Publication No. 78-e28
WA-CR-1010

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

October 13, 1978

MEMORANDUM

To: Jon Neel

From: Bill Yake

Re: Weyerhauser Pulp (Longview) Class II Inspection

Introduction:

A Class II inspection was performed at the Weyerhaeuser Pulp Mill in Longview, Washington August 15-16, 1978. Present were Bill Yake and Greg Cloud (DOE, Water and Wastewater Monitoring); John Stetson, Jon Neel, and Bob Bishop (DOE, Industrial Section), Dan Tangerone (EPA); and Roger Yerkes, Suzanne Perry, and Dave Hamilton (Weyerhaeuser Pulp Mill).

The major discharges (001 and 002) at this facility are effluents from the primary and secondary (activated sludge) pulping wastewater treatment systems. Both DOE and Weyco composite samplers were used to collect primary and secondary effluent from these systems. Samples were split and run by the DOE (Tumwater laboratory), the Weyerhaeuser Pulp Mill laboratory, and the Weyerhaeuser regional laboratory. Grab or grab composite samples were taken from the A/C sump line (bypass), the E sump (water treatment backwash), and the sanitary treatment system effluent. These samples were also split and analyzed by all three laboratories.

This facility discharges to the Columbia River which is identified in the Five-Year Strategy only as exceeding receiving water standards for total dissolved gases.

Findings and Conclusions:

At approximately 3 p.m., August 15, 1978, one of three pumps serving the A/C sump by pumping wastewater to the secondary treatment system failed. All A/C sump water bypassed the treatment system for about six hours. During the remainder of the inspection the bypass valve was partially closed allowing only approximately 20 percent of the A/C flow to be bypassed to the Columbia River. During the inspection, therefore, treated and untreated pulp process wastewaters were discharged from several locations: 1) primary clarifier discharge, 2) discharge from two secondary clarifiers, and 3) A/C sump bypass. These effluent loadings are presented in Table 5 and are compared to NPDES permit limitations for BOD_5 and suspended solids. During the inspection period the pulp process wastewater (001 and 002) were meeting NPDES permit limitations for suspended solids. Although the monthly average BOD_5 limitations were being exceeded, effluent loadings were below daily maximum limitations.

Several pumps in the wastewater collection and treatment system at the mill were of the same materials and construction as the pump which failed. Because pump failure was evidently due to impeller corrosion and disintegration, and because these pumps were installed at or near the same time, there is a possibility of additional pump failure. The replacement of these pumps is complicated by the fact that changes in the system (scheduled within the next year) will result in the abandonment of the remaining questionable pumps.

As has been noted in previous inspections of secondary pulp mill effluents, total and fecal coliform concentrations were substantial.

The sanitary effluent met NPDES permit limitations for BOD_5 and suspended solids. Flow exceeded monthly average limitations but fell below monthly maximum limitations. A chlorine residual of 6 mg/l was recorded during the inspection which exceeds the permit limitation of 5 mg/l. It was noted during the laboratory review that the pulp mill was using a type of DPD chlorine residual tablet which was formulated to measure free chlorine residual. This results in underestimation of total chlorine residual. Care should be taken that the correct tablets are used so that total chlorine residual is measured and recorded. The chlorine contact chamber is well designed and total residual concentrations of 1 mg/l should be sufficient to lower fecal coliform concentrations to permitted levels. A decrease of 5 mg/l chlorine residual would result in annual savings of about $1,500.

The suspended solids concentration recorded from the Weyco backwash (E sump) composites was not particularly high although there is some question about the placement and operation of Weyco's backwash composite sampler. The intake nozzle is not set into the pipe and into the flow. This, in conjunction with low sampler intake velocity, probably biases the samples to the low side. Additionally, flow in the backwash effluent pipe is intermittent and settling in the line below the intake port and may further bias suspended solids concentrations.

Collection, storage and analyses of pulp mill samples were reviewed with mill personnel and the findings are summarized in the "Review of Laboratory Procedures and Techniques."

The complete results of all entities' sampling and analytical efforts are presented in Tables 1 through 4.

BY:av
101231

cc: Dick Cunningham
Central Files through Skip Harlan
Files (2)

REVIEW OF LABORATORY PROCEDURES AND TECHNIQUES

Laboratory procedures for analysis of BOD_5 and suspended solids were reviewed in detail with Dave Hamilton of the Weyerhaeuser Pulp Mill laboratory. The attached "Laboratory Procedural Survey" contains this detailed information. In addition, BOD_5 and TSS test samples were provided for the Weyerhaeuser Pulp Mill laboratory for analysis. The results of these analyses are given in Table 6. Based on this information the following major points are noted.

