



STATE OF
WASHINGTON

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Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504

206/753-2353

M E M O R A N D U M

June 5, 1978

To: Fred Fenske

From: Eric Egbers and Bill Yake

Re: Crown Zellerbach Pulp Mill
Class II Inspection

Findings and Conclusions:

A Class II inspection was conducted at Crown Zellerbach Pulp and Paper Mill, Camas plant, on April 1819, 1978, by Bill Yake and Eric Egbers. Dave Bachman, Environmental Engineer for Crown Zellerbach, assisted in the sampler locations and was helpful throughout the inspection.

Based on sampling results Crown Zellerbach was in compliance with NPDES permit limitations during the sampling period. The two flow measuring devices located on Blue Creek are in need of repair or replacement. The upstream rectangular weir is out of level, lacking a sharp crest and the head level indicator inaccurate. The downstream, 002, concrete dam weir was definitely deteriorating on the downstream side, forming a deep pool. The weir surface was not level, even or sharp crested. Crown Zellerbach's flow chart, for 002, is based on a sharp crested weir, where in fact this concrete dam weir more closely resembles a broad crested weir. Closer attention must be paid toward the accuracy of these flow measuring devices.

An unknown source, possibly within the plant, is contributing a substantial increase in temperature and specific conductivity to Whiskey Creek, a right bank tributary to Blue Creek. The temperature of Whiskey Creek increased by 7.2°C from the time it enters the Crown Zellerbach complex to the time it flows into Blue Creek. This source should be investigated and identified.

The only major discrepancy found concerning the ASB001 effluent was that the YSI (Yellow Springs Instrument) dissolved oxygen analyzer appeared to report a higher dissolved oxygen content than that found using the Winkler-Azide method. This result should be viewed with caution as the Winkler determination may have been negatively affected by reducing compounds in the waste waters (iodine demand). The preferred approach would be to calibrate the D.O. meter at several oxygen concentrations in uncontaminated waters against oxygen concentrations

June 5, 1978

determined using the Winkler-Azide method. The meter readings of A.S.B. waters could then be corrected, using standard tables, for the conductivity of the wastewater if the conductivity of the wastewater was high.

The next Class II inspection of this facility should include careful measurement of the dissolved oxygen concentrations, probably using the method described above.

If the apparent lack of dissolved oxygen detected in the ASB001 effluent is verifiable, additional BOD removal might be affected by increasing aeration.

EE:WY:ee

cc: Central Files through Skip Harlan
Dick Cunningham

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Blue Creek, upstream aliquot - 250 ml/30 min.	4/18/78, 0835	Approximately 7 ft. upstream of mill weir
2. Blue Creek, downstream aliquot - 250 ml/30 min.	4/18/78, 0930	Approximately 5 ft. upstream of (002 discharge) mill weir
3. Aerated stabilization basin eff. aliquot - 250 ml/30 min.	4/18/78,	Immediately below north effluent (001 discharge) weir.

Grab Samples

	Date and Time	Analysis	Sample Location
1.	4/18/78 - 0955	Dissolved O ₂	A.S.B. effluent
2.	4/18/78 - 1630	Dissolved O ₂ , Coliform	Blue Creek upstream
3.	4/19/78 - 0830	Dissolved O ₂ , Coliform	Blue Creek upstream
4.	4/19/78 - 0915	Dissolved O ₂ , Coliform	Blue Creek downstream
5.	4/19/78 - 0940	Dissolved O ₂ , Coliform	A.S.B. effluent
6.			

