JOHN SPELLMAN
Governor

Publication No. 83-e12

WA-01-0010

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

MEMORANDUM
August 17, 1983

To: John Glynn, Northwest Regional Office

From: Marc Heffner, Water Quality Investigations Section

Subject: Blaine STP Class II Inspection - February 15-16, 1983

Introduction

On February 15 and 16, 1983, a Class II inspection was conducted at the Blaine sewage treatment plant (STP). Personnel involved included Dale Clark and Marc Heffner (Washington State Department of Ecology [WDOE], Water Quality Investigations Section), John Glynn (WDOE, Northwest Regional Office), and Jill Spurgeon (acting operator, Blaine STP).

The Blaine STP is a rotating biological contactor (RBC) type secondary plant (Figures 1 and 2). Plant treatment facilities include rotating screens, air-driven RBC units, secondary clarifiers, and chlorine injection and contact units. Sludge is aerobically digested, then applied to land. Discharge via an outfall to the Strait of Georgia is regulated by National Pollution Discharge Elimination System (NPDES) Permit No. WA-002264-1.

Primary tasks and goals for this Class II inspection included:

1. Review and evaluation of plant laboratory procedures used in determining NPDES permit compliance;

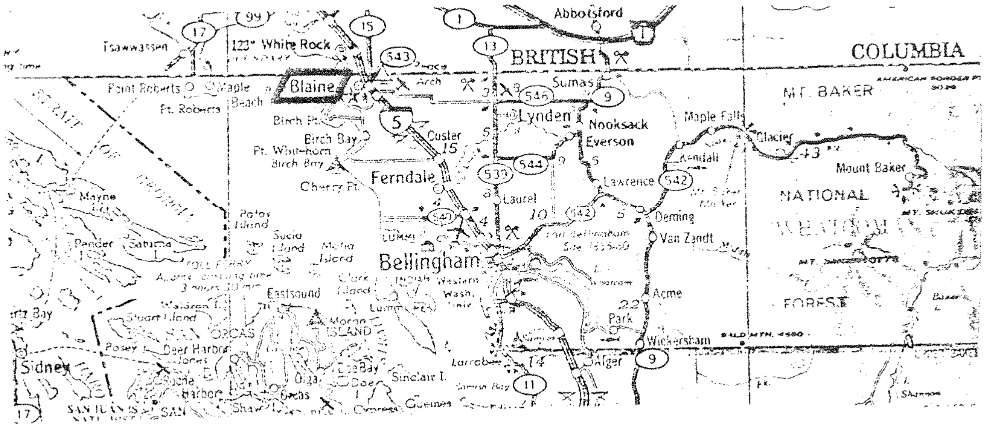
2. Comparison of plant and WDOE sample results with NPDES permit limits as an estimate of plant efficiency; and

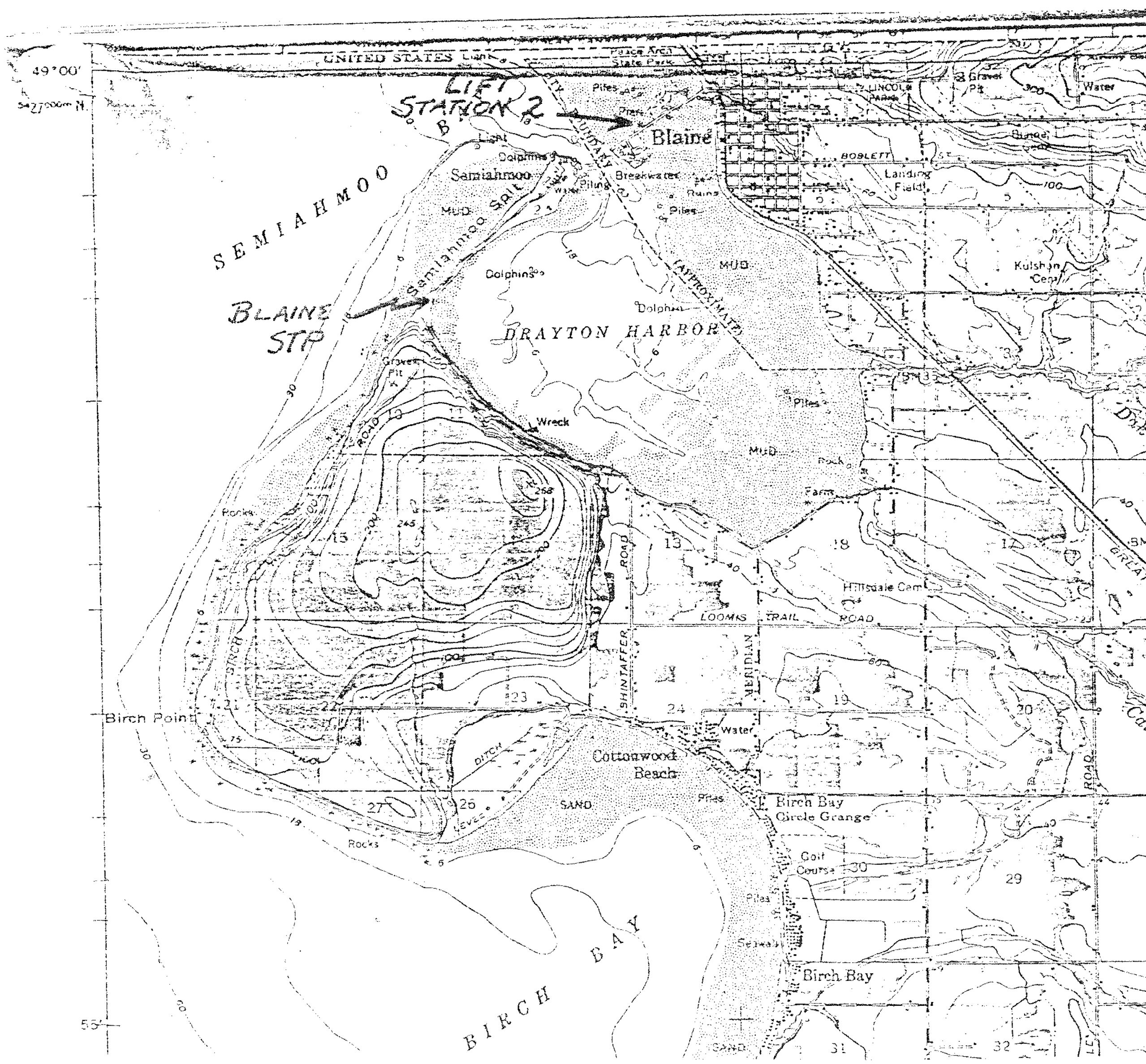
3. Estimation of the ability of the STP to handle increased loads from local fish processing industries.

