ANDREA BEATTY RINIKER
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504-6811 • (206) 753-2353

MEMORANDUM
November 17, 1986

To: Jim Milton

From: Marc Heffner

Subject: Yakima Sewage Treatment Plant Class II Inspection, July 15-16, 1986

ABSTRACT

A Class II inspection was conducted at the Yakima Sewage Treatment Plant (STP) on July 15-16, 1986. The STP provides secondary treatment plus seasonal nitrification prior to discharge into the Yakima River. Inspection results were within NPDES permit limits and indicated the plant was being well operated.

INTRODUCTION

A Class II inspection was conducted at the Yakima Sewage Treatment Plant on July 15-16, 1986. The inspection was requested by Al Newman as a routine check of plant and laboratory performance. Objectives were to:

1. Collect samples and make flow measurements to estimate plant efficiency and National Pollutant Discharge Elimination System (NPDES) permit compliance.

2. Review laboratory procedures (including sample splits with the operator) to estimate accuracy of results and conformance with approved analytical techniques.

The inspection was conducted by Don Reif and Marc Heffner of the Ecology Water Quality Investigations Section with the help of Bruce Bates, process control supervisor, and Kathy Nichols, a laboratory technician at the Yakima STP.

The Yakima STP is designed to provide year-round secondary treatment plus nitrification between May 1 and November 1. During the

inspection, treatment was provided by one coarse bar screen, one comminutor, one grit basin, three primary clarifiers in parallel, two trickling filters in parallel, three aeration basins in series, two secondary clarifiers in parallel, and two chlorine contact basins in parallel (Figure 1). Figure 1 also notes the additional units available and the reasons they were not used during the inspection. Effluent is discharged to the Yakima River based on limits set forth in NPDES permit No. WA-002402-3. Sludge is anaerobically digested, centrifuged or dried on drying beds, then applied to agricultural land.

PROCEDURES

Composite and grab samples were collected during the inspection. Ecology composite samples were set up at the influent splitter box (influent sample) and outfall distribution box (effluent sample). Approximately 220 mLs of sample were collected every 30 minutes from approximately 0930 on July 15 to approximately 0930 on July 16. Yakima collected an influent composite sample at the influent splitter box and an effluent composite sample at the chlorine contact chamber outlet channel. The Yakima compositors ran from approximately 0400 on July 15 to approximately 0400 on July 16 and collected approximately 225 mLs of sample per hour between 1000 and 2400 hours and approximately 175 mLs of sample per hour between 2400 and 1000 hours. The volume change is an effort to reflect fluctuations in flow during the 24-hour period. The Ecology and Yakima composite samples were split for analysis by both Ecology and Yakima. Parameters analyzed are noted on Table 1. Table 1 also notes the sampling schedule and parameters analyzed for grab samples.

Plant flow is monitored in line at several stations. Meters measure flow routed to each primary clarifier (influent flow) and at the inlet of each chlorine contact basin (effluent flow). Ecology verification of plant meter accuracy could not be done during the inspection.

RESULTS AND DISCUSSION

Data for samples collected during the inspection are presented in Table 2. The data indicate that the plant was operating well during the inspection. BOD_5, TSS, and NH_3-N influent concentrations were being efficiently removed. This is particularly impressive because during the inspection one of the aeration basins was being removed from service while another basin was being put back into service. Removing the basin from service entailed sending the contents of the basin to the headworks after minimal solids removal using the DAF unit. The influent composite samplers were stationed to avoid the high solids flow from the aeration basin. The aeration basin changeover was necessitated by maintenance requirements involving rebalancing the diffused air/turbine mix aeration system. The operator

indicated that keeping the diffused air/turbine mix units properly balanced was becoming a maintenance problem.

