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DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504

206/753-2353

**Publication No. 78-e40****WA-22-0030**M E M O R A N D U M

August 29, 1978

To: Ron Robinson

From: Eric Egbers

Re: Aberdeen STP

Date: July 25-26, 1978

Aberdeen STP is a primary plant with a treatment design flow of 4.5 MGD. The plant effluent is discharged into the Chehalis River, 18 miles upstream from the mouth. I met with Arne Wilppone, head operator, to discuss plant operation, problems and laboratory procedures.

The Aberdeen plant is in the design stages of becoming a secondary treatment facility. Therefore, most of its problems will be corrected when the new plant is constructed. Their laboratory is not large enough to handle the number of samples necessary to achieve accurate data. They have no way of calibrating their flow measuring device or obtaining an instantaneous flow from their weir because it lies beneath their grit chamber. They have no backup auxiliary power in case of a power failure, which happened while I was there. Hopefully these, and other problems, will be solved with the construction of the new facility.

## Findings and Conclusions

Fecal coliform concentrations during the inspection were greatly in excess of NPDES permit limitations. At the time the samples were taken, no chlorine residual was detected. The chlorine feed system is typical of older primary plants. An irregular shaped program disk relays the amount of chlorine needed according to average flow and time of day. As the flow increases or decreases, the amount of chlorine used is not adjusted. This poorly designed chlorine feed system, and a short contact time in the chlorine contact chamber make adequate disinfection difficult. Recurrent high wastewater flows, which often exceed design flow, probably aggravates this inefficiency.

Based on five year strategy figures, inner Grays Harbor is not meeting federal water quality standards for fecal coliform. Inadequate disinfection may be aggravating the situation within Grays Harbor. Suspended solids concentration also exceeded NPDES limitations.

Laboratory procedures were reviewed with Mr. Wilppone and were found to be acceptable. Specific problems are discussed under the heading "Laboratory Procedures".

The plant is maintained exceptionally well and Mr. Wilppone can be commended on this point.

#### Laboratory Procedures

Mr. Wilppone's technique and procedures appear to be acceptable. His problems arise from incorrect or inadequate equipment and lack of laboratory space.

#### BOD<sub>5</sub>

- 1) During the summer, the BOD water bath incubator may reach temperatures of 30°C, which render any BOD results useless. Mr. Wilppone said he will ask permission to have his BOD samples incubated at the Hoquiam plant, which has a reliable incubator.
- 2) To date, BOD analysis has been performed on the unchlorinated effluent. Mr. Wilppone agreed to begin performing the analysis on the chlorinated effluent as soon as he feels comfortable with the technique.
- 3) After examining their water distillation apparatus, I decided to collect a sample of their distilled water to check for heavy metals. As suspected, copper and zinc occurred in concentrations greater than desired for dilution water.
- 4) Mr. Wilppone did not analyze for BOD<sub>5</sub> on the sample split because of a dissolved oxygen depletion greater than 1.8 ppm in his dilution water. This depletion was probably due to the high temperature, 28°C, of his water bath incubator.

#### Suspended Solids

- 1) The dessicant in the dessicator had turned white. This dessicant should be removed, thoroughly dried, and placed back in the dessicator. The filter paper used for TSS analysis is not an approved type. Mr. Wilppone agreed to order either Gelman A/E or Reeve Angel 934AH filters as soon as his supply of Whatman #5 is exhausted.

#### Fecal Coliform

- 1) Fecal coliform analysis is performed at the Hoquiam STP.

EE:ee

cc: Dick Cunningham  
Central Files through Skip Harlan  
Bill Yake

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Automatic composite on influent aliquot - 250 ml every half hour		End of grit chamber prior to entering clarifier.
2. Automatic composite on unchlorinated effluent aliquot - 250 ml every half hour		The clarifier discharge point.
3. Automatic composite on chlorinated effluent aliquot - 250 ml every half hour		End of chlorine contact chamber prior to falling over weir.

Grab Samples

	Date and Time	Analysis	Sample Location
1.	7/26/78 @ 1000	Fecal Coliform	Chlorinated effluent
2.	7/26/78 @ 1000	Dissolved Oxygen	Chlorinated effluent
3.	7/26/78 @ 1200	Fecal Coliform	Chlorinated effluent
4.	7/26/78 @ 1200	Dissolved Oxygen	Chlorinated effluent
5.	7/26/78 @ 1230	Heavy Metals	Secondary digester
6.	7/26/78 @ 1245	Heavy Metals	Distilled water still

Flow Measuring Device

1. Type Weir. Type unknown due to location
2. Dimensions

a. Meets standard criteria  Yes

No Explain: Could not take accurate measurements due to location of weir.