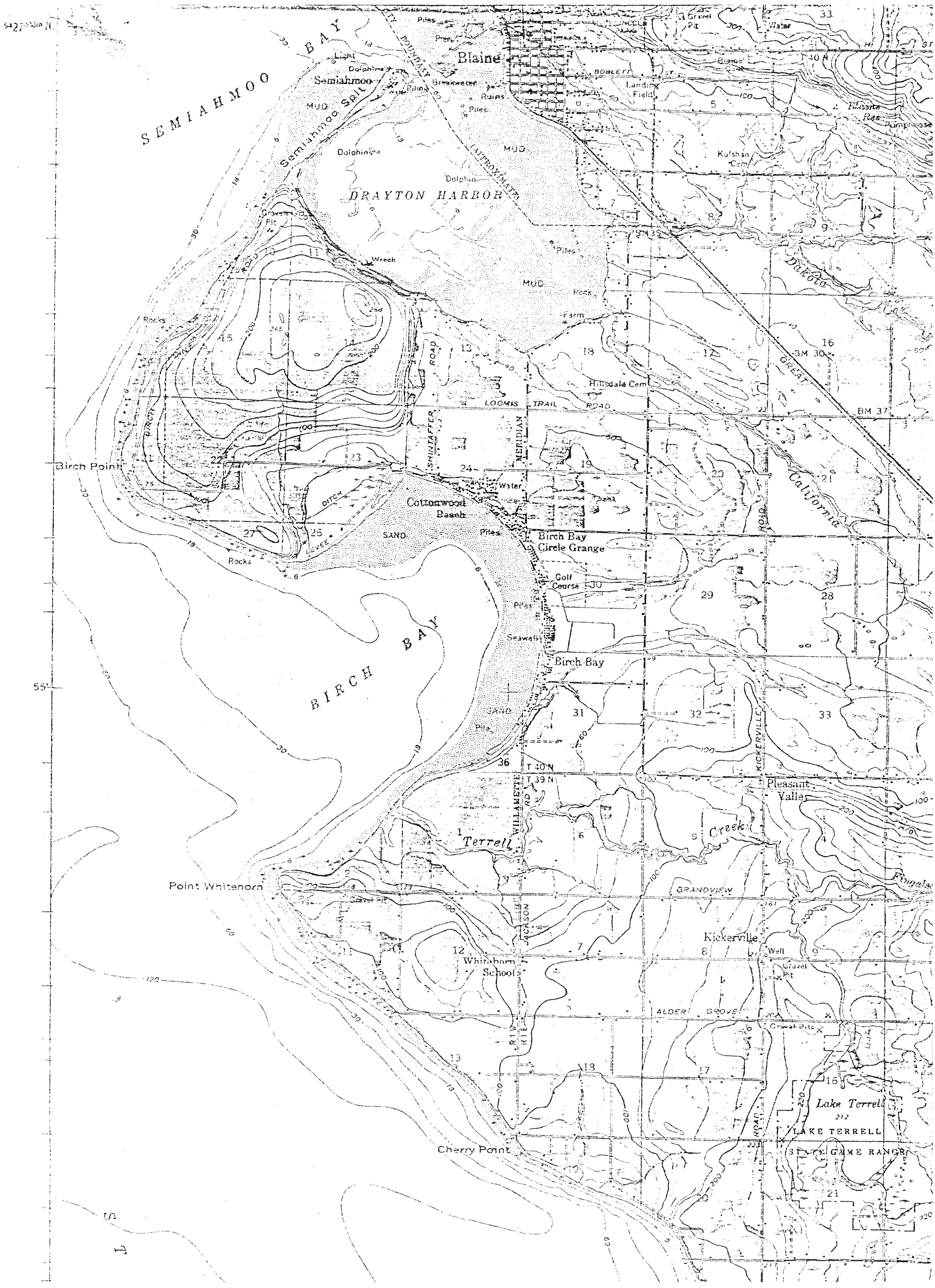
Procedure

WDOE composite samplers were set up to collect plant influent, RBC basin at the basin inlet, and plant effluent samples (Figure 2). The samplers collected approximately 250 mls of sample every 30 minutes for 24 hours. Blaine STP composite samplers were set to collect plant influent, RBC

Figure 1. Location of Blaine STP - Blaine Class II Inspection, February 1983.