Flow data are summarized in Table 3. The table notes a difference of approximately 2.5 MGD between the influent and effluent flow meters. The operator indicated that the influent flow meter is generally about 1 MGD greater than the effluent flow meter. The influent meter is usually used for NPDES permit reporting purposes. Loading calculations in this report were based on the effluent flow, since the effluent flow was greater. The influent flow is the sum of four meters; one meter at the inlet to each of the primary clarifiers. The operator reported that because of space limitations, the meters could not be installed in conformance with criteria specifying the length of straight pipe required before and after the meters. The meters require recalibration as different clarifiers are put into or removed from service resulting in a system of questionable accuracy. Plans have been made to install flow measurement equipment in the headworks area when funds are available.

Inspection data are compared to appropriate NPDES permit limits in Table 4. The inspection data were all within weekly and monthly limits during the inspection.

Metals analysis results from the sludge sample are presented in Table 5. The results indicate that the Yakima STP sludge metals concentrations fell within the range of concentrations found at activated sludge plants during previous Class II inspections.

Laboratory Review

Laboratory procedures at the STP were generally good. Laboratory responsibilities are shared by three staff members, necessitating good communication so that all personnel use the same procedures. Recommendations made to keep the Yakima STP laboratory procedures in conformance with approved methods include:

BOD_5:

1. Dilution water should be made fresh daily; storage is not recommended when tests are run without nitrification inhibitor (APHA, 1985, #5b, p. 528). It is recommended that the practice of saving excess dilution water for use the next day be discontinued. Excess dilution water should be discarded and a fresh batch made the day the test is set up.

2. BOD bottles should be cleaned thoroughly with detergent rather than just rinsed prior to use (APHA, 1985, #3a, p. 527). Improper cleaning may contribute to the occasional blank D.O. depletions >0.2 mg/L.

3. Sample pH should be routinely checked and adjusted if the pH falls outside the 6.5 - 8.5 range.

4. The dechlorination method outlined in Standard Methods should be used by all analysts (APHA, 1985, #5e2, p. 529).

5. Sodium thiosulfate standardization using potassium bi-iodate is suggested in preference to use of dichromate (APHA, 1985, #2e, p. 419).

6. An initial dissolved oxygen concentration should be determined on one bottle for all sample dilutions and blanks rather than on just one of the dilutions (APHA, 1985, #5g, p. 530).

7. Seed corrections should be made based on seed control data rather than seed blank data (APHA, 1985, #5d, p. 529; #6, p. 531).

8. Seed should be added at such a rate that D.O. uptake in the seeded dilution water is between 0.6 and 1.0 mg/L (APHA, 1985, #5d, p. 529).

9. BOD_5 calculations should be made with all dilutions meeting the criteria of a residual D.O. of at least 1.0 mg/L and a D.O. depletion of at least 2.0 mg/L (APHA, 1985, #6, p. 531). If a dilution fails to meet the criteria, calculations should not include that dilution.

TSS:

1. Filters should be pre-rinsed with distilled water prior to the drying and weighing cycle necessary to determine filter weight (APHA, 1985, #3a, p. 96).

2. Redrying and reweighing filters until a constant weight is attained (<0.5 mg or 4 percent weight loss between reweighings, whichever is less) is a suggested quality assurance technique (APHA, 1985, #3c, p. 97). Quarterly checks to assure proper solids drying using the redry/reweigh technique are recommended.

Many of these recommendations were made during the inspection and have already been implemented (Bates, 1986).

Results of the sample splits are summarized in Table 6. Results compare fairly well. The BOD_5 results at the Yakima STP lab were slightly lower than Ecology lab results, but the differences are acceptable

considering BOD_5 test variability. The normality of the sodium thiosulfate used for D.O. meter standardization should be checked to assure that it is not the cause of the lower concentrations found by the STP lab. The colorimetric total chlorine residual measurements found effluent chlorine concentrations greater than the amperometric titrator results. The higher concentrations should be reported until the accuracy of the two methods is assessed using known concentrations. Splits for NB_3-N analysis were not made. Results of EPA laboratory performance evaluation sample analysis indicate that NH_3-N analysis by the Yakima STP is acceptable (EPA, 1986).

