoff

Flow

Flows could not be verified during the inspection. 001 flow was measured by Weyco with in-line meters and 002 flow was estimated. Weyco flows were used for this report.

- Weyerhaeuser should provide calibration records and manufacturer's recommendations for frequency of calibration for the 001 in-line meters.

- o A flow measuring device for 002 should be installed to provide accurate measures of flow from the discharge.

General Chemistry Results/NPDES Permit Limits Comparison

The plant met all NPDES permit limits during the inspection with the exception of the estimated Ecology BOD_5 and possible high fecal coliform counts. Proper fecal coliform testing is recommended (see Fecal Coliform Results, below).

Low nitrogen concentrations in the 001 effluent suggest nitrogen may be limiting to any BOD reduction beyond that currently achieved. This may not be a concern at present since the discharge met permit limits. Attention to nitrogen concentrations may be necessary in the future to maintain acceptable effluent quality.

Dioxin (2,3,7,8-TCDD) was not detected in outfall 001. The detection limit corresponded to a daily average below the scheduled daily maximum permit limit (monthly basis).

DOX grab sample results were greater than proposed permit limits for composite samples. Variable DOX concentrations were also detected in the 002 discharge.

- o It is recommended that Weyerhaeuser check DOX concentrations in the 002 discharge to verify discharge concentrations.

Fecal Coliform Results/NPDES Permit Limits Comparison

Fecal coliform counts for 001 effluent were well within the permit limits with the most probable number (MPN) test (14; 62/100mL), but greatly exceeded permit limits with the membrane filter (MF) method (2,500,000; 540,000/100mL). *Klebsiella*, present in large numbers, may be responsible. The Weyco practice of visual evaluation of colonies indicating positive with the initial MF test to determine if they are true fecal coliforms is unacceptable.

- o Consistent with the Department of Health use of the MPN test to determine fecal coliform counts in Grays Harbor, it is recommended that Weyco use the MPN test to determine fecal coliform counts.

Priority Pollutants (VOA, BNA, Pesticide/PCB and Metals Scans)

All VOA and BNA compounds and metals detected from outfalls 001, 002, and runoff were at concentrations less than EPA water quality toxicity criteria.

Guaiacols, Catechols & Resin Acids-Fatty Acids

Several guaiacol/catechol compounds were found in the influent and effluent samples. A number of resin acid/fatty acid compounds were found in the influent, with considerably lower

concentrations in the secondary (001) effluent. Effluent concentration for compounds in both groups were fairly low (less than 50 ug/L).

Dioxin/Furan

No dioxins were detected in the 001 and 002 effluent. TCDFs (total) were the only furans detected in the 001 and 002 effluent.

Bioassays

No acute toxicity was found for rainbow trout, *Daphnia magna*, and Pacific oyster larvae tests in the 001 effluent. Some acute toxicity was found for fathead minnow and Microtox in the test in the 001 effluent. Chronic toxic effects were found in tests with echinoderm sperm cell and Pacific oyster larvae in the 001 effluent. No chronic effects were found with the fathead minnow. The echinoderm and bivalve larvae tests were most sensitive.

Outfall 002 effluent showed no toxicity. Runoff showed toxicity to Microtox.

Ditches

The ditch-2 sample was collected near the solids holding/disposal lagoon. Higher concentrations of several general chemistry parameters were found at the Ditch-2 station than in the other three ditch samples. Also, the only organic compounds, two VOA compounds found in concentrations less than EPA water quality criteria were found in the Ditch-2 sample.

Sediment

Physical characteristics of the Sed-1 sample (near outfall) were somewhat different than those of the Sed-2 (edge of dilution zone) and Sed-3 (background) samples. BNA scans found higher concentrations of several compounds, mostly PAH's, in the Sed-1 and Sed-2 samples than in the Sed-3 sample. All BNA compounds detected were less than sediment standards.

A few dioxin/furan compounds were detected in the sediments. The concentrations were low. 2,3,7,8 TCDD was not detected in the sediments.

Toxicity was found in Sed-1 by the amphipod, Microtox, and echinoderm embryo bioassays. Some toxicity was also noted in the Sed-3 sample with the Microtox and echinoderm embryo bioassays. It is unclear if the toxicity observed in Sed-1 was due to chemical contaminants or the high silt content of the sample.

Table 13 – Sediment Bioassay Results – Weyerhaeuser (Cosmopolis), May 1991.

Microtox Sediment Toxicity Test

EC50 (% extract)

Sample	Sample No.	15 minutes
Sed-1	238261	76
Sed-2	238262	a
Sed-3	238263	>100

a Statistical analysis resulted in a large number of negative gammas. Negative gammas are interpreted as a lack of toxicity.

Echinoderm Embryo Sediment Test

(Strongylocentrotus purpuratus)

Sample	Sample No.	% abnormal	% abnormal/ dead*	Percent mortality*
	Seawater control	13.1	15.6	3.2
	Yaquina Bay control	6.2	9.5	3.8
Sed-1	238261	100	100	91.3
Sed-2	238262	9.3	12.1	2.8
Sed-3	238263	18.1	42.1	28.8

* Based on an average initial count of 200 embryos per 10 ml subsample. 5 replicates (subsamples) per sample.

Marine Amphipod Sediment Test

(Rhepoxinius abronius)

Sample	Sample No.	No. Tested*	% Survival
	Control	100	100
Sed-1	238261	100	25
Sed-2	238262	100	93
Sed-3	238263	100	83

*5 replicates of 20 organisms each per treatment.

Sed-1	- Sediment sample collected approximately 50 feet west of the diffuser area.
Sed-2	- Sediment sample collected approximately 100 yards to sea from the diffuser markers.
Sed-3	- Sediment sample collected approximately 400 yards NE of the diffuser markers.

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APPENDICES

Appendix A – Sampling Schedule – Weyerhaeuser (Cosmopolis), May 1991.

Parameter	Quantity	Location:	Trns Blk	Inf-1	Inf-2	Inf-C	Blch-1	Blch-2	DAef-1	001-1	001-2	001-C
		Type:	grab	grab	grab	comp	grab	grab	grab	grab	grab	comp
		Date:	5/28	5/29	5/29	5/29–30	5/29	5/29	5/29	5/29	5/29	5/29–30
		Time:	1345	1205	1120	0800–0800	1240	1105	1220	1040	1430	0800–0800
		Lab Log #:	228230	228231	228232	228233	228234	28235&6	228237	228239	228240	228241
GENERAL CHEMISTRY												
Conductivity						E						E
Alkalinity						E						EW
Hardness						E						E
Color						E						E
SOLIDS 4						E						E
TSS								E				W
% Solids												
% Volatile Solids												
BOD5						E						EW
COD						E		E				E
TOC (water)						E		E				E
TOC (soil)												
NH3-N												E
NO2+NO3-N												E
Phosphorous – Total												E
Oil and Grease										E	E	
F-Coliform MF									E	EW	E	
F-Coliform MPN									E	E	E	
% Klebsiella (KES)									E	E	E	
Grain Size												
ORGANICS												
DOX				E	E		E	E		EW	E	
VOA (water)			E	E	E		E	E		E	E	
VOA (soil)												
BNAs (water)			E			E		E				E
BNAs (soil)												
Pest/PCB (water)			E			E						E
Pest/PCB (soil)												
Resin/Fatty Acids (water)						E						E
Guaiacols (water)						E						E
Phenolics Total(water)			E			E		E				E
Dioxin/Furans			E			E		E				E
METALS												
PP Metals			E			E						E
BIOASSAYS												
Salmonid (acute) 100%												
Salmonid (acute) 65%												
Microtox (acute)												
Daphnia (acute)												
Fathead Minnow (chronic)												
Bivalve Larvae												
Echinoderm sperm cell												
Rhepoxinius (solid acute)												
Microtox (solid acute)												
FIELD OBSERVATIONS												
Temp				E	E	E	E	E		E	E	EW
pH				E	E	E	E	E		E	E	E
Conductivity				E	E	E	E	E		E	E	E
Sulfide										E	E	
Chlorine				E	E					E	E	