BOD_5 Analysis

1. Collection - Weyco samples are not refrigerated as collected. Intake hoses had considerable wall growth and should be cleaned out periodically. These lines were cleaned out during the inspection.

2. Storage - Sanitary samples are frozen prior to analyses. All BOD_5 samples are held up to 6 days prior to analyses. Sample freezing and delays of greater than 24 hours before analyses are contrary to accepted procedures (Standard Methods, DOE BOD_5 procedures, etc.).

3. Test Procedures - Samples are not brought to room temperature prior to dilution. The zero-day D.O. is determined from the lowest sample dilution bottle only. These procedures may lead to errors in determining the zero-day D.O. for other dilutions. Modifications to resolve this problem should be instituted.

4. Split Samples - Weyco Pulp Mill BOD_5 results were generally higher than either DOE laboratory results or Weyerhaeuser regional laboratory results. Although this may, in part, be due to the fact that the Weyco laboratory does not correct for dilution water D.O. drops, there are probably other factors involved.

5. Test Sample - Weyco Pulp Mill BOD_5 results on the test sample were very close to the "true value" provided by EPA.

6. Errata - It appears that the sanitary effluent sample processed by the Weyerhaeuser regional laboratories was not dechlorinated and/or reseeded.

TSS Analysis

1. Collection - Weyco compositor inlet velocity is very low; however, results from Weyco samplers showed generally higher TSS values than samples from DOE samplers.

2. Test Procedure - The Weyco laboratory is using a Whatman GF/C filter which no longer meets the specifications for suspended solids analysis. It is suggested that this be replaced by a Reeve Angel 934 AH or Gelman Type A/C filter when the present supply is exhausted. Also, filters should be rinsed prior to drying, dessication and analysis. Finally, filters are not dessicated at room temperature prior to final weighing. It is important that this be done.

3. Split Samples - Agreement between DOE and Weyco Pulp lab samples was fair, with some moderate discrepancies. There was no clear pattern to the discrepancies.

4. Test Samples - The Weyco Pulp lab reported consistently low values, but indicated that there were difficulties encountered in running the test samples including the loss of solids from the filter paper while handling, drying, etc.

General Conclusions:

The results of the review, split samples, and test samples do not lend themselves to unambivalent conclusions. In general, the BOD_5 results from primary effluent analysis agree more closely with DOE results than do the secondary effluent sample analyses. This appears to be a pattern with secondary pulp wastewater effluents and may well be a function of the unusual characteristics displayed by these effluents (i.e., low BOD:COD ratio, low reaction rate constant (k), erratic long-term BOD satisfaction curve, etc.). At best, BOD_5 appears to be only a marginal indicator of the organic constituents of secondary pulp mill effluent.

The Weyco Pulp Mill laboratory has several procedural problems with both BOD_5 and TSS collection and analyses. These should be addressed as soon as possible. If this is done, results of proceeding Class II inspections may more clearly isolate remaining discrepancies.

Table 1

Comparison of Laboratory Results from 24-Hour Composites
Together with NPDES Permit Effluent Limitations

(Additional results pertinent to this inspection have also been included)

	DOE		WEYCO	NPDES (Monthly) Average)
	Sanitary ** Effluent	Backwash *** & Sump	Sanitary ** Effluent	
BOD_5 mg/l	11		5	30
lbs/day	37		17	75
TSS mg/l	12		16	30
lbs/day	40		54	75
Total Plant Flow (MGD)	0.403		0.403	0.3
Fecal Coliforms (no./100 ml)	<10[1] <10[2]			200
Chlorine Residual (mg/l)*	6.0 + 1 3.0			0.5-5.0
pH (S.U.)	6.6			
Spec. Cond. (μmhos/cm)	6540			
Turbidity (JTU)	12			
NH_3-N (mg/l)	0.40			
NO_2-N (mg/l)	<0.02			
NO_3-N (mg/l)	<0.02			
O-PO_4-P (mg/l)	0.80			
T-PO_4-P (mg/l)	1.30			
Total Solids (mg/l)	394	231		
TNVS (mg/l)	329	181		
TSS (mg/l)	12	130		
TNVSS (mg/l)	5	108		
COD (mg/l)	270			