SUMMARY AND CONCLUSIONS

The Yakima STP was an efficiently operated plant producing an effluent quality well within permit limits during the inspection. Problem areas at the plant (the influent flow measurement system and the aerators) have resulted in higher maintenance requirements than desired, but were being managed to prevent any significant degradation of effluent quality. Several recommendations are made in the laboratory discussion to keep STP laboratory procedures in conformance with approved techniques.

MH:cp

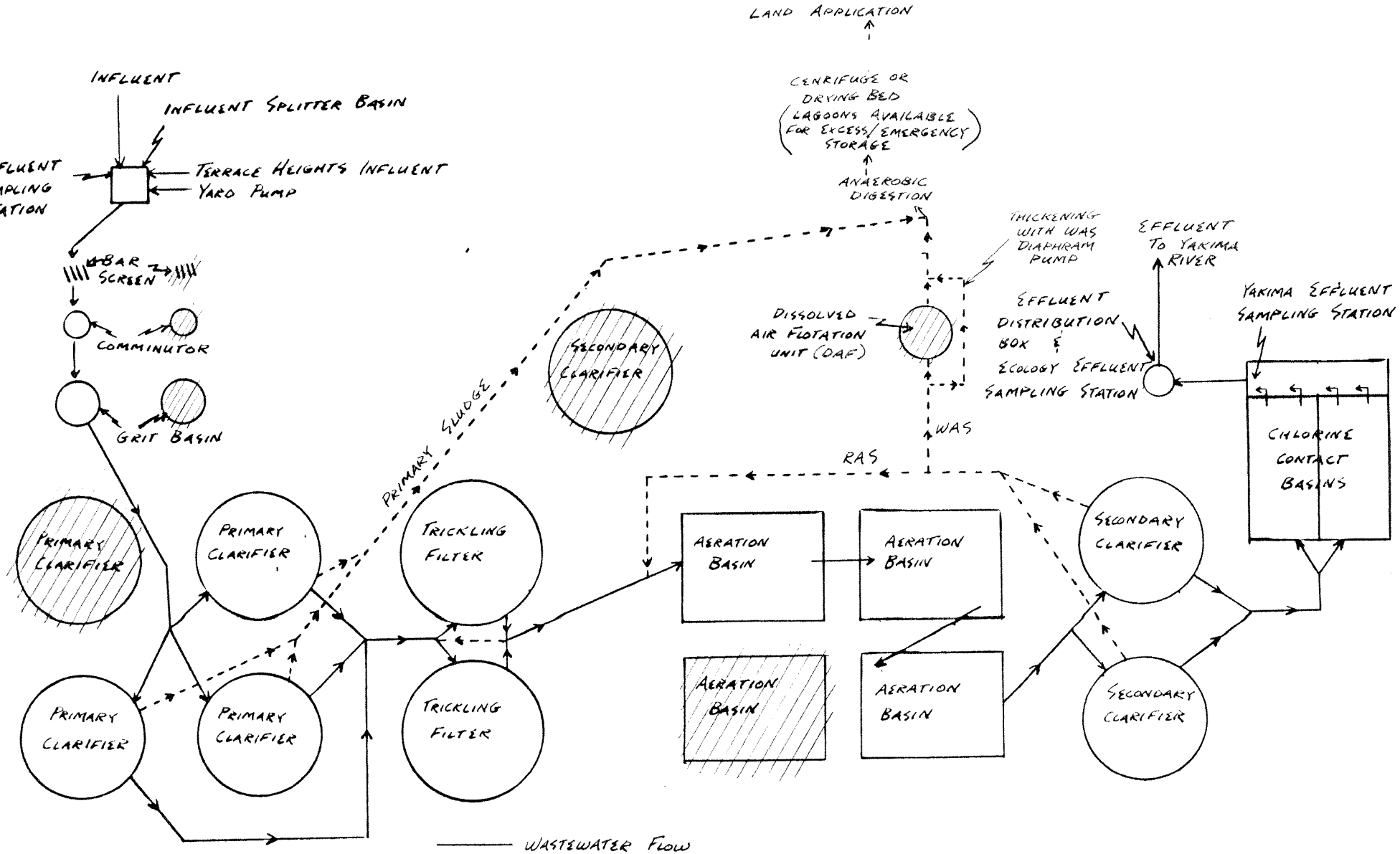
Attachments

REFERENCES

APHA, AWWA, WPCF, 1985. Standard Methods for the Examination of Water and Wastewater, 16th ed.

Bates, B., 1986. Letter to J. Milton, October 15, 1986.

EPA, 1986. "Performance Evaluation Report for the Yakima Wastewater Treatment Plant," 7/9/86.



——— WASTEWATER FLOW

------ SLUDGE OR RETURN FLOW

///// - UNIT OUT OF SERVICE:

BAR SCREEN, COMMINUTOR, GRIT BASIN, & PRIMARY CLARIFIER NOT NEEDED FOR INSPECTION FLOW

SECONDARY CLARIFIER (FOR USE BETWEEN TRICKLING FILTER AND AERATION BASIN) NOT USED BECAUSE OF HEAD REQUIREMENTS

AERATION BASIN BEING DRAINED TO REBALANCE AERATOR TURBINE

DAF NOT BEING USED FOR WAS, BUT BEING USED TO REMOVE SOME SOLIDS FROM AERATION BASIN BEING DRAINED. LIQUID STREAM FROM DAF TO INFLUENT SPLITTER BASIN VIA YARD PUMP.

FIGURE 1 - FLOW SCHEME - YAKIMA, 7/86.