E – Analysis by Ecology
W – Analysis by Weyco

Trans Blk –transfer blank
Inf –influent to the bioponds
C –composite sample

Blch –bleach plant effluent
DAef –de-aeration tank effluent
001 –the 001 effluent

GC –grab composite sample
002 –the 002 effluent
Sed –sediment sample

Appendix A – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Parameter	Locatn:	001-GC	001-Wey	002-1	002-2	002-C	002-GC	Runoff	Ditch-1	Ditch-2	Ditch-3	Ditch-4	Sed-1	Sed-2	Sed-3
	Type:	gr-comp	comp	grab	grab	comp	gr-comp	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	5/29	5/29-30	5/29	5/29	5/29-30	5/29	5/29	5/28	5/28	5/28	5/28	6/04	6/04	6/04
	Time:	*	00-0800	1145	1545	0800-0800	*	0935	1020	1105	1130	1150	1235-1255	1340-1400	1400-1500
	Lab Log #:	228242		228244	228245	228246	228247	228248	228249	228250	228251	228252	238261	238262	238263
GENERAL CHEMISTRY															
Conductivity		E				E	E	E	E	E	E	E			
Alkalinity		E				E	E	E	E	E	E	E			
Hardness		E				E	E	E	E	E	E	E			
Color						E		E	E	E	E	E			
SOLIDS 4						E		E	E	E	E	E			
TSS			W**	W		W									
% Solids													E	E	E
% Volatile Solids													E	E	E
BOD5			W**	W		E		E							
COD						E		E	E	E	E	E			
TOC (water)						E		E	E	E	E	E			
TOC (soil)													E	E	E
NH3-N						E		E	E	E	E	E			
NO2+NO3-N						E		E	E	E	E	E			
Phosphorous – Total						E		E	E	E	E	E			
Oil and Grease				EW	E			E							
F-Coliform MF				EW	E				E	E	E	E			
F-Coliform MPN				E	E										
% Klebsiella (KES)				E	E										
Grain Size													E	E	E
ORGANICS															
DOX				EW	E										
VOA (water)				E	E			E	E	E	E	E			
VOA (soil)													E	E	E
BNAs (water)						E		E	E	E	E	E			
BNAs (soil)													E	E	E
Pest/PCB (water)						E		E	E	E	E	E			
Pest/PCB (soil)													E	E	E
Resin/Fatty Acids (water)						E									
Guaiacols (water)						E									
Phenolics Total(water)						E		E							
Dioxin/Furans						E							E	E	E
METALS															
PP Metals						E		E	E	E	E	E	E	E	E
BIOASSAYS															
Salmonid (acute) 100%		E					E	E							
Salmonid (acute) 65%		E													
Microtox (acute)		E					E	E	E	E	E	E			
Daphnia (acute)		E					E	E	E	E	E	E			
Fathead Minnow (chronic		E													
Bivalve Larvae		E													
Echinoderm sperm cell		E											E	E	E
Rhepoxinius (solid acute)													E	E	E
Microtox (solid acute)													E	E	E
FIELD OBSERVATIONS															
Temp				E	E	E		E	E	E	E	E			
pH				E	E	E		E	E	E	E	E			
Conductivity				E	E	E		E	E	E	E	E			
Sulfide				E	E				E	E	E	E			
Chlorine				E	E										

* – Grab composite samples consist of equal volumes of two grab subsamples.

** – Weyco analysis only. Sample discarded before split was made.

Appendix B – Ecology Analytical Methods – Weyerhaeuser (Cosmopolis), May 1991.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
GENERAL CHEMISTRY		
Conductivity	EPA, 1983: 120.1	Ecology
Alkalinity	EPA, 1983: 310.1	Ecology
Hardness	EPA, 1983: 130.2	Ecology
Color	EPA, 1983: 110.1	Amtest
SOLIDS 4	EPA, 1983: 160	Ecology
TSS	EPA, 1983: 160.2	Ecology
% Solids	APHA, 1989: 2540G	Ecology
% Volatile Solids	EPA, 1983: 160.4	Ecology
BOD5	EPA, 1983: 405.1	Amtest
COD	EPA, 1983: 410.1	Amtest
TOC (water)	EPA, 1983: 415.1	Ecology
TOC (soil)	EPA, 1983: 415.1	Amtest
NH3-N	EPA, 1983: 350.1	Amtest
NO2+NO3-N	EPA, 1983: 353.2	Amtest
Phosphorous - Total	EPA, 1983: 365.1	Amtest
Oil and Grease	EPA, 1983: 413.1	Amtest
F-Coliform MF	APHA, 1989: 9222D	Water Management Labs
F-Coliform MPN	APHA, 1989: 9221C	Water Management Labs
% Klebsiella (KES)	APHA, 1989: 9222F	Water Management Labs
Grain Size	Tetra Tech, 1986	Soil Technology
ORGANICS		
DOX	EPA, 1986: 9020	Ecology
VOA (water)	EPA, 1984: 624	Analytical Resources Inc
VOA (soil)	EPA, 1986: 8260	Analytical Resources Inc
BNAs (water)	EPA, 1984: 625	Analytical Resources Inc
BNAs (soil)	EPA, 1986: 8270	Analytical Resources Inc
Pest/PCB (water)	EPA, 1984: 608	Analytical Resources Inc
Pest/PCB (soil)	EPA, 1986: 8080	Analytical Resources Inc
Phenolics Total(water)	EPA, 1983: 420.2	Amtest
Dioxin/Furans	EPA, 1989 :1613	Enseco
METALS		
PP Metals	EPA, 1979: 200	Sound Analytical Services
BIOASSAYS		
Salmonid (acute) 100%	WDOE, 1981	Ecology
Salmonid (acute) 65%	WDOE, 1981	Ecology
Microtox (acute)	Beckman, 1982	Ecology
Daphnia (acute)	EPA, 1987	Ecology
Fathead Minnow (chronic)	EPA, 1989	Ecology
Bivalve Larvae	ASTM, 1989: E724-89	NW Aquatic Sci
Echinoderm sperm cell	Dinnel,1987	NW Aquatic Sci
Echinoderm embryo	ASTM, 1991: E 724-89	NW Aquatic Sci
Rhepoxinius (solid acute)	ASTM,1990: E1367-90	NW Aquatic Sci
Microtox (solid acute)	Tetra Tech, 1986.	Ecology

Appendix B – (Cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

FIELD OBSERVATIONS	
Temp	
pH	APHA, 1989: 4500-H+ B.
Conductivity	APHA, 1989: 2510 B.
Sulfide	APHA, 1989: 4500-S2 D.
Chlorine	APHA, 1989:4500-CL G.