*Field Analysis: "<" is "less than" and ">" is "greater than"
**Grab Composite
[1]Grab Sample - 7/15/78 - 1045
[2]Grab Sample - 7/17/78 - 1010
***Weyco Composite Sample Split

Table 2

Comparison of Laboratory Results from 24-Hour Composites
Together with NPDES Permit Effluent Limitations

(Additional results pertinent to this inspection have also been included)

	DOE SAMPLERS								NPDES (Monthly Average) 001 and 002 Discharges
	DOE Laboratory Results				WEYCO Laboratory Results				
	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	A/C Bypass 1/	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	A/C Bypass 1/	
BOD_5 mg/l	92	20	14	170	109	27	35	213	
lbs/day	19,490	2,785	1,950	18,150	23,090	3,760	4,870	22,740	26,800
TSS mg/l	29	80	60	122	31	55	72	72	
lbs/day	7,015	11,140	8,355	13,025	6,570	7,660	10,030	7,690	44,800
Flow (MGD)	25.4	16.7	16.7	12.8	25.4	16.7	16.7	12.8	85
COD (mg/l)	3/	543	520	950	228	456	494	741	
Fecal Coliforms (No./100 ml)	64,000 1/		27,000 1/ (est.)						
pH (S.U.)	6.7 6.5 4/ 7.5 2/	6.4 6.4 4/ 5.7 2/	6.4 6.3 4/ 5.8 2/	12.1					5.0-9.0
Turbidity (JTU)	42	26	18	24					
Spec. Cond. (μmhos/cm)	1,060 876 4/	2,060 1,950 4/	1,890 1,650 4/	6,590					
NH_3-N (mg/l)	1.65	2.35	1.10	0.40					
NO_2-N (mg/l)	<0.02	<0.02	<0.02	<0.02					
NO_3-N (mg/l)	<0.02	<0.02	<0.02	<0.02					
O-PO_4-P (mg/l)	0.1	1.5	1.3	0.8					
T-PO_4-P (mg/l)	0.6	1.9	1.6	1.3					
Total Solids (mg/l)	805	1,734	1,616	3,555					
Tot. Non.Vol. Solids (mg/l)	769	1,204	1,139	2,976					
TSS (mg/l)	29	60	60	122					
TNVSS (mg/l)	13	10	17	36					
Color (Color Units)	142	1,830	1,690	1,890					

1/ Grab Sample
2/ Field Analysis - Grab
3/ Apparent Laboratory Error
4/ Field Analysis - Composite

Table 3

Comparison of Laboratory Results from 24-Hour Composites
Together with NPDES Permit Effluent Limitations

(Additional results pertinent to this inspection have also been included)

	WEYCO SAMPLERS								NPDES (Monthly Average) 001 and 002 Discharges
	DOE Laboratory Results				WEYCO Laboratory Results				
	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	A/C Bypass 1/	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	A/C Bypass	
BOD_5 mg/l	52	28	36		90	36	29		
lbs/day	12,150	3,970	5,100		21,020	5,100	8,370		26,800
TSS mg/l	54	96	62		52	86	56		
lbs/day	12,610	13,610	8,790		12,140	12,190	7,940		44,800
Flow (MGD)	28	17	17	12.8	28	17	17	12.8	85
COD (mg/l)	220				190				
pH (S.U.)	6.9	6.5	6.3						5.0-9.0
Turbidity (JTU)	40	26	-						
Spec. Cond. (μmhos/cm)	1,080	2,140	2,110						
NH_3-N (mg/l)									
NO_2-N (mg/l)									
NO_3-N (mg/l)									
O-PO_4-P (mg/l)									
T-PO_4-P (mg/l)									
Total Solids (mg/l)	781	1,729	1,714						
Tot. Non.Vol. Solids (mg/l)	652	1,188	1,195						
TSS (mg/l)	54	96	62						
TNVSS (mg/l)	18	16	12						
Color (Color Units)	188	1,740	1,690						