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	None		
2.			
3.			

is within accepted 15% error limitations

is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
Temp.	7/26 @ 1110	Influent	9.6
pH			7.2
Cond.			> 1000
Temp.	7/26 @ 1100	Unchlorinated Effluent	12.0
pH			7.1
Cond.			> 1000
Temp	7/26 @ 1125	Chlorinated Effluent	11.2
pH			7.0
Cond.			> 1000

The following table is a comparison of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to this inspection have also been included.

	Influent	DOE		Aberdeen STP		NPDES (Monthly average)
		Unchlor. Effluent	Chlor. Effluent	Influent	Unchlor. Effluent	
BCD <sub>5</sub> mg/l	130	72	84			84
lbs/day	2591	1435	1674			6305
TSS mg/l	192	78	68	157	76	43
lbs/day	3827	1555	1355	3129	1515	3228
Total Plant Flow MGD			2.39			<9.0
Sp. Conductivity (µmhos/cm)	2320	2880	2830			
pH	7.0	7.1	7.1			6.0-9.0
COD (mg/l)	390	160	220			
Total Coliform (col/100 ml)			>80,000 <sup>1</sup> >80,000 <sup>2</sup>			
Fecal Coliform (col/100 ml)			>54,000 <sup>1</sup> >100,000 <sup>2</sup>			700
NO <sub>3</sub> -N (mg/l)	0.4	ND	0.2			
NO <sub>2</sub> -N (mg/l)	< 0.02	<0.02	< 0.02			
NH <sub>3</sub> -N (mg/l)	13.0	14.0	14.0			
D-PO <sub>4</sub> -P (mg/l)	3.0	3.2	3.2			
Total Phos-P (mg/l)	4.7	4.4	4.5			
Total Solids (mg/l)	1430	1696	1710			
Total Non. Vol. Solids (mg/l)	1110	1410	1420			
Total Sus. Non. Vol. Solids (mg/l)	60	34	30			
Cl <sub>2</sub> Residual (ppm)*			0.0 <sup>1</sup> 0.0 <sup>2</sup>			
Dissolved O <sub>2</sub> (ppm)**			1.1 <sup>1</sup> 0.5 <sup>2</sup>			

\* Field Analysis

\*\* Winkler-Azide

<sup>1</sup> - 7/26/78 @ 1000

<sup>2</sup> - 7/26/78 @ 1200

ND - None detected

"<" is "less than" and ">" is "greater than"

	DOE					NPDES (Monthly Average)
	Secondary Digester Sludge (mg/Kg dry wt)	Aberdeen Lab Distilled Water (mg/l)				
Copper	320	.02				
Chromium	33	<.01				
Lead	290	<.05				
Zinc	1070	.02				
Cadmium	4.6	<.01				
Iron		<.02				

\* Field Analysis

"<" is "less than" and ">" is "greater than"

## LABORATORY PROCEDURAL SURVEY

Discharger: Aberdeen STP, Aberdeen WashingtonNPDES Permit Number: Segment # 10-22-04Date: 7/25-26/78Industry Representatives present: Arne Wilppone - OperatorAgency Representatives present: Eric B. EgbersI.) BIOCHEMICAL OXYGEN DEMAND CHECKLIST

What analysis technique is utilized in determining biochemical oxygen demand?

1. Standard Methods 12<sup>th</sup>
2. EPA \_\_\_\_\_
3. NCASI \_\_\_\_\_
4. Other BOD manual by DOE/Kjosness  
Fecal coli. manual by DOE/Woodward

A.) SAMPLE COLLECTION AND PREPARATION

1. Are samples collected at a point where homogeneous conditions exist? yes
2. Are samples collected via composite or grab? grab. Semi composite  
4Am-8Am Lump grab, then grab hourly until 3pm.
3. What is compositing period? 12 hr. How often does compositor draw a sample? once per hour 8Am to 3pm
4. Is composite sample flow proportional? yes, they use  
a chart that equates the flow for the hour  
to the # of ml. sample to be collected.
5. Are composites refrigerated during collection? yes @ 4°C ± 1°
6. Are BOD samples frozen prior to analysis? No
  - a.) For how long? N/A
  - b.) Are samples reseeded before set-up? N/A
7. How long are samples held prior to analysis? up to 24 hours
8. Under what condition are samples held prior to analysis?  
refrigerated @ 4°C ± 1°

9. What is the approximate sample water temperature at time of set-up? 4°C ± 1°, recommended they sit out to equilibrate to room temperature.
10. Are compositor bottles and sampling lines cleaned periodically? N/A
11. Does compositor go through a flush cycle before drawing sample? N/A
12. Are composite container contents mixed thoroughly before sample is withdrawn? yes

B.) SEED MATERIAL

1. Is seed material used in determining BOD? no
2. Where is seed material obtained? N/A
3. Is seed from an unchlorinated effluent? N/A
4. How long is a batch of seed kept? N/A
5. Under what conditions is seed kept? (temperature, dark)  
N/A

