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Segment No: 22-49-02

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MEMORANDUM
January 7, 1987

To: John Hodgson

From: Dale Clark DKC

Subject: Conconully Publicly Owned Treatment Works Limited Class II Inspection

ABSTRACT

On July 12-13, 1986, a limited Class II inspection was conducted at the Conconully, Washington, publicly owned treatment works (POTW). During the inspection, hydraulic (flow) and organic (BOD_5) loadings were well within the POTW design criteria. Influent BOD_5 concentration was within the normal range for domestic raw sewage with minimal business input. The treatment lagoons had low dissolved oxygen (D.O.) concentrations. This condition may have been related to increased BOD loading from tourist activity during the previous holiday weekend.

INTRODUCTION

On July 12-13, 1986, a limited Class II inspection was carried out by the Washington State Department of Ecology (Ecology) at the Conconully POTW. The inspection was requested by the Ecology Central Regional Office (CRO). The objectives were:

1. Collect information on treatment plant loadings during a peak period of summer use.

2. Characterize loadings from the town of Conconully and Conconully State Park including flow and organic load (BOD_5).

3. Collect information on the condition of the treatment lagoons.

This Class II inspection was designed to meet the limited objectives noted above and to make general observations. In-depth plant design and process control evaluations were not intended to be part of this inspection.

The inspection was carried out by Dale Clark. Herb Scott (plant operator) assisted during the field work.

Memo to John Hodgson
Conconully Publicly Owned Treatment Works Limited Class II Inspection

SETTING

The treatment plant is located one-half mile south of the town of Conconully and above the lower Conconully reservoir (Figure 1). The facility treats wastewater from the town and associated state park.

The facility is a faculative lagoon system consisting of three treatment lagoons--a primary lagoon, a smaller secondary lagoon, and a polishing basin. Wastewater is pumped from town by force main that feeds into a gravity sewer for the final 800 feet (Figure 1). Wastewater enters the primary lagoon via a manifold system that allows the influent to be routed to several points in the lagoon, thus minimizing solids buildup at a single location. An aeration tank adjacent to Lagoon #1 is used during spring turnover (Figure 1).

Following treatment in the three lagoons, effluent is spray-irrigated onto adjacent agricultural land. There is no discharge to surface waters; thus, a National Pollutant Discharge Elimination Permit (NPDES) is not required. However, a Washington State permit for plant operation and spray-irrigation is in effect. During late summer and early fall, lagoon water levels are drawn down to allow for winter storage.

Influent flow is measured at the pump station by an in-line flow meter and recorded by script chart and totalizer. Recorded flows are checked for accuracy by comparing recorded flows to flows calculated from lift pump rated flows (gpm) and operating time. The pumps operate one at a time during pumping cycles.

A service building located at the pump station houses the script chart and totalizer, system control panel, chlorine feed regulator, and storage tank, plus an air compressor for aerating wet-well influent and the force main. Aeration is used during heavy loading to increase D.O. concentration in the influent prior to pumping to the lagoons. The system can also be used to aerate the wet well to maintain aerobic conditions during pump shutdown. The wet well has a capacity of 15,000 gallons--large enough to store raw wastewater for several days during low flows (e.g., winter). If required, an emergency bypass line can route water from the wet well to nearby Salmon Creek, a primary source of water to the lower Conconully reservoir. Chlorination would occur during such an emergency.

For monitoring report requirements, the plant operator normally collects a single grab sample monthly for BOD_5 and solids analysis at the Omak POTW laboratory. The sample is collected on the morning of the day of analysis. Dissolved oxygen and pH are measured by meter in the plant on a weekly basis.

METHODS

Six sites were selected for sampling during the inspection, including:

1 State park sewer collection system - at sewer access port upstream of confluence with city sewer line.

2 Pump station wet well - below state park and city sewer confluence.

3-5 Primary treatment lagoon - three sites on opposite side from influent discharge.

6 Secondary lagoon - one site on opposite side from primary lagoon discharge.

Grab and composite samples were collected for field and laboratory analysis, as shown on Table 1. Grab composites were collected at sites 1 and 3 - 6. A 24-hour automatic composite sample (200 mL/30 min) was collected at site 2. Site 1 required grab compositing due to intermittent day flows and low flow at night. Sample volumes and flows for site 1 are listed on Table 2.