Flow Measuring Device - See attachment

1. Type
2. Dimensions

a. Meets standard criteria Yes
 No Explain:

b. Accuracy check

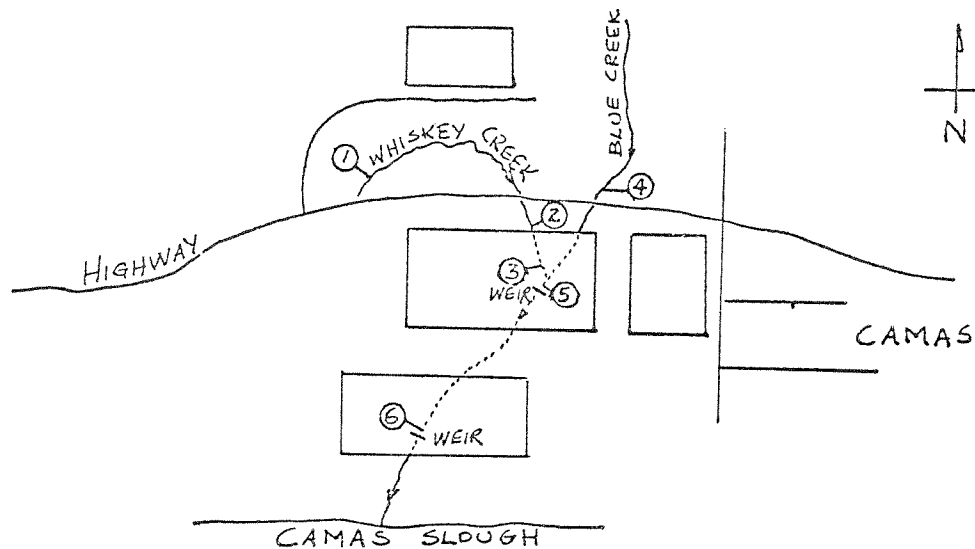
	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.			
2.			
3.			

- 1.
- 2.
- 3.

is within accepted 15% error limitations
 is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
Temp., pH, Conductivity	4/18/78 - 0835	Blue Cr. upstream	See results.
Temp., pH, Conductivity	4/18/78 - 0930	Blue Cr. downstream	See results.
Temp., pH, Conductivity	4/18/78 - 0955	ASB effluent	See results.
Temp., pH, Conductivity	4/18/78 - 0850	Whiskey Cr. at confluence w/Blue Cr.	See results.
Temp., pH, Conductivity	4/18/78 - 1300	Blue Cr. upstream of plant	See results.
Temp., pH, Conductivity	4/18/78 - 1310	Whiskey Cr. upstream of plant	See results.
Temp., pH, Conductivity	4/18/78 - 1320	Whiskey Cr. immediately before entering beneath plant.	See results.



Grab and Field Sample Results

Station Number	Station Name	pH		Sp. Conductivity		Temp. °C		T.C. ¹ #/100 ml		F.C. ² #/100 ml		D.O. ³ mg/l		D.O. % Sat. ⁴	
		4/18	4/19	4/18	4/19	4/18	4/19	4/18	4/19	4/18	4/19	4/18	4/19	4/18	4/19
1	Whiskey Creek Upstream	6.9		113		9.7°C									
2	Whiskey Creek Imm. Upstream of Plant	6.7		128		10.8°C									
3	Whiskey Creek at Confluence w/Blue Creek	6.9	7.8	152	192	18.0°C	12.6°C								
4	Blue Creek Upstream of Plant	6.9		89		11.4°C									
5	Blue Creek Upstream	7.2	7.6	100	111	12.1°C	11.5°C	13,000	26,000	1400	>12,000	10.2	10.5	94.7%	96.2%
6	Blue Creek Downstream	7.3	6.9	173	125	15.3°C	17.1°C		22,000		>3,000		7.95		82.3%
	A.S.B. Effluent	5.6	5.6	1410	1675	21.8°C	21.7°C	>60,000	>40,000	470	330	0	0	0%	0%

- 1) Total Coliforms
- 2) Fecal Coliforms
- 3) Dissolved Oxygen - mg/l
- 4) Dissolved Oxygen, percent of theoretical saturation

Review of Laboratory Procedures and Techniques

Laboratory procedures were discussed with Dave Bachman, using a laboratory procedure survey developed by Roger Stanley. Results of that survey may be found further within this report.