SEMIAHMOO BAY
Semiahmoo
Semiahmoo Spit
Blaine
BOBLETT
Landing Field
Kulshan Cem
DRAYTON HARBOR
MUD
Dakota
Rocks
Farm
Hillsdale Cem
LOOMIS TRAIL ROAD
SHINTAFFER ROAD
MERIDIAN
Birch Point
Cottonwood Beach
SAND
California
Birch Bay
Circle Grange
Golf Course
BIRCH BAY
Seawall
Birch Bay
T 40 N
T 39 N
Pleasant Valley
WILLAMETTE RD
Terrell
Creek
KICKERVILLE
Point Whitehorn
Gravel Pit
GRANDVIEW
JACKSON
Kickerville
Whitehorn School
ALDER GROVE
Lake Terrell
LAKE TERRELL
STATE GAME RANGE
Cherry Point

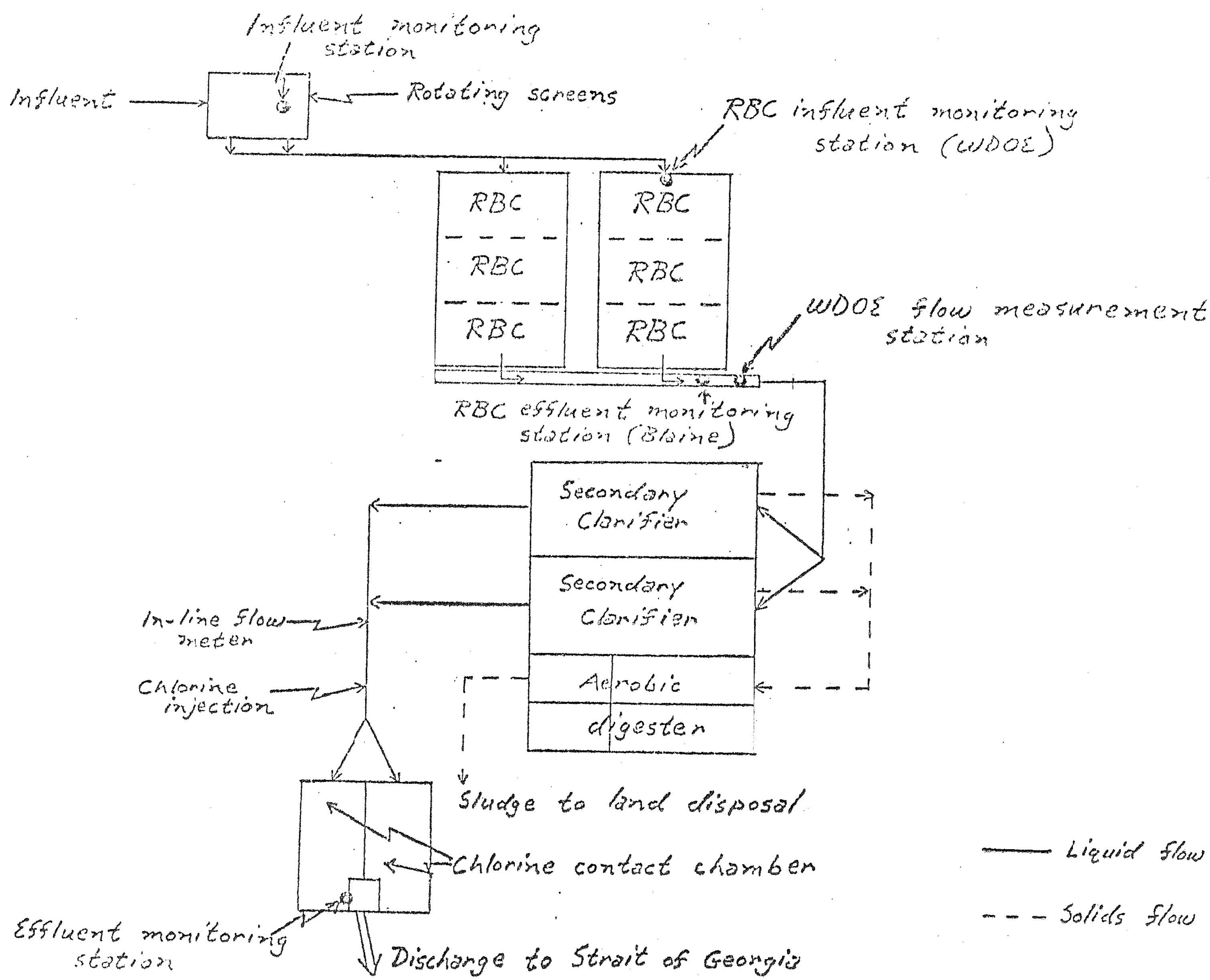


Figure 2. Flow scheme at Blaine STP - Blaine STP Class II Inspection, February 1983.

effluent, and plant effluent samples during the same time span (approximately from 2/15 - 1000 to 2/16 - 1000). The Blaine samplers collected equal volumes of sample every hour for the 24-hour period. Plant influent and plant effluent samples were split for analysis of permit parameters by both WDOE and Blaine laboratories (Tables 1 and 2).

Flow measurements were taken by WDOE for comparison with the Blaine flow meter (Table 3). WDOE measurements were taken using a Marsh-McBernie meter in a channel between the RBC units and the secondary clarifiers.

Grab samples were taken during the inspection for field analysis (Table 4) and for laboratory fecal coliform and oils and grease analysis (Table 5). Also, a digested sludge grab sample was taken for metals and percent solids analyses. Before the inspection, the STP chlorine injection unit had failed, resulting in no chlorination of the effluent. Although the factory repairman had been called, he was unable to make repairs before the inspection was completed. Thus, samples of "typical" effluent for fecal coliform and chlorine residual analysis could not be taken.