1/ Grab Sample

Table 4

Results of Weyco Regional Laboratory Analysis

	DOE SAMPLERS				WEYCO SAMPLERS				
	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	A/C 1/ Bypass	Primary Effluent	Secondary Clarifier No. 1 Effluent	Secondary Clarifier No. 2 Effluent	Sanitary Effluent 2/	Backwash E-Sump 3/
BOD mg/l	75	11	11	171	43	20	18	1	3
lbs/day	15,890	1,530	1,530	18,250	10,040	2,840	2,550	3.4	
TSS mg/l	45	48	75	97	29	77	114	11	27
lbs/day	9,530	6,690	10,450	10,350	6,770	10,920	16,160	37	
Flow (MGD)	25.4	16.7	16.7	12.8	28	17	17	0.403	
COD (mg/l)	169	443	494	665	140	450	462	46	34
pH	6.7	6.3	6.2	12.4	6.8	6.2	6.2	6.5	6.9
Turbidity (JTU)	27	23	17	17	33	19	33	8.9	6.9
Spec. Cond. (μmho/cm)	747	1,420	1,490	4,310	747	1,490	1,430	441	106
NH_3-N (mg/l)	1.30	1.17	1.15		0.99	1.05	0.93		
NO -N (mg/l)	0.03	0.04	0.03		0.05	0.06	0.03		
T-PO_4-P (mg/l)	0.34	1.75	1.98		0.36	2.01	1.83		
Color (APHA units)	333	1,460	1,700	989	341	1,950	1,260	146	38

1/ Grab Sample
2/ Grab Composite
3/ Weyco Composite Split

Table 5

Total 001 and 002 Effluent Data

	DOE SAMPLER - DOE ANALYSIS 0945/8-15-78 to 0945/8-16-78					WEYCO SAMPLERS - WEYCO ANALYSIS 1/ 0700/8-15-78 to 0700/8-16-78					DOE SAMPLERS - WEYCO ANALYSIS 2/ 0945/8-15-78 to 0945/8-16-78				
	Flow	BOD_5 mg/l	BOD_5 lbs/day	TSS mg/l	TSS lbs/day	Flow	BOD_5 mg/l	BOD_5 lbs/day	TSS mg/l	TSS lbs/day	Flow	BOD_5 mg/l	BOD_5 lbs/day	TSS mg/l	TSS lbs/day
Primary Clarifier Effluent	25.4	92	19,490	29	7,015	28	90	21,020	52	12,140	25.4	75	15,890	45	9,530
Secondary Clarifier No. 1 Effluent	16.7	20	2,785	80	11,140	17	36	5,100	86	12,190	16.7	11	1,530	48	6,690
Secondary Clarifier No. 2 Effluent	16.7	14	1,950	60	8,355	17	29	8,370	56	7,940	16.7	11	1,530	75	10,450
Subtotal	58.8		24,225		26,510	62		34,490		32,270	58.8		18,950		26,670
A/C Bypass	12.8	170	18,150	122	13,025	12.8	213	22,740	72	7,690	12.8		18,250	97	10,350
Total Discharges	71.6		42,375		39,535	74.8		57,230		39,960	71.6		37,200		37,020
Permit Limitation (Monthly Average)	85		26,800		44,800	85		26,800		44,800	85		26,800		44,800
Permit Limitation (Daily Maximum)	100		51,700		83,800	100		51,700		83,800	100		51,700		83,800

1/ Weyco Pulp Mill Laboratories
2/ Weyco Regional Laboratories

Table 6

Test Samples

Parameter	Code	Actual Value (mg/l)	WEYCO Value (mg/l)
BOD_5	-	145	140
TSS (fibrous)	AA 819	29.3	18
TSS (fibrous)	AB 781	222.9	120
TSS (fibrous)	AC 786	952.6	600
TSS (fine particles)	BA	39.1	33
TSS (fine particles)	BB	252.1	200
TSS (fine particles)	BC	884.4	780

LABORATORY PROCEDURAL SURVEY

Discharger: **Wenatchee Pulp Mill - Longview, Washington**

NPDES Permit Number: WA 0000124

Date: 8/15/78

Industry Representatives present: Dave Hamilton

Agency Representatives present: Bill Yake, Greg Cloud

I.) BIOCHEMICAL OXYGEN DEMAND CHECKLIST

What analysis technique is utilized in determining biochemical oxygen demand?

1. Standard Methods X
2. EPA _____
3. NCASI _____
4. Other _____

A.) SAMPLE COLLECTION AND PREPARATION

1. Are samples collected at a point where homogeneous conditions exist? Yes, however hoses have considerable wall growth
2. Are samples collected via composite or grab? Composite
3. What is compositing period? 24 hr. (3-8 hr shifts) How often does compositor draw a sample? Variable
4. Is composite sample flow proportional? Yes
5. Are composites refrigerated during collection? No
6. Are BOD samples frozen prior to analysis? No (Sanitary Eff. samples are frozen)

   If Yes: a.) For how long? N.A.

   b.) Are samples reseeded before set-up? -
7. How long are samples held prior to analysis? Up to 6 days
8. Under what condition are samples held prior to analysis?