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Appendix C - Priority Pollutant Cleaning and Field Transfer Blank Procedures - Weyerhaeuser (Cosmopolis), May 1991.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

FIELD TRANSFER BLANK PROCEDURE

1. Pour organic free water directly into appropriate bottles for parameters to be analyzed from grab samples (VOA).

2. Run approximately 1L of organic free water through a compositor and discard.

3. Run approximately 6L of organic free water through the same compositor and put the water into appropriate bottles for parameters to be analyzed from composite samples (BNA, Pesticide/PCB, resin acids, guaiacols, dioxins, phenolics, and metals).

Appendix D – VOA Scan Results – Weyerhaeuser (Cosmopolis), May 1991.

	Location:	Trns Blk	Inf–1	Inf–2	Inf–C	Blch–1	Blch–2	DAef–1
	Type:	grab	grab	grab	comp	grab	grab	grab
	Date:	5/28	5/29	5/29	5/29–30	5/29	5/31	5/29
	Time:	1345	1205	1120	0800–0800	1240	1105	1220
	Lab Log#:	228230	228231	228232	228233	228234	228235&6	228237
VOA Compounds		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloromethane		2 U	2 U	100 U		10 U	10 U	
Bromomethane		2 U	2 U	100 U		10 U	10 U	
Vinyl Chloride		3 U	3 U	150 U		10 U	10 U	
Chloroethane		3 U	3 U	150 U		10 U	10 U	
Methylene Chloride		5 UJ	6 UJ	220 UJ		10 U	10 U	
Acetone		11	12000	35000		340	400	
Carbon Disulfide		2 U	2 U	100 U		5 U	5 U	
1,1–Dichloroethene		1 U	1 U	50 U		5 U	5 U	
1,1–Dichloroethane		1 U	1 U	50 U		5 U	5 U	
1,2–Dichloroethene (total)		1 U	1 U	50 U				
trans–1,2–dichloroethene						5 U	5 U	
cis–1,2–dichloroethene						5 U	5 U	
Chloroform		1 U	7.2	50 U		590	600	
1,2–Dichloroethane		2 U	2 U	100 U		5 U	5 U	
2–Butanone (MEK)		7.5 U	1600	2000		25 U	25 U	
1,1,1–Trichloroethane		1 U	1 U	50 U		5 U	5 U	
Carbon Tetrachloride		2 U	2 U	100 U		5 U	5 U	
Vinyl Acetate		2 U	2 U	100 U		5 U	5 U	
Bromodichloromethane		1 U	1 U	50 U		9.7 J	10 J	
1,2–Dichloropropane		1 U	1 U	50 U		5 U	5 U	
trans–1,3–Dichloropropene		2 U	2 U	100 U		5 U	5 U	
Trichloroethene		1 U	1 U	50 U		5 U	5 U	
Dibromochloromethane		1 U	1 U	50 U		5 U	5 U	
1,1,2–Trichloroethane		1 U	1 U	50 U		5 U	5 U	
Benzene		1 U	1 U	50 U		5 U	5 U	
cis–1,3–Dichloropropene		1 U	1 U	50 U		5 U	5 U	
2–Chloroethylvinyl Ether		2 U	2 U	100 U		5 U	5 U	
Bromoform		3 U	3 U	150 U		5 U	5 U	
4–Methyl–2–Pentanone (MIBK)		2 U	2 U	100 U		25 U	25 U	
2–Hexanone		2 U	2.9 J	100 U		25 U	25 U	
Tetrachloroethene		1 U	1 U	50 U		5 U	5 U	
1,1,2,2–Tetrachloroethane		2 U	2 U	100 U		5 U	5 U	
Toluene		1 U	1 U	50 U		5 U	5 U	
Chlorobenzene		1 U	1 U	50 U		5 U	5 U	
Ethylbenzene		1 U	1 U	50 U		5 U	5 U	
Styrene		1 U	1 U	50 U		5 U	5 U	
Total Xylenes		2 U	2 U	100 U		10 U	10 U	
Trichlorofluoromethane		2 U	2 U	100 U		10 U	10 U	
1,1,2–Trichloro–1,2,2–Trifluoroethane (Freon 113)		2 U	2 U	100 U		10 U	10 U	

U – indicates compound was analyzed for but not detected at the given detection limit.
J – indicates an estimated value for a detected analyte.
NJ – indicates there is evidence the analyte is present The numerical result is an estimate.
UJ – the analyte was not detected at or above the reported estimated result.

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample collected by Ecology
Blch – bleach plant effluent
DAef – de–aeration tank effluent

001–1 – the 001 effluent
GC – grab–composite sample
Runoff – runoff from woodyard riverside drain
Ditch – ditch sample
Sed – sediment sample

Appendix D (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Location:	001-1	001-2	001-C	001-GC	002-1	002-2	002-C	002-GC	Runoff
Type:	grab	grab	comp	gr-comp	grab	grab	comp	gr-comp	grab
Date:	5/29	5/29	5/29-30	5/29	5/29	5/29	5/29-30	5/29	5/29
Time:	1040	1430	0800-0800		1145	1545	0800-0800		0935
Lab Log#:	228239	228240	228241	228242	228244	228245	228246	228247	228248
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloromethane	25 U	25 U			5 U	5 U			5 U
Bromomethane	15 U	15 U			3 U	3 U			3 U
Vinyl Chloride	15 U	15 U			3 U	3 U			3 U
Chloroethane	15 U	15 U			3 U	3 U			3 U
Methylene Chloride	40 UJ	20 UJ			5 UJ	5 UJ			5 UJ
Acetone	110 UJ	70 UJ			8 UJ	10 UJ			20 UJ
Carbon Disulfide	10 U	10 U			2 U	2 U			2 U
1,1-Dichloroethene	10 U	10 U			2 U	2 U			2 U
1,1-Dichloroethane	5 U	5 U			1 U	1 U			0.8 J
1,2-Dichloroethene (total)									
trans-1,2-dichloroethene	5 U	5 U			1 U	1 U			1 U
cis-1,2-dichloroethene	5 U	5 U			1 U	1 U			1 U
Chloroform	430	430			10	9.6			0.7 J
1,2-Dichloroethane	5 U	5 U			1 U	1 U			1 U
2-Butanone (MEK)	20 J	21 J			7.5 U	7.5 U			7.5 U
1,1,1-Trichloroethane	5 U	5 U			1 U	1 U			0.7 NJ
Carbon Tetrachloride	5 U	5 U			1 U	1 U			1 U
Vinyl Acetate	5 U	5 U			1 U	1 U			1 U
Bromodichloromethane	5.3 J	5.6 J			1.9 J	1.7 J			1 U
1,2-Dichloropropane	5 U	5 U			1 U	1 U			1 U
trans-1,3-Dichloropropene	5 U	5 U			1 U	1 U			1 U
Trichloroethene	5 U	5 U			1 U	1 U			1 U
Dibromochloromethane	5 U	5 U			1 U	1 U			1 U
1,1,2-Trichloroethane	5 U	5 U			1 U	1 U			1 U
Benzene	5 U	5 U			1 U	1 U			1 U
cis-1,3-Dichloropropene	5 U	5 U			1 U	1 U			1 U
2-Chloroethylvinyl Ether	5 U	5 U			1 U	1 U			1 U
Bromoform	5 U	5 U			1 U	1 U			1 U
4-Methyl-2-Pentanone (MIBK)	10 U	10 U			2 U	2 U			2 U
2-Hexanone	20 U	20 U			4 U	4 U			4 U
Tetrachloroethene	5 U	5 U			1 U	1 U			1 U
1,1,2,2-Tetrachloroethane	5 U	5 U			1 U	1 U			1 U
Toluene	3.6 J	3.6 J			1 U	1 U			35
Chlorobenzene	5 U	5 U			1 U	1 U			1 U
Ethylbenzene	5 U	5 U			1 U	1 U			1 U
Styrene	5 U	5 U			1 U	1 U			1 U
Total Xylenes	10 U	10 U			2 U	2 U			2 U
Trichlorofluoromethane	5 U	5 U			1 U	1 U			1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	25 U	25 U			5 U	5 U			5 U