In addition to the treatment plant samples, several grab samples were taken at a manhole near the old treatment plant (Figure 3). The manhole sampled (Manhole [MH] 1) is the site where lift station 1, serving the restaurants, fish processors, and small businesses southwest of the lift station, would discharge into the sanitary system. The waste would then be carried to lift station 2 at the site of the old STP from which it is pumped to the new STP for treatment. Last year, plant overloads believed to be caused by high BOD and grease loadings from lift station 1 resulted in a decision to re-route the flow from lift station 1 to the old STP outfall line. (The old STP outfall line presently serves as an emergency bypass for lift station 2). During tides greater than approximately 9 feet, the flow in the old STP outfall is reversed, resulting in lift station 1 flow, cooling water discharge from a fish rendering plant, and marine water entering the sanitary system at MH 1 and being pumped to the new STP. Grab samples of the backflow at MH 1 were collected for field and laboratory analysis.

Results and Discussion

During the inspection, flows were measured using both the plant in-line flow meter and the WDOE Marsh-McBernie magnetic flow meter (Figure 2). Flow to the plant is primarily from a variable-speed pump station (the operator estimated that greater than 90 percent of the plant flow came from lift station 2). Plant flows fluctuated somewhat during the WDOE "instantaneous" flow measurement period. The WDOE flow measurement was therefore compared to the range of plant flow meter readings that occurred during the WDOE measurement period (Table 3). For the three comparisons made, the plant meter and WDOE "instantaneous" measurements

Table 1. WDOE laboratory results - Blaine Class II inspection, February 1983.

Sample	Compositor	BOD_5 (mg/L)	Sol. BOD_5 (mg/L)	COD (mg/L)	Solids (mg/L) TS	TNVS	TSS	TNVSS	Turbidity (NTU)	Conductivity (µmhos/cm)	Salinity (ppt)	Nutrients (mg/L) NO_3-N	NO_2-N	NH_3-N	Dis. O-P	Total-P	Chloride as Cl (mg/L)	pH
Plant Influent	WDOE	80		150	320	190	70	12	43	405	.2	.28	.10	6.5	1.5	1.8		7.4
Plant Influent	Blaine	79		170			87		41	414	.2							7.6
RBC Basin	WDOE	73	21	110	340	210	84	20	35	412	.2	6.8	.10	2.6	2.3	2.9		7.4
Plant Effluent	WDOE	24	11	66	290	200	17	4	12	388	.2	5.9	.25	1.4	1.7	2.0	56	7.4
Plant Effluent	Blaine	27		62			26		14	394	.2						59	7.4
MH 1 Backflow	WDOE* grab	470		680	2600	1900	230	28	140	3350	2.1	<.10	<.10	5.6	4.0	5.3		7.6

*Sample taken at approximately 0810 hours on February 6, 1983.

Table 2. Comparison of WDOE and Blaine laboratory analysis - Blaine Class II Inspection, February 1983.

Sample	Sampler	Laboratory Results: BOD_5 (mg/L) WDOE	BOD_5 (mg/L) Blaine*	Soluble BOD5 (mg/L) WDOE	Soluble BOD5 (mg/L) Blaine	TSS (mg/L) WDOE	TSS (mg/L) Blaine
Plant Influent	WDOE	80	120		83	70	67
Plant Influent	Blaine	79	99		44	87	81
RBC Basin	WDOE	73		21		84	
RBC Effluent	Blaine						80
Plant Effluent	WDOE	24	28	11	11.5	17	22
Plant Effluent	Blaine	27	28		10	26	23

*BOD blank depletion = 0.6 mg/L: Flow = .612 MGD

Table 3. Flow measurements - Blaine STP Class II inspection, February 1983.

Date	Time	WDOE Instantaneous Flow (gpm)	Blaine Flow Instantaneous (gpm)	Totalizer value	(gpm)	(MGD)
2/15	0850		400	250725		
		455	400-480			
	0930		400	250748		
	0938			250751		
	1550	385	380	250904		
					442*	.64
2/16	0910		500	251373		
		590	500-700			
	0918		500	251378		
	0925			251382		
	1058		480	251428		

*Estimate of script chart average was 450 gpm.

Table 4. Field measurements - Blaine STP Class II inspection, February 1983.

Sample	Date	Time	Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)
Plant Influent	2/15	1015	10.7	7.2	740	0.6
	2/15	1305	11.0	7.2	495	0.5
	2/16	0915	10.4	7.1	870	2.0
	2/15-16	Composite	1.5	7.3	405	
RBC Basin	2/15	1020	10.7	7.2	600	6.8
	2/15	1455	11.2	7.2	430	6.0
	2/16	0905	10.4	7.1	430	7.4
	2/15-16	Composite	5.0	7.3	390	
Plant Effluent	2/15	1025	10.5	7.3	300	7.9
	2/15	1445	11.1	7.2	500	6.6
	2/16	0850	10.6	7.1	260	8.2
	2/15-16	Composite	5.0	7.3	385	
Manhole 1 Backflow	2/15	0750	10.1	8.2	5,000	
	2/16	0805	11.2	7.5	3,700	3.3