   4°C, Refrigerated

9. What is the approximate sample water temperature at time of set-up? 4°C, THIS MAY BE SIGNIFICANT AT LOW DILUTIONS

10. Are compositor bottles and sampling lines cleaned periodically? NO, SAMPLING LINES NEARLY CLOGGED W/ WAX GROWTH

11. Does compositor go through a flush cycle before drawing sample? NO

12. Are composite container contents mixed thoroughly before sample is withdrawn? YES

B.) SEED MATERIAL

1. Is seed material used in determining BOD? PRIMARY EFFLUENT SEEDED, SECONDARY NO.

2. Where is seed material obtained? UNCHLORINATED EFF. FROM LONGVIEW, STP.

3. Is seed from an unchlorinated effluent? YES

4. How long is a batch of seed kept? ONE DAY

5. Under what conditions is seed kept? (temperature, dark)

4°C, IN REFRIGERATOR

C.) DILUTION WATER

1. Reagent water utilized in preparing dilution water is:

distilled, deionized, tap, other STAINLESS STEEL DISTILLED

If tap, is it chlorinated or unchlorinated? N/A

2. Is reagent water aged prior to use? YES

3. How long is it aged, and under what conditions? AT ROOM TEMP, IN DARK BOTTLE, ABOUT 1 WEEK.

4. When is the phosphate buffer added (in relation to sample set-up)? IMMEDIATELY BEFORE DILUTIONS MADE UP.

5. Are the four (4) nutrient buffers added to the reagent water in prescribed volumes? YES

6. How often is dilution water made up? (Maximum age of dilution water at time of set-up.) ONE WEEK

7. How often are BOD's being set up? Weekly

8. Under what conditions is reagent water kept? Dark 40 gal. Bottles at room temperature.

9. Under what conditions is dilution water kept? N/A.

10. What is dilution water temperature at time of set-up? 20°C
Thermostat on room

D.) TEST PROCEDURE

1. Does sample to be tested contain residual chlorine? Sanitary, Yes.

   If yes, is sample dechlorinated and reseeded? Sanitary not dechlorinated, is reseeded.

2. Is sample pH 6.5-8.5? Not always, adjusted to 6.0-8.0

   If no, is sample pH adjusted and reseeded? Yes

3. How is pH measured? Photovolt pH meter

   Probe calibration frequency: 2-3 days

4. Is effluent sample toxic? Not apparently

5. Is BOD of dilution water determined? Blank incubated 5 days, not used in calculations.

6. Is seed BOD determined? Yes

7. Is BOD of seeded blank determined? Yes

   If yes, is 5-day dissolved oxygen depletion of seeded blank near 0.5 mg/l beyond that of dilution water blank? Yes, they aim for 0.6 mg/l seed depletion

8. Is zero day D.O. obtained from sample dilution or from dilution water prior to sample addition?

   From sample dilution (from lowest dilution factor only for each series of dilutions)

9. What is the range of zero day D.O. in dilution water blank?

   8.0 - 9.0 mg/l

10. How much seed is used in preparing seeded dilution water?

    Calculated to produce 0.6 mg/l drop in D.O. (Based on BOD_5 = 0.4 COD)

11. Is liter dilution method or bottle dilution method utilized in the preparation of:

a.) Seeded dilution water: 1 liter

b.) Sample dilutions: 1 liter

12. Are samples and controls incubated for 5 days at 20°C? Yes

13. How is incubator temperature range regulated and kept track of? THERMOSTAT ON INCUBATOR

14. By what method are dissolved oxygen concentrations determined?

Probe x YST Winkler _____ Other _____

If by probe: What method of calibration is in use? WINKLER

What is frequency of calibration: DAILY

If by Winkler: Is sodium thiosulfate or PAO used as titrant?

How is standardization of titrant accomplished? DICHROMATE STANDARD

What is the frequency of standardization?