Table 1. Sampling Schedule - Yakima, 7/86

Sample	Sampler	Laboratory	Date	Time	Field Analysis				Laboratory Analysis																			
					pH	Conductivity	Temp.	Chlorine residual	Chlorine residual	Fecal Coliform	Oil and Grease	BOD5	COD	Solids				Turbidity	Nutrients						pH	Conductivity	Alkalinity
														TS	TNVS	TSS	TNVSS		NH_3-N	NO_2-N	NO_3-N	NO_3+NO_3-N	O-PO_4-P	Total P			
Grab Samples																												
Influent		Ecology	7/15	0855	X	X	X				X																	
				1605	X	X	X																					
			7/16	0935	X	X	X				X																	
Effluent		Ecology	7/15	0945	X	X	X	X			X		X			X		X	X			X		X	X	X	X	X
				1620	X	X	X	X																				
			7/16	1010	X	X	X			X	X		X			X		X	X	X	X		X	X	X	X	X	X
				1040				X		X																		
		Yakima		1040					X	X																		
Composite Samples																												
Influent	Ecology	Ecology	7/15-16	0930-0930	X	X	X					X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
		Yakima										X				X												
	Yakima	Ecology	7/15-16	0400-0400								X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
		Yakima										X				X												
Effluent	Ecology	Ecology	7/15/16	0945-0945	X	X	X					X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
		Yakima										X				X												
	Yakima	Ecology	7/15-16	0400-0400								X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
		Yakima										X				X												

AV/OP3/86/111709(1)