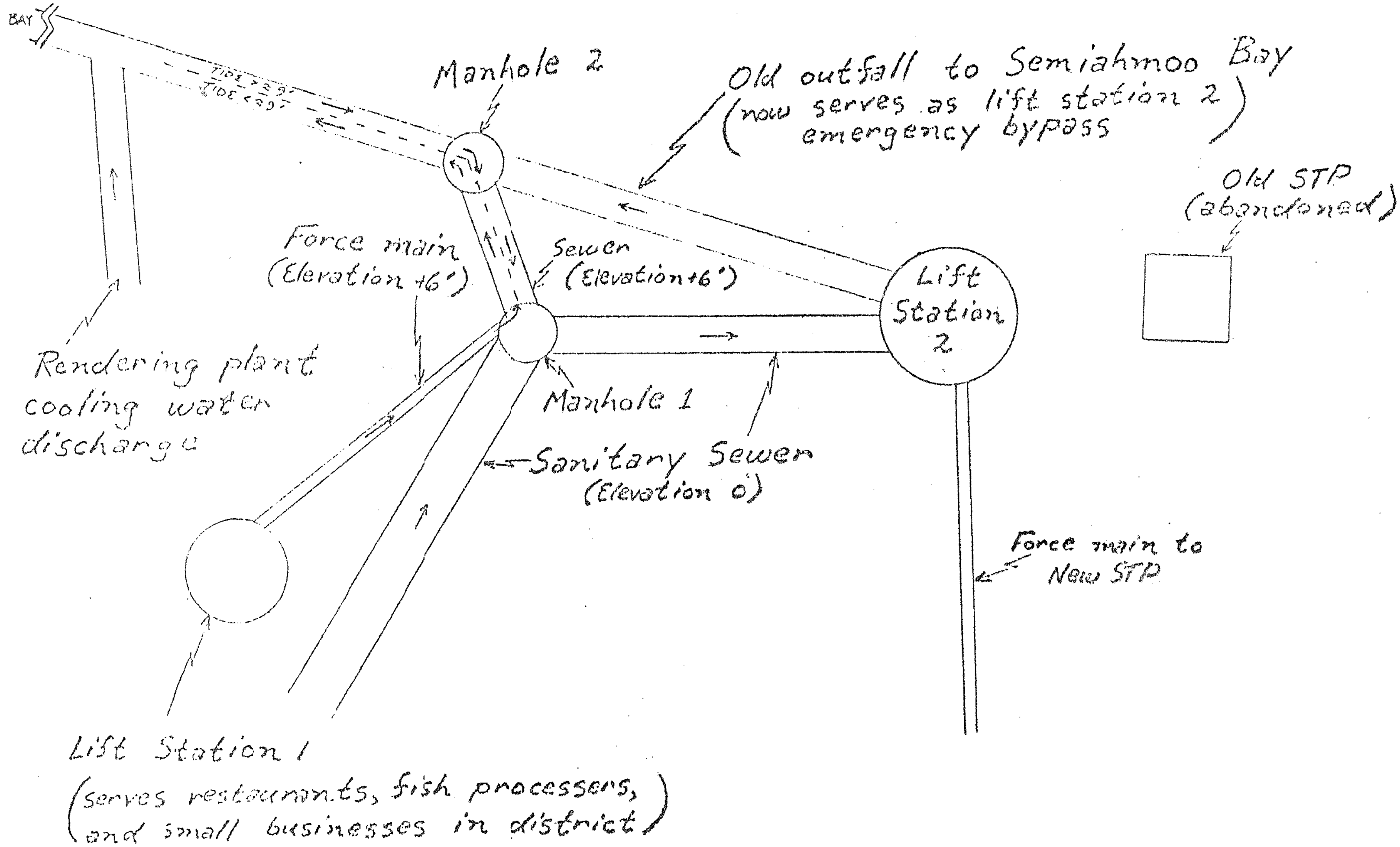


Figure 3. Flow scheme of bypass area - Blaine STP Class II Inspection, February 1983.

Table 5. Oils & grease and fecal coliform results - Blaine STP Class II inspection, February 1983.

Sample	Date	Time	Oils & Grease (mg/L)	Fecal Coliform (#/100 ml)
Plant Influent	2/15	1040	13	
	2/15	1305	22	
	2/16	0915	21	
Plant Effluent	2/15	1040	2	
	2/15	1500	2	
	2/16	0850	4	25,000
Manhole 1 Backflow	2/15	0750	38	26,000*
	2/16	0805	360	18,000

*Estimated value.

were similar. Also, an average flow during the inspection of 450 gpm (.65 MGD) was estimated based on the Blaine script chart which agrees well with the Blaine totalizer daily flow of 442 gpm (.64 MGD). It appears that the plant flow meter was functioning accurately.

A portion of the flow to the plant was entering the system as backflow from MH 1 (Figure 3). Grab samples for field and laboratory analysis were taken from the MH 1 backflow when it was spilling into the sanitary sewer system (Tables 1, 4, and 5). Conductivities for the three grab samples collected at MH 1 were 3350, 3700, and 5000. Conductivity data collected by the WDOE ambient monitoring program at the Drayton Harbor entrance channel ranges from 19,200 to 48,000 and has a geometric mean of approximately 34,600. By comparing the Drayton Harbor mean conductivity to the MH 1 backflow conductivities, one could estimate that roughly 10 to 15 percent of the MH 1 backflow is marine water.

During the Class II inspection, tides greater than 9 feet occurred on February 15 at 0750 (height 9.8 feet) and on February 16 at 0804 (height 9.7 feet). The operator predicted such tides would result in backflows from MH 1 of approximately four hours. Plant influent conductivity measurements were also indicative of temporary saltwater inflow as on February 15 readings decreased from 740 at 1015 to 495 at 1305.

The flow rate for the MH 1 backflow was estimated as noted in Table 6.

Although only estimates, the flows calculated suggest the magnitude of the backflow. During the Class II inspection, the manhole 1 backflow was estimated to be roughly 6 to 14 percent of the plant flow when backflow was occurring (Table 6).

Table 6. Estimation of the manhole 1 backflow flow rate* - Blaine STP Class II inspection, February 1983.