Appendix D (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Ditch-1	Ditch-2	Ditch-3	Ditch-4	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	5/28	5/28	5/28	5/28	6/4	6/4	6/4
Time:	1020	1105	1130	1150	1235-1255	1340-1400	1440-1500
Lab Log#:	228249	228250	228251	228252	238261	238262	238263
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/Kg *	ug/Kg *	ug/Kg *
Chloromethane	5 U	5 U	5 U	5 U	2.8 U	2.3 U	2.5 U
Bromomethane	3 U	3 U	3 U	3 U	2.8 U	2.3 U	2.5 U
Vinyl Chloride	3 U	3 U	3 U	3 U	4.2 U	3.4 U	3.8 U
Chloroethane	3 U	3 U	3 U	3 U	4.2 U	3.4 U	3.8 U
Methylene Chloride	5 UJ	5 UJ	5 UJ	10 UJ	4 UJ	8 UJ	4 UJ
Acetone	10 UJ	24 UJ	12 UJ	10 UJ	17 J	8.6 J	8.8 J
Carbon Disulfide	2 U	2 U	2 U	2 U	2.8 U	2.3 U	2.5 U
1,1-Dichloroethene	2 U	2 U	2 U	2 U	1.4 U	1.1 U	1.3 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
1,2-Dichloroethene (total)					1.4 U	1.1 U	1.3 U
trans-1,2-dichloroethene	1 U	1 U	1 U	1 U			
cis-1,2-dichloroethene	1 U	1 U	1 U	1 U			
Chloroform	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
2-Butanone (MEK)	7.5 U	5.2 J	7.5 U	7.5 U	10.6 U	8.6 U	9.5 U
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Carbon Tetrachloride	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
Vinyl Acetate	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
Trichloroethene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Dibromochloromethane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Benzene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
2-Chloroethylvinyl Ether	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
Bromoform	1 U	1 U	1 U	1 U	4.2 U	3.4 U	3.8 U
4-Methyl-2-Pentanone (MIBK)	2 U	2 U	2 U	2 U	2.8 U	2.3 U	2.5 U
2-Hexanone	4 U	4 U	4 U	4 U	2.8 U	2.3 U	2.5 U
Tetrachloroethene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
Toluene	1 U	95	1 U	1 U	1.4 U	1.1 U	1.3 U
Chlorobenzene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Ethylbenzene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Styrene	1 U	1 U	1 U	1 U	1.4 U	1.1 U	1.3 U
Total Xylenes	2 U	2 U	2 U	2 U	2.8 U	2.3 U	2.5 U
Trichlorofluoromethane	1 U	1 U	1 U	1 U	2.8 U	2.3 U	2.5 U
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	5 U	5 U	5 U	5 U	2.8 U	2.3 U	2.5 U

* Dry weight basis

Appendix E – BNA Scan Results – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Trns Blk	Inf-1	Inf-2	Inf-C	Blch-1	Blch-2	DAef-1
Type:	grab	grab	grab	comp	grab	grab	grab
Date:	5/28	5/29	5/29	5/29-30	5/29	5/31	5/29
Time:	1345	1205	1120	0800-0800	1240	1105	1220
Lab Log#:	228230	228231	228232	228233	228234	22823586	228237
BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Phenol	2 U			26		2 U	
Bis(2-Chloroethyl)Ether	1 U			1 U		1 U	
2-Chlorophenol	1 U			1 U		1 U	
1,3-Dichlorobenzene	1 U			1 U		1 U	
1,4-Dichlorobenzene	1 U			1 U		1 U	
Benzyl Alcohol	5 U			5 U		5 U	
1,2-Dichlorobenzene	1 U			1 U		1 U	
2-Methylphenol	1 U			1 U		1 U	
Bis(2-Chloroisopropyl)Ether	1 U			1 U		1 U	
4-Methylphenol	1 U			1 U		1 U	
N-Nitroso-di-n-Propylamine	1 U			1 U		1 U	
Hexachloroethane	2 U			2 U		2 U	
Nitrobenzene	1 U			1 U		1 U	
Isophorone	1 U			1 U		1 U	
2-Nitrophenol	5 U			5 U		5 U	
2,4-Dimethylphenol	2 U			2 U		2 U	
Benzoic Acid	10 UJ			16		10 UJ	
Bis(2-Chloroethoxy)Methane	1 U			1 U		1 U	
2,4-Dichlorophenol	3 U			3 U		2.7 NJ	
1,2,4-Trichlorobenzene	1 U			1 U		1 U	
Naphthalene	1 U			1 U		1 U	
4-Chloroaniline	3 UJ			3 UJ		3 UJ	
Hexachlorobutadiene	2 U			2 U		2 U	
4-Chloro-3-Methylphenol	2 U			2 U		2 U	
2-Methylnaphthalene	1 U			1 U		1 U	
Hexachlorocyclopentadiene	5 U			5 U		5 U	
2,4,6-Trichlorophenol	5 U			4.5 NJ		9.5 J	
2,4,5-Trichlorophenol	5 U			5 U		5 U	
2-Chloronaphthalene	1 U			1 U		1 U	
2-Nitroaniline	5 UJ			5 UJ		5 UJ	
Dimethyl Phthalate	1 U			1 U		1 U	
Acenaphthylene	1 U			1 U		1 U	
3-Nitroaniline	5 UJ			5 UJ		5 UJ	
Acenaphthene	1 U			1 U		1 U	
2,4-Dinitrophenol	10 U			10 U		10 U	
4-Nitrophenol	5 UJ			5 UJ		5 UJ	
Dibenzofuran	1 U			1 U		1 U	
2,4-Dinitrotoluene	5 U			5 U		5 U	
2,6-Dinitrotoluene	5 U			5 U		5 U	
Diethyl Phthalate	1 U			1 U		1 U	
4-Chlorophenyl Phenylether	1 U			1 U		1 U	
Fluorene	1 U			1 U		1 U	
4-Nitroaniline	5 UJ			5 UJ		5 UJ	
4,6-Dinitro-2-Methylphenol	10 U			10 U		10 U	
N-Nitrosodiphenylamine	1 U			1 U		1 U	

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample collected by Ecology
Blch – bleach plant effluent
001 – the 001 effluent
002 – the 002 effluent
GC – grab-composite sample
Runoff – runoff from woodyard riverside drain
Ditch – ditch sample

U – indicates the analyte was not detected at the given detection limit.
J – indicates an estimated value for a detected analyte.
UJ – the analyte was not detected at or above the reported estimated result.
NJ – indicates there is evidence the analyte is present. The numerical result is an estimate.