Table 2. Ecology Analytical Results - Yakima, 7/86

Sample	Sampler	Date	Time	Field Analysis					Laboratory Analysis																				
				pH (S.U.)	Conductivity (umhos/cm)	Temp. (°C)	Chlorine Residual (mg/L)		Fecal Coliform (#/100 mL)	Oil and Grease (mg/L)	BOD5 (mg/L)	COD (mg/L)	Solids (mg/L)				Turbidity (NTU)	Nutrients (mg/L)						pH (S.U.)	Conductivity (umhos/cm)	Alkalinity (mg/L as CaCO3)
							Free	Total					TS	TNVS	TSS	TNVSS		NH_3-N	NO_2-N	NO_3-N	NO_2+NO_3-N	O-PO_4-P	Total-P			
Grab Samples																													
Influent		7/15	0855	6.9	390	18.2				22																			
			1605	7.0	460	19.4																							
		7/16	0935	7.1	350	18.0				18																			
Effluent		7/15	0945	6.9	460	18.7	0.2	0.5		<1		49			6		3	.04			6.7		3.0	7.0	636	74			
			1620	6.9	510	19.1	0.0	0.2																					
		7/16	1010	6.9	590	17.9			10	<1		41			6		2	.03	.01	7.2		2.4	2.8	7.0	606	76			
			1040				0.1	0.5	17																				
Composite Samples																													
Influent	Ecology	7/15-16	0930-0930	7.1	630	4.5					140	300	480	270	100	9	27	5.2	.01	.46		2.1	3.5	7.2	616	140			
	Yakima	7/15-16	0400-0400								170	200	460	300	64	8	25	4.7	.02	.78		2.2	3.7	7.3	562	130			
Effluent	Ecology	7/15-16	0945-0945	7.1	580	4.1					13	34	390	280	7	2	4	.05	.01	7.6		2.8	2.8	7.2	554	77			
	Yakima	7/15-16	0400-0400								15	45	380	280	8	4	4	.05	.02	7.8		2.8	2.9	7.2	536	76			

AV/OP3/86/111709(2)

Table 4. Comparison of inspection data to NPDES permit limits - Yakima, July 1986.

Parameter	NPDES Permit Limits		Inspection Data*		
	Monthly Average	Weekly Average	Ecology Composite	Yakima Composite	Grab
BOD_5 (mg/L)	30	45	13	15	
(lbs/day)	4779	7168	1832	2114	
(% removal)	85		91	91	
TSS (mg/L)	30	45	7	8	
(lbs/day)	3405	5107	987	1128	
(% removal)	85		93	88	
Fecal Coliforms (#/100 mL)	200	400			10, 17
NH_3-N (mg/L)	$\leq$ 1.6 mg/L from May 1 = November 1		0.05	0.05	0.03, 0.04
pH (S.U.)	6.0 $\leq$ pH $\leq$ 9.0				6.9, 6.9, 6.9
Flow (MGD)	19.1		16.9**	16.9**	

*Ecology analysis.
**Effluent flow used.

Table 5. Sludge metals results - Yakima, July 1986.

Metal	Yakima Sludge+ (mg/Kg d.w.)	Previous Inspection Data* Geometric Mean (mg/Kg d.w.)	Range (mg/Kg d.w.)	No. of Samples
Cadmium	7.4	6.9	<0.1-25	28
Chromium	68	60	15-300	28
Copper	450	370	75-1700	28
Lead	370	224	34-600	28
Nickel	28	22	<0.1-62	24
Zinc	1490	1160	165-3370	28

+ = 19 percent solids (59 percent volatile, 41 percent ash)
* = Summary of data collected during previous Class II inspections at activated sludge plants.

Table 6. Comparison on sample splits - Yakima, July 1986.

Sample	Sampler	Laboratory	BOD_5 (mg/L)	TSS (mg/L)	Fecal Coliform (#/100 mL)	Total Chlorine Resid. (mg/L)
Infl. Comp.	Ecology	Ecology	140	100		
		Yakima	115	87		
	Yakima	Ecology	170	64		
		Yakima	140	109		
Effl. Comp.	Ecology	Ecology	13	7		
		Yakima	7	6		
	Yakima	Ecology	15	8		
		Yakima	10	8		
Effl. Grab		Ecology			17	0.5*
		Yakima			15 est.	0.3*, 0.05***

*LaMotte DPD kit used.
**Hach colorimetric test.
***Amperometric titration used.
est. = estimated.