Date	Plant Influent Conductivity Morning	Plant Influent Conductivity Afternoon	Morning Plant Flow (gpm)†	Manhole 1 Backflow Conductivity	Manhole 1 Backflow flow (gpm)	Manhole 1 Backflow flow (MGD)
2/15	740	495	455	5,000	25	.04
2/16	870	495**	590	3,700	69	.10

*Method of estimation

Symbols:
MPC - Plant influent conductivity in the morning (μmhos/cm)
MPF - Plant flow in the morning (gpm)
MHC - Manhole 1 backflow conductivity (μmhos/cm)
MHF - Manhole 1 backflow flow (gpm)
APC - Plant influent conductivity in the afternoon (μmhos/cm)

Equation:

$$MPC \times MPF = [MHC \times MHF] + [APC \times (MPF - MHF)]$$

The equation is solved for MHF

**A February 16 afternoon measurement was not made, so the February 15 afternoon measurement was used

†Data collected using WDOE Marsh-McBernie magnetic flow meter

BOD and TSS loading based on the February 16 grab sample data for manhole 1 backflow is calculated in Table 7.

Table 7. Comparison of manhole 1 backflow and STP BOD and TSS loadings - Blaine Class II inspection, February 1983.

	Flow	BOD			TSS		
	(MGD)	(mg/L)	(lbs/hr)	(lbs/d)	(mg/L)	(lbs/hr)	(lbs/d)
Manhole 1 Backflow*	≈.07	470	11.4	45.6**	230	5.6	22.4**
Plant Influent***	.64	80	17.8	427	70	15.6	374

*Calculated using February 16 grab sample data
**Based on flow occurring for four hours per day
***Calculated using February 15-16 WDOE analysis of WDOE composite samples

The estimated daily load to the STP from the manhole 1 backflow is fairly small, primarily because the estimate was based on the backflow occurring for only four hours daily. The concentrations and hourly loads demonstrate that flow from lift station 1 should be treated rather than bypassed.

Blaine STP hydraulic and wasteloads were compared to theoretical domestic loads for a plant serving a population of 2,500. This comparison appears reasonable because "industrial" loads from MH 1 bypass were relatively minor. A population served of 2,500, as reported on the Blaine wastewater treatment plant monitoring reports, was used for calculations.

Based on 100 gal/cap/D, .17 lb BOD/cap/D, and .20 lb TSS/cap/D (Clark, et al., 1977) one would expect plant loadings of .25 MGD, 425 lbs BOD/D, and 500 lbs TSS/D. The plant influent BOD (427 lbs/D) and TSS (374 lbs/D) compare reasonably with the estimate. The measured plant flow (.64 MGD) is much higher than the estimate and is indicative of significant infiltration/inflow. Based on plant influent conductivities and the estimation of the manhole 1 backflow flow rate (Table 7), the infiltration/inflow is assumed to be primarily from a freshwater source.

Plant performance during the Class II is compared to the NPDES permit on Table 8. The 30 mg/L TSS - 30 mg/L BOD_5 requirements and associated loadings were met during the inspection. Because of the weak influent strength, 85 percent removal requirements were limiting. During the inspection, the plant was achieving only 70 percent BOD removal and 76 percent suspended solids removal (based on WDOE data). Autotrol RBC design curves do not include weak influent with a low hydraulic loading of the RBC so expected effluent characteristics could not be accurately estimated (Autotrol, 1978). The fecal coliform sample collected was in excess of the permit requirements. This was expected as during the Class II the chlorinator was broken resulting in the discharge of unchlorinated effluent (Table 8).

Table 8. Comparison of Class II data to NPDES permit limits - Blaine Class II inspection, February 1983.

Parameter	NPDES Permit Limits Monthly Average	Weekly Average	WDOE Analysis WDOE Composite	Blaine Composite	WDOE Grab	Blaine Analysis WDOE Composite	Blaine Composite
BOD_5 (mg/L)	30*	45	24	27		28	28
(lbs/day)	200	300	128	144		143	143
% Removal	85%		70%	66%		77%	72%
TSS (mg/L)	30*	45	17	26		22	23
(lbs/day)	200	300	91	139		112	117
% Removal	85%		76%	70%		67%	72%
Fecal Coli. (#/100 ml)	200	400			25,000		
pH (S.U.)	$6.0 \leq pH \leq 9.0$				7.1-7.3		
Flow (MGD)	**	**	.64			.612	

*30 mg/L or ≤ 15% of the influent concentration, whichever is more stringent.
**Loadings calculated with flow of .8 MGD.

Plant loading is compared to plant capacity calculated using several design criteria in Table 9. Design capacity for flow and TSS were not critically reviewed as part of this memorandum, so Class II data are compared only to the respective design capacity shown on the Blaine STP plans and specs. TSS loadings were well under (≈15 percent of) design capacity. Flow was approaching 80 percent of design capacity during the Class II. Review of past NPDES monitoring reports from Blaine suggests that high flows are wet-weather infiltration/inflow related.

Several design criteria for calculating the BOD_5 capacity of the RBC units were considered (Autotrol, 1978; WDOE, 1978; WDOE, 1983). For all cases, the plant loading during the sampling period fell below the design capacity calculated using the criteria. The estimations of the RBC capacity being used during the sampling period ranged from 15 percent to 71 percent of the total plant and 26 percent to 94 percent of

Table 9. Plant loading - plant capacity comparison - Blaine Class II inspection, February 1983.

	BOD_5 (Total - lbs/D)			BOD_5 (Soluble - lbs/D)				
	Calculated	Temperature Corrected*	Percent of Capacity Utilized during Class II†	Calculated	Temperature Corrected*	Percent of Capacity Utilized during Class II	TSS (lbs/D)	Flow (MGD)
Influent Data Collected during Class II	422-640**	N/A		188-443†*	N/A		358-464	.64
Design Capacity from Plans and Specs.								
Industrial	560	504	--	504	454		350	
Domestic	1528	1375	--	522	470		2292	
Total	2088††	1879††	22-34††	1026	923	20-48	2642	.8
Design Capacity from March 1980 Revision of WDOE Design Criteria(1)	1500-2100	1350-1890	22-47					
Design Capacity from Proposed Revisions to WDOE Design Criteria								
Total System(2)	1200	1080	39-59	660	594	32-75		
First Stage(3)	1000	900	47-71	500	450	42-98		
Peak-hour Load for First Stage(4)	1200	1080	--	800	720	--		
Design Capacity from Autotrol Design Manual								
Total System(5)				≈1300	≈1170	16-38		
First Stage(6)				1000	900	20-49		

*Based on temperatures measured during Class II (≈10.8°C) and the Autotrol temperature correction factor (Autotrol Figure C-4). Correction factor used was .9.