Appendix E – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

BNA Compounds	001-1 grab 5/29 1040 228239 ug/L	001-2 grab 5/29 1430 228240 ug/L	001-C comp 5/29-30 0800-0800 228241 ug/L	001-GC gr-comp 5/29 228242 ug/L	002-1 grab 5/29 1145 228244 ug/L	002-2 grab 5/29 1545 228245 ug/L	002-C comp 5/29-30 0800-0800 228246 ug/L	002-GC gr-comp 5/29 228247 ug/L	Runoff grab 5/29 0935 228248 ug/L
Phenol			3.1 J				2 U		2 U
Bis(2-Chloroethyl)Ether			1 U				1 U		1 U
2-Chlorophenol			1 U				1 U		1 U
1,3-Dichlorobenzene			1 U				1 U		1 U
1,4-Dichlorobenzene			1 U				1 U		1 U
Benzyl Alcohol			5 U				5 U		5 U
1,2-Dichlorobenzene			1 U				1 U		1 U
2-Methylphenol			1 U				1 U		1 U
Bis(2-Chloroisopropyl)Ether			1 U				1 U		1 U
4-Methylphenol			34				1 U		1 U
N-Nitroso-di-n-Propylamine			1 U				1 U		1 U
Hexachloroethane			2 U				2 U		2 U
Nitrobenzene			1 U				1 U		1 U
Isophorone			1 U				1 U		1 U
2-Nitrophenol			5 U				5 U		5 U
2,4-Dimethylphenol			2 U				2 U		2 U
Benzoic Acid			10 UJ				10 UJ		10 UJ
Bis(2-Chloroethoxy)Methane			1 U				1 U		1 U
2,4-Dichlorophenol			2.3 J				3 U		3 U
1,2,4-Trichlorobenzene			1 U				1 U		1 U
Naphthalene			1 J				1 U		1 U
4-Chloroaniline			3 UJ				3 UJ		3 UJ
Hexachlorobutadiene			2 U				2 U		2 U
4-Chloro-3-Methylphenol			2 U				2 U		2 U
2-Methylnaphthalene			1 U				1 U		1 U
Hexachlorocyclopentadiene			5 U				5 U		5 U
2,4,6-Trichlorophenol			6.4				5 U		5 U
2,4,5-Trichlorophenol			5 U				5 U		5 U
2-Chloronaphthalene			1 U				1 U		1 U
2-Nitroaniline			5 UJ				5 UJ		5 UJ
Dimethyl Phthalate			1 U				1 U		1 U
Acenaphthylene			1 U				1 U		1 U
3-Nitroaniline			5 UJ				5 UJ		5 UJ
Acenaphthene			1 U				1 U		1 U
2,4-Dinitrophenol			10 U				10 U		10 U
4-Nitrophenol			5 UJ				5 UJ		5 UJ
Dibenzofuran			1 U				1 U		1 U
2,4-Dinitrotoluene			5 U				5 U		5 U
2,6-Dinitrotoluene			5 U				5 U		5 U
Diethyl Phthalate			1 U				1 U		1 U
4-Chlorophenyl Phenylether			1 U				1 U		1 U
Fluorene			1 U				1 U		1 U
4-Nitroaniline			5 UJ				5 UJ		5 UJ
4,6-Dinitro-2-Methylphenol			10 U				10 U		10 U
N-Nitrosodiphenylamine			1 U				1 U		1 U

Appendix E – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

BNA Compounds	Ditch-1 grab 5/28 1020 228249 ug/L	Ditch-2 grab 5/28 1105 228250 ug/L	Ditch-3 grab 5/28 1130 228251 ug/L	Ditch-4 grab 5/28 1150 228252 ug/L	Sed-1 grab 6/4 1235-1255 238261 ug/Kg *	Sed-2 grab 6/4 1340-1400 238262 ug/Kg *	Sed-3 grab 6/4 1440-1500 238263 ug/Kg *
Phenol	2 U	2 U	2 U	2 U	35 U	27 U	29 U
Bis(2-Chloroethyl)Ether	1 U	1 U	1 U	1 U	17 U	14 U	15 U
2-Chlorophenol	1 U	1 U	1 U	1 U	17 U	14 U	15 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Benzyl Alcohol	5 U	5 U	5 U	5 U	87 U	68 U	73 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
2-Methylphenol	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Bis(2-Chloroisopropyl)Ether	1 U	1 U	1 U	1 U	17 U	14 U	15 U
4-Methylphenol	1 U	1 U	1 U	1 U	130	34 NJ	32 J
N-Nitroso-di-n-Propylamine	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Hexachloroethane	2 U	2 U	2 U	2 U	35 U	27 U	29 U
Nitrobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Isophorone	1 U	1 U	1 U	1 U	17 U	14 U	15 U
2-Nitrophenol	5 U	5 U	5 U	5 U	87 U	68 U	73 U
2,4-Dimethylphenol	2 U	2 U	2 U	2 U	35 U	27 U	29 U
Benzoic Acid	10 UJ	10 UJ	10 UJ	10 UJ	170 U	140 U	150 U
Bis(2-Chloroethoxy)Methane	1 U	1 U	1 U	1 U	17 U	14 U	15 U
2,4-Dichlorophenol	3 U	3 U	3 U	3 U	52 U	41 U	44 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Naphthalene	1 U	1 U	1 U	1 U	38 J	26 J	10 J
4-Chloroaniline	3 UJ	3 UJ	3 UJ	3 UJ	52 U	41 U	44 U
Hexachlorobutadiene	2 U	2 U	2 U	2 U	35 U	27 U	29 U
4-Chloro-3-Methylphenol	2 U	2 U	2 U	2 U	35 U	27 U	29 U
2-Methylnaphthalene	1 U	1 U	1 U	1 U	12 J	12 J	15 U
Hexachlorocyclopentadiene	5 U	5 U	5 U	5 U	87 U	68 U	73 U
2,4,6-Trichlorophenol	5 U	5 U	5 U	5 U	87 U	68 U	73 U
2,4,5-Trichlorophenol	5 U	5 U	5 U	5 U	87 U	68 U	73 U
2-Chloronaphthalene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
2-Nitroaniline	5 UJ	5 UJ	5 UJ	5 UJ	87 U	68 U	73 U
Dimethyl Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Acenaphthylene	1 U	1 U	1 U	1 U	7.2 J	3.9 NJ	15 U
3-Nitroaniline	5 UJ	5 UJ	5 UJ	5 UJ	87 U	68 U	73 U
Acenaphthene	1 U	1 U	1 U	1 U	56 J	41 J	15 U
2,4-Dinitrophenol	10 U	10 U	10 U	10 U	170 U	140 U	150 U
4-Nitrophenol	5 UJ	5 UJ	5 UJ	5 UJ	87 UJ	68 UJ	73 UJ
Dibenzofuran	1 U	1 U	1 U	1 U	32 J	28 J	15 U
2,4-Dinitrotoluene	5 U	5 U	5 U	5 U	87 U	68 U	73 U
2,6-Dinitrotoluene	5 U	5 U	5 U	5 U	87 U	68 U	73 U
Diethyl Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
4-Chlorophenyl Phenylether	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Fluorene	1 U	1 U	1 U	1 U	34 J	36 J	15 U
4-Nitroaniline	5 UJ	5 UJ	5 UJ	5 UJ	87 U	68 U	73 U
4,6-Dinitro-2-Methylphenol	10 U	10 U	10 U	10 U	170 U	140 U	150 U
N-Nitrosodiphenylamine	1 U	1 U	1 U	1 U	17 U	14 U	15 U