Crown Zellerbach's BOD₅ procedure appears to be adequate, except for the fact that they are incubating the BOD₅ sample bottles in a water bath with a clear cover. This is contrary to accepted methods as described in NCASI procedures, which the Crown Zellerbach Laboratory follows.

The only discrepancy in the TSS procedure was that we found no means of temperature identification within the drying oven. Apparently the thermometer had been broken and not replaced.

Parameter	DOE Results 001 (ASB) Effluent		CZ Mill 001 (ASB) Effluent		CZ ESD Lab 001 (ASB) Effluent		NPDES Limitations (Daily Average)
	DOE ¹	CZ ²	DOE ¹	CZ ²	DOE ¹	CZ ²	
BOD ₅ (mg/l) (lbs/day)	21 11,700	27 15,100	43 24,000	38 21,200	32 17,900	34 19,000	26,000
TSS (mg/l) (lbs/day)	44 24,600	46 25,700	60 33,500	50 27,900	40.4 22,600	60 33,500	41,000
Flow (MGD)	67.0	67.0	67.0	67.0	67.0	67.0	
TOD (mg/l)	283	283					
pH	5.8	5.6	5.8	5.6	5.6	5.5	5.0-8.5
App. Cond. (umhos/cm)	1500	1520			1614	1614	
Turb. (NTU's)	21	21					
NO ₃ -N (mg/l)	<.02						
NO ₂ -N (mg/l)	<.02						
NH ₃ -N (mg/l)	2.3						
Ortho-PO ₄ -P (mg/l)	0.30						
Total-PO ₄ -P (mg/l)	0.35						
Total Solids (mg/l)	1395	1632					
Total Non-Vol. Solids (mg/l)	829	962					
Total Susp. Non-Vol. Solids (mg/l)	20	20					
Dissolved O ₂ (mg/l) 4/18	0	*3.1					
4/19	0						
Total Coliforms (#/100 ml)		>40,000				<100,000	
Fecal Coli. (#/100 ml)		330				<100,000	
BI	1970	2110					
Copper	0.02	0.02					

C.Z. YSI probe reading.

¹) Sample collected with DOE composite sampler.

²) Sample collected with Crown Zellerbach Composite sampler.

Parameter	DOE LAB				CZ MILL LAB				CZ ESD LAB				NPDES (Monthly Average lbs/da
	002 Upstream		002 Downstream		002 Upstream		002 Downstream		002 Upstream		002 Downstream		
	DOE	CZ	DOE	CZ	DOE	CZ	DOE	CZ	DOE	CZ	DOE	CZ	
BOD ₅ (mg/l) (lbs/day)	3 80	5 133	>29 >1906	19 1249	6 210	6 210	22 1009	23 1055	2.0 70	4.3 151	29 1330	25 1147	2000
TSS (mg/l) (lbs/day)	24 641	29 774	22 1446	23 1512	20 701	12 420	16 734	24 1101	18.5 648	28.8 1009	18.1 830	34.2 1569	3000
Flow (MGD)	3.2		7.88		4.2		5.5		4.2		5.5		
COD (mg/l)	36	44	167	145									
pH	7.4	8.7	6.9	7.1	7.5	8.4	6.9	7.0	7.3	8.3	6.7	6.7	5.0-8.5
Specific Cond.	101	127	290	249	85	110	200	200	95	138	246	233	
Turbidity (NTU's)	8	9	7	7									
NO ₃ -N (mg/l)	.66		.62										
NO ₂ -N (mg/l)	<.02		<.02										
NH ₃ -N (mg/l)	.04		.06										
O-PO ₄ -P (mg/l)	.02		.08										
Total Phos-P (mg/l)	.06		.18										
Total Solids (mg/l)	87	117	256	234									
Total Non. Vol. Solids (mg/l)	55	79	118	119									
Total Sus. Non. Vol. Solids (mg/l)	17	23	13	16									
Dissolved O ₂ (mg/l) 4/18	*10.5												
(mg/l) 4/19	*10.2		*7.95										
	DOE Sample		CZ Sample		DOE Sample		CZ Sample		DOE Sample		CZ Sample		
BOD Loading **(lbs/day)	>1828		1120		799		845		1260		996		
TSS Loading **(lbs/day)	825		762		33		681		182		560		