†Based on influent load, no BOD removal was credited to the rotating screen.

**Range of values found by WDOE and Blaine analysis of WDOE and Blaine composite samples taken during the Class II inspection (Table 2).

†*Influent percent soluble BOD values found by Blaine times range of influent BOD values (Table 2).

††Value must be used with discretion due to different percent soluble BOD assumptions for domestic (34%) and industrial (90%) used in design.

(1)Criteria are 2.5-3.5 lbs total $BOD_5/1000\ ft^2$-D. Blaine RBC has six 100,000 ft^2 shafts for a total surface area of 600,000 ft^2.

(2)Proposed criteria are 2.0 lbs total $BOD_5/1000\ ft^2$-D or 1.1 lbs soluble $BOD_5/1000\ ft^2$-D.

(3)Proposed criteria are 5.0 lbs total $BOD_5/1000\ ft^2$-D or 2.5 lbs soluble $BOD_5/1000\ ft^2$-D. The first shaft in each train was considered first stage for a surface area of 200,000 ft^2.

(4)Proposed criteria are 6.0 lbs total $BOD_5/1000\ ft^2$-D or 4.0 lbs soluble $BOD_5/1000\ ft^2$-D.

(5)Calculation based on Autotrol Industrial Waste General Design Criteria for the AerO-Surf process. The surface area required to treat an influent of 70 mg/L soluble BOD_5 to an effluent concentration of 10 mg/L soluble BOD_5 for the design flow (.8 MGD) was calculated to be ≈ 300,000 ft^2. The remaining surface area (≈ 300,000 ft^2) could remove soluble BOD_5 at the zero-order rate of 3 lbs/D-1000 ft^2.

(6)Criteria are 5 lbs soluble $BOD_5/1000\ ft^2$-D. The first stage surface area was considered to be 200,000 ft^2.

the first (RBC) stage. The peak-hour load criteria suggested in the proposed WDOE criteria were not critical during the inspection, but could become critical as it is anticipated that the presently bypassed wasteload is not distributed uniformly throughout a 24-hour period (Table 9).

The WDOE proposed criteria for airdrive RBC units also include guidelines for an air supply of 350 cfm per RBC shaft. The operator reported that the air supply at Blaine is rated at 1500 cfm of which 1050 cfm or 175 cfm per shaft is available. It would appear that as loads increase, the air supply might become a limiting factor.

An attempt to measure the load being applied to the RBC basin was made. A compositor was set up with the sampling tube located in a position which appeared to be most favorable for sampling flow at the submerged inlet to the RBC basin. Table 10 compares plant influent, RBC basin, and plant effluent nitrogen concentrations.

Table 10. Blaine STP nitrogen concentrations (mg/L) - Blaine Class II inspection, February 1983.

	NO_3-N	NO_2-N	NH_3-N	NO_3-N + NO_2-N + NH_3-N
Plant Influent	.28	.10	6.5	6.88
RBC Basin	6.8	.10	2.6	9.50
Plant Effluent	5.9	.25	1.4	7.55

Based on the comparison of the nitrogen forms found, it appears that the RBC basin sample had received some treatment. The inability to sample from the submerged inlet to the RBC basin prevented collection of a representative sample of RBC influent, as had been intended. The table does indicate that nitrification is taking place in the plant.

Operational problems at the plant were discussed with the operator. Noteworthy problems included grit buildup in the RBC basins and problems believed to be associated with the manhole 1 bypass flow. The plant has no grit removal facilities and grit tends to settle in the RBC basins. Annually, the basins must be drained and the grit removed. Restarting the RBC unit requires approximately four weeks for the biomass to build up to pre-cleaning conditions. The problem is so severe that two cleanings per basin per year are being considered. There appears to be a need for a better system of handling grit at the plant.

Other problems thought to be associated with the wastes bypassed at manhole 1 were discussed with the operator. These items included problems with fish parts entering the plant and problems with grease buildup in the RBC basin. Several oil and grease samples were collected during the Class II inspection. Values were typically low, although the February 16 sample of the manhole 1 backflow was a relatively high value (360 mg/L). It should be noted that this concentration would be significantly diluted by domestic flows to the plant. Evidence of grease was also apparent on the walls of lift station 1. "Oil and grease concentrations of <200 mg/L of animal and vegetable origin...have been absorbed by the Bio-Surf processes with no loss in treatment efficiency" notes Autotrol; however, a recent EPA draft document recommends that a primary clarifier with skimmer precede the RBC units if >100 mg/L oil and grease is expected in the influent (Brenner, et al., p. 127).

Based on the Class II BOD_5, TSS, and fecal coliform values, the waste being bypassed at manhole 1 demonstrates the need for treatment. The exact quality and quantity of waste being bypassed is both unknown and variable. Approximate ranges of flow and waste strength would be useful for management of the waste stream. Lift station 1 is probably the best site to collect the necessary samples and make flow estimates.

Data collected at lift station 1 could be used initially to predict treatment plant loadings and/or possible upsets due to lift station 1 flows. Steps could be taken to minimize harmful effects of the load prior to rerouting the flow and sending it for treatment. Because of the various estimates of system capacity noted in Table 9, a system of flow diversion at manhole 1 to allow a portion of the flow to be bypassed and a portion of the flow to go to the plant may be desirable. Gradually increasing the portion going to the plant would allow actual plant capacity to be defined, if the capacity is below the total load the plant could receive from both the bypassed and present plant flow. If plant operational problems occur, lift station 1 data could prove useful in understanding and suggesting solutions to the problem.