* Dry weight basis

Appendix E – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

	Location:	Trns Blk	Inf–1	Inf–2	Inf–C	Blch–1	Blch–2	DAef–1
	Type:	grab	grab	grab	comp	grab	grab	grab
	Date:	5/28	5/29	5/29	5/29–30	5/29	5/31	5/29
	Time:	1345	1205	1120	0800–0800	1240	1105	1220
	Lab Log#:	228230	228231	228232	228233	228234	228235&6	228237
BNA Compounds		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
4–Bromophenyl Phenylether		1 U			1 U		1 U	
Hexachlorobenzene		1 U			1 U		1 U	
Pentachlorophenol		5 U			5 U		5 U	
Phenanthrene		1 U			2.6 J		1 U	
Anthracene		1 U			1 U		1 U	
Di–n–Butyl Phthalate		1 U			1 U		1 U	
Fluoranthene		1 U			1 U		1 U	
Pyrene		1 U			1 U		1 U	
Butylbenzyl Phthalate		1 U			1 U		1 U	
3,3'–Dichlorobenzidine		5 UJ			5 UJ		5 UJ	
Benzo(a)Anthracene		1 U			1 U		1 U	
Bis(2–Ethylhexyl)Phthalate		1 U			1 U		1 U	
Chrysene		1 U			1 U		1 U	
Di–n–Octyl Phthalate		1 U			1 U		1 U	
Benzo(b)Fluoranthene		1 U			1 U		1 U	
Benzo(k)Fluoranthene		1 U			1 U		1 U	
Benzo(a)Pyrene		1 U			1 U		1 U	
Indeno(1,2,3–cd)Pyrene		1 U			1 U		1 U	
Dibenzo(a,h)Anthracene		1 U			1 U		1 U	
Benzo(g,h,i)Perylene		1 U			1 U		1 U	

Appendix E – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

BNA Compounds	001–1 grab 5/29 1040 228239 ug/L	001–2 grab 5/29 1430 228240 ug/L	001–C comp 5/29–30 0800–0800 228241 ug/L	001–GC gr–comp 5/29 228242 ug/L	002–1 grab 5/29 1145 228244 ug/L	002–2 grab 5/29 1545 228245 ug/L	002–C comp 5/29–30 0800–0800 228246 ug/L	002–GC gr–comp 5/29 228247 ug/L	Runoff grab 5/29 0935 228248 ug/L
4–Bromophenyl Phenylether			1 U				1 U		1 U
Hexachlorobenzene			1 U				1 U		1 U
Pentachlorophenol			5 U				5 U		5 U
Phenanthrene			1 U				1 U		1 U
Anthracene			1 U				1 U		1 U
Di–n–Butyl Phthalate			1 U				0.4 J		1 U
Fluoranthene			1 U				1 U		1 U
Pyrene			1 U				1 U		0.7 J
Butylbenzyl Phthalate			1 U				1 U		1 U
3,3'–Dichlorobenzidine			5 UJ				5 UJ		5 UJ
Benzo(a)Anthracene			1 U				1 U		1 U
Bis(2–Ethylhexyl)Phthalate			1 U				2.2 J		0.8 J
Chrysene			1 U				1 U		1 U
Di–n–Octyl Phthalate			1 U				1 U		1 U
Benzo(b)Fluoranthene			1 U				1 U		1 U
Benzo(k)Fluoranthene			1 U				1 U		1 U
Benzo(a)Pyrene			1 U				1 U		1 U
Indeno(1,2,3–cd)Pyrene			1 U				1 U		1 U
Dibenzo(a,h)Anthracene			1 U				1 U		1 U
Benzo(g,h,i)Perylene			1 U				1 U		1 U

Appendix E – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

BNA Compounds	Ditch-1 grab 5/28 1020 228249 ug/L	Ditch-2 grab 5/28 1105 228250 ug/L	Ditch-3 grab 5/28 1130 228251 ug/L	Ditch-4 grab 5/28 1150 228252 ug/L	Sed-1 grab 6/4 1235-1255 238261 ug/Kg*	Sed-2 grab 6/4 1340-1400 238262 ug/Kg*	Sed-3 grab 6/4 1440-1500 238263 ug/Kg*
4-Bromophenyl Phenylether	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Hexachlorobenzene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Pentachlorophenol	5 U	5 U	5 U	5 U	87 UJ	68 UJ	73 UJ
Phenanthrene	1 U	1 U	1 U	1 U	150	170	21 J
Anthracene	1 U	1 U	1 U	1 U	31 J	30 J	15 U
Di-n-Butyl Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Fluoranthene	1 U	1 U	1 U	1 U	210	170	20 J
Pyrene	1 U	1 U	1 U	1 U	150	130	20 J
Butylbenzyl Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
3,3'-Dichlorobenzidine	5 UJ	5 UJ	5 UJ	5 UJ	87 U	68 U	73 U
Benzo(a)Anthracene	1 U	1 U	1 U	1 U	42 NJ	50 J	15 U
Bis(2-Ethylhexyl)Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Chrysene	1 U	1 U	1 U	1 U	32 J	46 J	15 U
Di-n-Octyl Phthalate	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Benzo(b)Fluoranthene	1 U	1 U	1 U	1 U			15 U
Benzo(k)Fluoranthene	1 U	1 U	1 U	1 U	38 J	59 J	15 U
Benzo(a)Pyrene	1 U	1 U	1 U	1 U	18 NJ	32 J	15 U
Indeno(1,2,3-cd)Pyrene	1 U	1 U	1 U	1 U	17 U	15 NJ	15 U
Dibenzo(a,h)Anthracene	1 U	1 U	1 U	1 U	17 U	14 U	15 U
Benzo(g,h,i)Perylene	1 U	1 U	1 U	1 U	17 U	15 NJ	15 U

* Dry weight basis

Appendix F – Pesticide/PCB Scan Results – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Trns Blk	Inf–C	001–C	002–C	Runoff	Ditch–1	Ditch–2	Ditch–3	Ditch–4
Type:	grab	comp	comp	comp	grab	grab	grab	grab	grab
Date:	5/28	5/29–30	5/29–30	5/29–30	5/30	5/28	5/28	5/28	5/28
Time:	1345	0800–0800	0800–0800	0800–0800	0935	1020	1105	1130	1150
Lab Log#:	228230	228233	228241	228246	228248	228249	228250	228251	228252
Pesticide/PCB Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
alpha–BHC	0.04 U	1.5 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
beta–BHC	0.04 U	3 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
delta–BHC	0.06 U	0.2 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
gamma–BHC (Lindane)	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor Epoxide	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endosulfan I	0.04 U	0.1 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Dieldrin	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4,4'–DDE	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
Endrin	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
Endosulfan II	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4,4'–DDD	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
Endosulfan Sulfate	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
4,4'–DDT	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
Methoxychlor	0.16 U	0.3 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Endrin Ketone	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
alpha–Chlordane	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
gamma–Chlordane	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
Toxaphene	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Aroclor–1221	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Aroclor–1232	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Aroclor–1242/1016	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Aroclor–1248	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Aroclor–1254	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Aroclor–1260	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample collected by Ecology
001 – the 001 effluent
002 – the 002 effluent
Runoff – runoff from woodyard riverside drain
Ditch – ditch sample
Sed – sediment sample

U The analyte was not detected at or above the reported result.