WEEKLY

15. What is the observed dissolved oxygen depletion in the dilution water blank? USUALLY 0.1 - 0.3 mg/l

BIOCHEMICAL OXYGEN DEMAND
METHODS FOR CALCULATING FINAL VALUES

1.) WASHINGTON STATE DEPARTMENT OF ECOLOGY

A.) CORRECTION FACTORS

1. Dilution factor:

$$= \frac{\text{total dilution volume (ml)}}{\text{volume of sample diluted (ml)}}$$

2. Seed correction:

$$= \frac{(\text{BOD of Seed})(\text{ml of seed in 1 liter dilution water})}{1000}$$

3. F factor ∿ a minor correction for the amount of seed in the seeded reagent versus the amount of seed in the sample dilution:

$$F = \frac{[\text{total dilution volume (ml)}] - [\text{volume of sample diluted, ml}]}{\text{Total dilution volume, ml}}$$

B.) FINAL BOD CALCULATIONS:

For seed reagent:

(seed reagent depletion-dilution water blank depletion) x D.F.

For seeded sample:

(sample dilution depletion-dilution water blank depletion-scf) x DF

For unseeded sample:

(sample dilution depletion-dilution water blank depletion) x D.F.

2.) INDUSTRY $BOD_5 = [(\text{ZERO DAY D.O.} - \text{SEED CORRECTION}) - \text{FIVE DAY D.O.}]\, df$

SEED CORRECTION CALCULATED ON BASIS OF DILUTIONS OF SEED MATERIAL AND VOLUME OF SEED MATERIAL ADDED.

II.) TOTAL SUSPENDED SOLIDS CHECKLIST

What analysis technique is utilized in determining total suspended solids?

a. Standard Methods

b. EPA

c. NCASI

d. Industry

A.) Sample Collection

1. Are TSS samples representative of the discharge in question, i.e., taken from a homogeneous segment of the effluent? GENERALLY

YES, SAMPLE LINE VELOCITY MAY BE LOW, INTAKE PLACEMENT ~~FROM~~ ON A/C BYPASS LINE. QUESTIONABLE

2. How long are samples held prior to analysis? RUN IMMEDIATELY

3. Is composite container well mixed when sample is withdrawn? YES

4. Under what conditions are samples held prior to analysis? N/A

B.) Test Procedure

1. What type of filter is utilized:

Reeve Angel 934 AH
Gelman Type A/E
Other WHATMAN GF/C Size 9CM - NOT APPROVED.

2. What type of filter support is used?

   Gooch crucible _____, Millipore filter suction base _____, Other 7 cm PLASTIC SCREEN

3. Are filters washed prior to adding sample? No, JUST DRIED

   a. If yes: are filters then dried for a minimum of one hour YES at 103-105°C YES.

   b. Are filters allowed to cool in a dessicator prior to weighing? YES

4. How are filters stored prior to use? IN DESSICATOR

5. What is the average and minimum volume filtered?

   417 ml. IS MAXIMUM VOLUME, ADJUSTED DOWNWARD AS NEEDED

6. How is sample volume selected?

   a. ease of filtration _____

   b. ease of calculation _____

   c. grams per unit surface area _____

   d. other SEE ABOVE

7. What is the average filtering time (assume sample is from final effluent)? VARIES WITH SAMPLE

8. How does analyst proceed with the test when the filter clogs at partial filtration? REDUCE SAMPLE VOLUME, REPEAT

9. If less than 50 milliliters can be filtered at a time, are duplicate or triplicate filtrations performed? N/A

10. Is filter funnel washed following sample filtration? YES, IF SOLIDS ON FUNNEL VISUALLY NOTED

11. Following filtration, is filter dryed for 1 hour, cooled in a dessicator and then reweighed?

    IS NOT DESSICATED AFTER DRYING

12. Is a filter aid such as cellite used? No

TOTAL SUSPENDED SOLIDS
METHODS OF CALCULATION

1.) WASHINGTON STATE DEPARTMENT OF ECOLOGY

$$\text{mg/l TSS} = \frac{A-B}{C} \times 10^6$$

Where: A = final weight of filter & residue (grams)
B = initial weight of filter (grams)
C = milliliters of sample filtered

2.) INDUSTRY

FINAL WEIGHT - TARE WEIGHT = GRAMS RESIDUE / 417 MLS. SAMPLE

SPLIT SAMPLE RESULTS:

Origin of Sample _____
Collection Date _____

BOD		TSS		EPA BOD Standard	
DOE	IND.	DOE	IND.	DOE	IND.
___	___	___	___	___	___