C.) DILUTION WATER

1. Reagent water utilized in preparing dilution water is:  
distilled, deionized, tap, other Obtained from Weyerhaeuser Co.  
the day BOD<sub>5</sub> samples are to be run.  
If tap, is it chlorinated or unchlorinated? N/A
2. Is reagent water aged prior to use? N/A
3. How long is it aged, and under what conditions? N/A
4. When is the phosphate buffer added (in relation to sample set-up)? N/A
5. Are the four (4) nutrient buffers added to the reagent water in prescribed volumes? N/A
6. How often is dilution water made up? (Maximum age of dilution water at time of set-up.) N/A

7. How often are BOD's being set up? Weekly, Thursday
8. Under what conditions is reagent water kept? N/A
9. Under what conditions is dilution water kept? N/A
10. What is dilution water temperature at time of set-up? Room

D.) TEST PROCEDURE

1. Does sample to be tested contain residual chlorine? NO  
If yes, is sample dechlorinated and reseeded? N/A
2. Is sample pH 6.5-8.5? yes, usually 6.5-7.1  
If no, is sample pH adjusted and reseeded? \_\_\_\_\_
3. How is pH measured? Beckman Ceromatic SS-3  
Probe calibration frequency: 1 per day with 7 buffer only
4. Is effluent sample toxic? NO
5. Is BOD of dilution water determined? yes
6. Is seed BOD determined? NO
7. Is BOD of seeded blank determined? NO  
If yes, is 5-day dissolved oxygen depletion of seeded blank near 0.5 mg/l beyond that of dilution water blank? \_\_\_\_\_
8. Is zero day D.O. obtained from sample dilution or from dilution water prior to sample addition?  
\_\_\_\_\_
9. What is the range of zero day D.O. in dilution water blank?  
8.7-9.1
10. How much seed is used in preparing seeded dilution water?  
N/A
11. Is liter dilution method or bottle dilution method utilized in the preparation of:



- a.) Seeded dilution water: \_\_\_\_\_
- b.) Sample dilutions: 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? A water bath incubator with a thermometer within. They are having trouble with high temperatures in summer.
14. By what method are dissolved oxygen concentrations determined?
- Probe \_\_\_\_\_ Winkler  Other \_\_\_\_\_
- If by probe: What method of calibration is in use? \_\_\_\_\_
- What is frequency of calibration: \_\_\_\_\_
- If by Winkler: Is sodium thiosulfate or PAO used as titrant?
- How is standardization of titrant accomplished? according to BOD manual with dichromate.
- What is the frequency of standardization?
- Whenever it is made, every month or so.
15. What is the observed dissolved oxygen depletion in the dilution water blank? ~ 0.3

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

II.) TOTAL SUSPENDED SOLIDS CHECKLIST

What analysis technique is utilized in determining total suspended solids?

a. Standard Methods

b. EPA

c. NCASI

d. Industry Water Pollution Control Plant Operators  
Manual.

A.) Sample Collection

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

2. How long are samples held prior to analysis? up to 24 hr.

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

4. Under what conditions are samples held prior to analysis? \_\_\_\_\_

refrigerated @ 4°C ± 1°

B.) Test Procedure

1. What type of filter is utilized:

Reeve Angel 934 AH

Gelman Type A/E

Other Whatman 5 Size 9.0µm

2. What type of filter support is used?  
Gooch crucible \_\_\_\_\_, Millipore filter suction base \_\_\_\_\_,  
Other Buchner funnel
3. Are filters washed prior to adding sample? yes
- a. If yes: are filters then dried for a minimum of one hour yes at 103-105°C 103°C.
- b. Are filters allowed to cool in a dessicator prior to weighing? yes, for 1 hour
4. How are filters stored prior to use? Used immediately after cooling
5. What is the average and minimum volume filtered?  
250 ml. both raw and final.
6. How is sample volume selected?
- a. ease of filtration \_\_\_\_\_
- b. ease of calculation ✓
- c. grams per unit surface area \_\_\_\_\_
- d. other \_\_\_\_\_
7. What is the average filtering time (assume sample is from final effluent)? 10 min for final effluent, up to 30 min. for influent.
8. How does analyst proceed with the test when the filter clogs at partial filtration? waits for full volume to pass through filter
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
11. Following filtration, is filter dried for 1 hour, cooled in a dessicator and then reweighed?  
yes
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

SPLIT SAMPLE RESULTS:

Origin of Sample Influent and Unchlor. Effluent  
Collection Date 7/25-26

<u>BOD</u>		<u>TSS</u>		<u>EPA BOD Standard</u>	
<u>DOE</u>	<u>IND.</u>	<u>DOE</u>	<u>IND.</u>	<u>DOE</u>	<u>IND.</u>
_____	_____	_____	_____	_____	_____