Appendix F – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab
Date:	6/4	6/4	6/4
Time:	1235-1255	1340-1400	1440-1500
Lab Log#:	238261	238262	238263
Pesticide/PCB Compounds	ug/Kg*	ug/Kg*	ug/Kg*
alpha-BHC	1 U	1 U	1 U
beta-BHC	1 U	1 U	1 U
delta-BHC	1.5 U	1.5 U	1.5 U
gamma-BHC (Lindane)	1 U	1 U	1 U
Heptachlor	1 U	1 U	1 U
Aldrin	1 U	1 U	1 U
Heptachlor Epoxide	1 U	1 U	1 U
Endosulfan I	1 U	1 U	1 U
Dieldrin	2 U	2 U	2 U
4,4'-DDE	3 U	2 U	2 U
Endrin	2 U	2 U	2 U
Endosulfan II	2 U	2 U	2 U
4,4'-DDD	5 U	2 U	2 U
Endosulfan Sulfate	4 U	4 U	4 U
4,4'-DDT	2 U	2 U	2 U
Methoxychlor	4 U	4 U	4 U
Endrin Ketone	3 U	3 U	3 U
alpha-Chlordane	1.5 U	1.5 U	1.5 U
gamma-Chlordane	1.5 U	1.5 U	1.5 U
Toxaphene	150 U	150 U	150 U
Aroclor-1221			
Aroclor-1232			
Aroclor-1242/1016	20 U	20 U	20 U
Aroclor-1248	20 U	20 U	20 U
Aroclor-1254	20 U	20 U	20 U
Aroclor-1260	20 U	20 U	20 U

* Dry weight basis

Appendix G – Metals Scan Results – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Trns Blk	Inf-C	001-C	002-C	Runoff	Ditch-1	Ditch-2	Ditch-3	Ditch-4
Type:	grab	comp	comp	comp	grab	grab	grab	grab	grab
Date:	5/28	5/29-30	5/29-30	5/29-30	5/30	5/28	5/28	5/28	5/28
Time:	1345	0800-0800	0800-0800	0800-0800	0935	1020	1105	1130	1150
Lab Log#:	228230	228233	228241	228246	228248	228249	228250	228251	228252
Metals	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Antimony	90	60 U	120	60 U	60 U	60 U	60 U	60 U	60 U
Arsenic	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pentavalent									
Trivalent									
Beryllium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cadmium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chromium	10 U	16 U	10 U	10 U	10 U	10 U	25	10 U	10 U
Hexavalent									
Trivalent									
Copper	25 U	35	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Lead	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	5 U	40	7	5 U	5 U	9	6	5 U	8
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	10 U	12	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	10 U	10 U
Zinc	20	130	29	20 U	25	27	64	22	45

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample collected by Ecology
001 – the 001 effluent
002 – the 002 effluent
Runoff – runoff from woodyard riverside drain
Ditch – ditch sample
Sed – sediment sample

U – The analyte was not detected at or above the reported result.

Appendix G – (cont'd) – Weyerhaeuser (Cosmopolis), May 1991.

Location:	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab
Date:	6/4	6/4	6/4
Time:	1235-1255	1340-1400	1440-1500
Lab Log#:	238261	238262	238263

Metals	mg/Kg*	mg/Kg*	mg/Kg*
Antimony	0.59 U	0.59 U	0.59 U
Arsenic	0.49 U	0.49 U	0.49 U
Pentavalent			
Trivalent			
Beryllium	0.25 U	0.35	0.35
Cadmium	2.8	2.1	2.0
Chromium	36	32	31
Hexavalent			
Trivalent			
Copper	41	16	18
Lead	14	10	8.8
Mercury	0.21	0.1 U	0.1 U
Nickel	31	32	27
Selenium	2.5 U	2.5 U	2.5 U
Silver	4.8	0.99 U	0.99 U
Thallium	0.99 U	0.99 U	0.99 U
Zinc	73	67	66

* Dry weight basis

Appendix H – VOA and BNA Scan Tentatively Identified Compounds (TICs) – Weyerhaeuser (Cosmopolis), May 1991

Tic data are presented on the laboratory report sheets that follow. Fractions are identified as VOA or ABN (BNA). Locations corresponding to the Lab Log# (called Sample No. on the laboratory report sheet) and data qualifiers are summarized on this page. If sheets are not included for a station, no TICs were detected.

Location:	Trns Blk	Inf–1	Inf–2	Inf–C	Blch–1	Blch–2
Type:	grab	grab	grab	comp	grab	grab
Date:	5/28	5/29	5/29	5/29–5/30	5/29	5/31
Time:	1345	1205	1120	0800–0800	1240	1105
Lab Log#:	228230	228231	228232	228233	228234	228235&6

Location:	001–1	001–2	001–C	002–1	002–2	002–C
Type:	grab	grab	comp	grab	grab	comp
Date:	5/29	5/29	5/29–30	5/29	5/29	5/29–30
Time:	1040	1430	0800–0800	1145	1545	0800–0800
Lab Log#:	228239	228240	228241	228244	228245	228246

Location:	Runoff	Ditch–1	Ditch–2	Ditch–3	Ditch–4
Type:	grab	grab	grab	grab	grab
Date:	5/29	5/28	5/28	5/28	5/28
Time:	0935	1020	1105	1130	1150
Lab Log#:	228248	228249	228250	228251	228252

NJ – indicates there is evidence the analyte is present. The associated numerical value is an estimate.