**Loading increase between 002 upstream and 002 downstream, see "Flow Measuring Devices" for explanation of flows used.

Flow Measuring Devices

Blue Creek Upstream

Type - Rectangular Weir
 Dimensions - 72" width

Does not meet standard criteria: A) Weir out of level by 1-5/8".
 B) Sharp crest not maintained.
 C) Head level indicator inaccurate.

Accuracy Check

Actual Head		Actual Flow MGD	Recorded Head	Flow Calculated From Recorded Head	Recorded Accuracy % of Actual Flow
Left Bank	Right Bank				
4.75"	6.375"	4.10*	6.75"	5.45"	133%

*Calculated from $Q = 3.33 LH^{3/2}$, $Q = \int_0^6 3.33 (0.396 + 0.023L)^{3/2} dL$
 Depth-of-head recorder inaccurate.
 Reported flows inaccurate, 33% greater than actual.

Blue Creek Downstream (002)

Type - Concrete Dam Weir
 Dimensions - 116" Width

Does not meet standard criteria: A) Weir not sharp-crested.
 B) Weir poorly maintained, deteriorating.

Accuracy Check

Actual Instan. Flow*	Recorded Head	Flow Calculated C.Z. Flow Chart	Flow Calculated From Eq. 1	Recorder Accuracy**
7.81 MGD	4.9"	5.45 MGD	4.99 MGD	70%

*Measured using magnetic flow meter.
 **100 (Actual flow/flow calculated from C.Z. Flow Chart).

The C.Z. Flow Chart is based on a sharp-crested weir. This weir more closely approximates a broad-crested weir. Flows over broad-crested weirs are calculated using Equation #1.

Eq. 1 $Q = 3.09 LH^{3/2}$
 where Q = Flow, cfs
 L = Weir Length, Ft.
 H = Head, Feet

Because the lip of this weir is extremely uneven and deteriorating, it is unlikely that flows can be accurately gaged.

NOTE - Because of substantial discrepancies in flows measured at Blue Creek weirs, flows and loadings are reported as follows:

- 1) Flows reported in the results section for Blue Creek Upstream
 - A) CZ Columns - flows transmitted by letter to DOE, 5/9/78.
 - B) DOE Columns - flows calculated from continuous head recorder x 0.72 to compensate for error.
- 2) Flows reported in the results section for Blue Creek Downstream
 - A) CZ Columns - flows transmitted by letter to DOE, 5/9/78.
 - B) DOE Columns - flows calculated from continuous head recorder x 1.43 to compensate for error.

ASB Effluent (001)

Type - 3 sharp-crested, contracted, rectangular weirs
 Dimensions - 11-1/2 foot width

South Weir		Middle Weir		North Weir		Mean Head	Actual Flow*	Recorded Head	Recorded** Head	Recorder Accuracy % of Inst. Flow
L. Side	R. Side	L. Side	R. Side	L. Side	R. Side					
11.0"	11.25"	11.5"	11.62"	11.56"	11.56"	11.42	67.8 MGD	11.4"	67.3 MGD	99.3%

*Computed from Eq. 2 for flow over contracted weirs.

**From mill chart

Eq. 2 $Q = 3.33 (L - 0.2 H) H^{3/2}$
 where Q = Flow, Ft.³/sec
 L = Width of Weir, Ft.
 H = Head, Feet

Accuracy very good. Because of this, flows transmitted by letter to DOE 5/9/78, are used exclusively in calculating loadings.