Composite samples collected for total BOD, soluble BOD, and TSS analysis and grab samples collected for oils and grease analysis would constitute the minimal sampling and testing necessary to characterize lift station 1 flows. Flow information from the lift station 1 pumping records could be used to calculate loadings. Samples should be collected once or twice weekly at least through the heavy fishing season (approximately May through October), depending on time available for personnel to take and analyze samples.

Sludge metals data collected at Blaine are compared to the data collected during other Class II inspections at trickling filter and RBC plants (Table 11). Values generally fall within the ranges previously found with the exception of Ni which was found at lower concentrations than that found in similar municipal sludges (Table 11).

Table 11. Sludge metals results - Blaine STP Class II inspection, February 1983.

Metal	Blaine Sludge* (mg/Kg dry weight)	Previous Class II Data** Geometric Mean (mg/Kg dry weight)	Range (mg/Kg dry weight)	Number of Samples
Cd	3.8	5.1	.01-16	12
Cr	52	37	.4-313	12
Cu	440	491	28-3100	12
Pb	120	337	100-1140	12
Ni	12	32	17-<100	10
Zn	810	1580	680-2200	12

*Sample of aerobically digested sludge that had been settled prior to wasting; % solids - 2.0

**Summary of data collected during Class II investigations conducted at trickling filter and RBC plants.

Laboratory Discussion

Blaine STP and WDOE laboratory results generally compare well for the samples split during the inspection (Table 2). Only influent BOD analyses showed notable differences with Blaine STP results (120 and 99 mg/L) somewhat higher than WDOE values (80 and 79 mg/L). The Blaine worksheets were reviewed and two items were noted that could contribute to the differences:

1. Blank depletion was .6 mg/L which is higher than the desired $\leq$ .2 mg/L; and

2. D.O. depletion for the samples averaged 1.9 mg/L which is less than the desired minimum of 2 mg/L.

When D.O. depletion is minimal and blank depletion fairly high, the combined effect may give BOD results greater than the BOD actually present. For cases in which the blank depletion is greater than .2 mg/L, test results should be reported with the high blank depletion footnoted.

BOD Comments

1. For each sample, adequate dilutions should be run to assure oxygen depletion such that more than 2.0 mg/L is depleted and

greater than 1.0 mg/L is remaining at the end of the test. Generally, two dilutions with ranges overlapping will provide sufficient test range to get good results.

2. Distilled water used for making BOD dilution water should be aged in containers with cotton plugs prior to use rather than being used directly from the still.

3. BOD samples should be set out approximately one hour before the test begins and allowed to warm to room temperature.

4. Blaine laboratory handling of the chlorinated effluent sample for BOD testing, in addition to normal procedures, included only dechlorinating the sample prior to testing. The dilution water should also be seeded using unchlorinated settled secondary effluent to help assure adequate bacterial populations for accurate results.

TSS Comments

It was suggested that the drying cycle be occasionally repeated for some samples as a quality control measure to assure that drying is complete.

Fecal Coliform Comments

For a valid fecal coliform count, dilutions should be set up so there are 20 to 60 colonies on the culture plate. However, if counts of <20/100 mLs are expected, a maximum volume of 100 mLs passed through the filter is adequate.

Composite Sampling Comments

1. It is desirable to run the compositor through a full cycle when taking the compositor off line. This helps to assure that the compositor is still functioning and that it sampled during the entire sampling period.

2. Samples should be cooled (iced) during the sampling period to minimize sample degradation while the sample is being collected.

Memo to John Glynn
Blaine STP Class II Inspection - February 15-16, 1983

Recommendations and Conclusions

Three major factors at the Blaine STP prevented the plant from providing the desired treatment. The first problem was the lift station 1 bypass situation. During the Class II inspection, the bypass demonstrated the need for treatment before discharge. A system of estimating the range of waste concentrations has been suggested in the text. Flow routing to the plant in increments may be helpful in determining actual plant capacity and determining the ability of the plant to treat part or all of the waste flow.

The second factor involved the failure to meet the $\geq$ 85 percent removal portion of the permit for BOD and TSS during the Class II inspection. A weak influent, probably caused by infiltration/inflow, was thought primarily responsible for the problem. Methods of removing the infiltration/inflow were not investigated.

The third factor was lack of chlorination during the Class II inspection. Repairs to the broken chlorinator should solve this problem.

General plant operational problems were discussed with the operator. As discussed in the text, potential solids and oil and grease problems associated with the manhole 1 bypass and grit buildup in the RBC basins were the primary concerns.

Laboratory procedures were generally good, although several suggestions were made in the discussion that could improve test accuracy.

MH:cp

Attachments

REFERENCES

Autotrol Corporation, 1979. *Autotrol Wastewater Treatment Systems Design Manual,* 1978 w/May 1979 updates

Brenner, R.C., J.A. Heidman, E.J. Opatken, and A.C. Petrasek, Jr. *Design Information on Rotating Biological Contactors,* Municipal Environmental Research Laboratory, Environmental Protection Agency, draft document

Clark, J.W., W. Viessman, Jr., and M.J. Hammer, 1977. *Water Supply and Pollution Control,* IEP-A Dun Donnelley, Publisher, 3rd edition, 857 pp.

WDOE, 1978. *Criteria for Sewage Works Design,* DOE 78-5, February 1978, Revised March 1980.

WDOE, 1983. Proposed changes to the *Criteria for Sewage Works Design* for RBC units, draft copy.