Trns Blk – transfer blank
Inf – influent to the bioponds
C – composite sample
Blch – bleach plant effluent
001 – the 001 effluent
002 – the 002 effluent
Runoff – runoff from woodyard riverside drain
Ditch – ditch sample

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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: **228230**

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Lab ID: 8406A
Matrix: Water

Data Release Authorized: Donna B. Patton

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	109-99-9	Tetrahydrofuran	VOA	298	7 J NJ
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228231

Lab ID: 8406B
Matrix: Water

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Data Release Authorized: Donna B. Cotton

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	-	UNKNOWN (bp m/e 45)	VOA	133	9 J NJ
2	7446-09-5	Sulfur Dioxide (ACN) (DOT)	VOA	158	7 J
3	79-20-9	Methyl Ester Acetic Acid	VOA	255	440 J
4	141-78-6	Ethyl Ester Acetic Acid	VOA	403	10 J
5	534-22-5	2-Methylfuran	VOA	430	19 J
6	563-80-4	3-Methyl-2-butanone	VOA	504	20 J
7	-	UNKNOWN (bp m/e 96)	VOA	627	35 J
8	-	Trimethylcyclopentenone Isomer (bp m/e 109)	VOA	911	120 J
9	-	Trimethylcyclopentenone Isomer (bp m/e 109)	VOA	1022	8 J
10					
11					
12					
13					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: **228231 dilution**

Lab ID: 8406Bdl
Matrix: Water

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Data Release Authorized: Jamie B. Patton

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	79-20-9	Methyl Ester Acetic Acid	VOA	253	700 NJ
2	-	UNKNOWN (bp m/e 96)	VOA	627	540 J
3					
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6					
7					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228232

Lab ID: 8406C
Matrix: Water

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Data Release Authorized: Donna B. Patton

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	79-20-9	Methyl Ester Acetic Acid	VOA	253	570 NJ
2	-	C4.H6.O2 Isomer (bp m/e 43)	VOA	383	260
3	-	UNKNOWN (bp m/e 96)	VOA	626	620
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6					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228239

Lab ID: 8406Hre
Matrix: Water

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Data Release Authorized: Tom B. Robertson

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	-	UNKNOWN (bp m/e 45)	VOA	288	48 J NS
2	79-20-9	Methyl Ester Acetic Acid	VOA	322	37 J
3					
4					
5					
6					
7					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: **228240**

Lab ID: 8406I
Matrix: Water

QC Report No: 8406-WDOE
Project No: Weyerhaeuser
Cosmopolis
VTSR: 6/3/91

Data Release Authorized: Ann B. Patton

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	79-20-9	Methyl Ester Acetic Acid	VOA	321	38 J NJ
2					
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10					
11					
12					
13					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228233

QC Report No: 8406-WDOE
Project No: Weyerhauser
Cosmopolis
VTSR: 06/03/91

Lab ID: 8406 D
Matrix: Water
Instrument: FINN2

Data Release Authorized: _____
Report prepared: 06/18/91 MAC:D jv

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	1192-62-7	1-(2-Furanyl)-Ethanone	ABN	294	190 J NJ
2	620-02-0	2-Furancarboxaldehyde, 5-methyl	ABN	375	190 J
3	-	Unknown (BP M/E 53)	ABN	391	820 J
4	-	Guaiacol Isomer Co-elute (BP M/E 109)	ABN	402	370 J
5	-	Guaiacol Isomer Co-elute (BP M/E 109)	ABN	474	300 J
6	-	Unknown (BP M/E 67)	ABN	492	400 J
7	-	Unknown C6.H14.O Isomer (BP M/E 126)	ABN	560	280 J
8	-	Unknown (BP M/E 123)	ABN	578	190 J
9	-	Unknown (BP M/E 126)	ABN	616	180 J
10	57-10-3	Hexadecanoic Acid	ABN	1411	440 J
11	-	Unknown (BP M/E 43)	ABN	1463	450 J
12	-	Unknown (BP M/E 67)	ABN	1536	220 J
13	-	Unknown (BP M/E 57)	ABN	1631	470 J
14	-	1-Phenenthrenecarboxylic Acid, Octahydro Isomer (BP M/E 239)	ABN	1737	270 J
15	-	Eicosene, (E) Isomer (BP M/E 43)	ABN	1759	220 J
16	-	Unknown (BP M/E 43)	ABN	1807	210 J
17	-	Unknown (BP M/E 43)	ABN	1877	190 J
18	-	Unknown (BP M/E 43)	ABN	1919	280 J
19	-	Unknown (BP M/E 43)	ABN	2071	200 J
20	-	Unknown (BP M/E 356)	ABN	2193	450 J V
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228236

Lab ID: 8406 G
Matrix: Water
Instrument: FINN2

QC Report No: 8406-WDOE
Project No: Weyerhauser
Cosmopolis
VTSR: 06/03/91

Data Release Authorized: MW
Report prepared: 06/18/91 MAC:D jv

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	-	Hydroxy-Methoxy Benzaldehyde Isomer (BP M/E 151)	ABN	908	5 J NJ
2	-	Dichloro-Methoxy-Phenol Isomer (BP M/E 177)	ABN	988	12 J
3	-	Unknown (BP M/E 185)	ABN	1055	17 J
4	-	Unknown (BP M/E 43)	ABN	1116	15 J
5	-	Unknown (BP M/E 199)	ABN	1176	4 J
6	-	Unknown (BP M/E 177)	ABN	1337	6 J
7	57-10-3	Hexadecanoic Acid	ABN	1397	18 J
8	-	Unknown (BP M/E 57)	ABN	1449	9 J
9	-	Unknown (BP M/E 55)	ABN	1490	4 J
10	-	Unknown (BP M/E 43)	ABN	1540	12 J
11	-	Unknown (BP M/E 43)	ABN	1626	130 J
12	-	Unknown (BP M/E 97)	ABN	1698	5 J
13	-	Unknown (BP M/E 43)	ABN	1756	45 J
14	-	Unknown (BP M/E 273)	ABN	1862	5 J
15	-	Unknown (BP M/E 83)	ABN	1877	11 J
16	-	Unknown (BP M/E 57)	ABN	2225	24 J
17	-	Unknown (BP M/E 57)	ABN	2247	89 J
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19					
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22					
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ORGANIC ANALYSIS DATA SHEET - Tentatively Identified Compounds

Sample No: 228241

QC Report No: 8406-WDOE
Project No: Weyerhauser
Cosmopolis
VTSR: 06/03/91

Lab ID: 8406 J
Matrix: Water
Instrument: FINN2

Data Release Authorized: _____
Report prepared: 06/18/91 MAC:D jv

	CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (µg/L)
1	-	Unknown (BP M/E 74)	ABN	227	11 J NJ SM
2	-	Unknown (BP M/E 67)	ABN	260	6 J
3	-	Unknown (BP M/E 95)	ABN	273	6 J
4	-	Unknown (BP M/E 45)	ABN	291	17 J
5	-	Unknown (BP M/E 74)	ABN	373	8 J
6	142-62-1	Hexanoic Acid	ABN	440	14 J
7	-	Unknown (BP M/E 60)	ABN	563	14 J
8	-	Unknown (BP M/E 60)	ABN	674	8 J
9	-	Unknown (BP M/E 91)	ABN	758	6 J
10	-	Unknown (BP M/E 95)	ABN	772	4 J
11	-	Hydroxy, Methoxy Benzaldehyde Isomer (BP M/E 151)	ABN	905	4 J
12	-	Unknown (BP M/E 178)	ABN	1211	7 J
13	-	Hexadecanoic Acid Co-Elute	ABN	1393	11 J
14	-	Unknown (BP M/E 255)	ABN	1460	10 J
15	-	Unknown (BP M/E 43)	ABN	1537	11 J
16	-	Unknown (BP M/E 43)	ABN	1622	190 J
17	-	Unknown (BP M/E 69)	ABN	1694	9 J
18	-	Unknown (BP M/E 43)	ABN	1751	70 J
19	-	Unknown (BP M/E 57)	ABN	1872	23 J
20	-	Unknown (BP M/E 57)	ABN	2240	20 J
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					