Table 2. Schedule for collecting grab/composite at State Park (site 1), July 12-13.

Time	Sample Volume (mL)	Flow Observation
0800	900	low
1000	1,800	medium
1235	900	medium
1435	900	low
0830	1,800	medium

For sites 3 through 6, two grab samples (morning-afternoon) were composited for lab analysis.

A grab sample was collected at the wet well on the morning of July 13. The analytical results were compared with the 24-hour composite collected by Ecology.

Immediately following collection, Ecology samples were placed on ice and stored in the dark in ice chests for transport to the Ecology laboratory at Manchester, Washington. The composited samples for sites 1 and 2 were kept on ice in automatic samplers during the 24 hours of sampling. BOD_5 and solids sample splits were made with the operator for comparative analyses. The sample splits were analyzed by the Omak laboratory, the operator (at the Conconully facility), and Ecology. Analytical procedures at the Ecology environmental laboratory conformed to EPA (1979) and APHA, et al. (1985).

Memo to John Hodgson
Conconully Publicly Owned Treatment Works Limited Class II Inspection

A walk-through pre-inspection survey was carried out on July 11. Plant maintenance and visual indicators of lagoon condition were noted.

RESULTS AND DISCUSSION

The grab sampling and 24-hour composite sample data collected during the survey are found on Table 3. BOD_5 and solids loading results are found on Table 4 along with percent reduction for the plant. The tables provide an overview of the survey results and serve as a reference for the following discussion. A summary of noteworthy findings follows:

1. Average influent flow of 22,180 (gpd) and BOD_5 loading of 44 lbs/day were well within the POTW design criteria (flow = 76,000 gpd, BOD_5 = 165 lbs/day) for summer use (criteria from R.W. Beck and Assoc., 1986).

2. Twenty-four-hour composite BOD_5 concentration for influent (240 mg/L) was of medium strength and considered normal for raw domestic sewage (200 - 300 mg/L) (Metcalf and Eddy, Inc., 1972).

3. Low dissolved oxygen values ($\leq$ 1.0 mg/L, EPA, 1977) were observed at all four lagoon sampling sites in the morning and at all three primary lagoon sites in the afternoon (Table 3). Weather conditions were mostly clear with patchy clouds and a temperature in the mid 70s--all conditions conducive to biological activity and optimum algal oxygen production.

4. There was an 83 percent reduction in BOD_5 observed during the survey based on influent 24-hour composite and treatment cell grab/composites (Table 4). The reduction may be misleading since lagoon design is based on long-term average loadings (R.W. Beck and Assoc., 1986). Conservative measures (conductivity, total inorganic nitrogen, and total phosphates) also indicate a reduction in the lagoon--most likely caused by recent additions of dilution water. Dilution water is often added to the lagoons to maintain sufficient water levels. The plant is hydraulically underloaded at present population served.

5. Observations of plant operation indicated a well-maintained facility with the exception of some weed control problems on the sides of the lagoons.

The low D.O.s observed in the lagoons may have been an artifact from the previous holiday weekend. Park attendance records estimate that about 2,600 overnight and day users (per day) were in the park on July 5 and 6, which may have resulted in high oxygen demand in the lagoons

the following week. Frequent measuring and recording of lagoon D.O. is recommended to determine if low D.O. is an on-going problem.

Specific conductivities measured in the field did not compare well with laboratory analyses (Table 3). Laboratory values were as much as one-third higher than field measurements. The cause of the measurement error is unknown.

Park attendance estimate and loading analyses are found on Table 5. Observations during the inspection suggest that park attendance records may be inaccurate. The park records indicate approximately 750 people used the park on the inspection weekend. Park records are based on a traffic counter at the main gate, and assuming three people per car. Plant flows and personal observations suggested a much lower attendance (approximately 200 park users). Care should be taken when using park records for calculating waste loads originating from the state park (park weekend attendance records, Appendix I).

Town population was based on an operator estimate of 165 (summer) and 150 winter full-time residents. The operator estimated up to 500 town users were possible due to recreation vehicle hook-ups; however, RV use appeared to be minimal during the inspection, and the 165 user estimate was used for the town population.

An objective of the survey was to measure waste flows and BOD_5 loading from the state park (Table 5). Due to very low and variable flow, flow measurement was not possible. Based on the town population estimate of 165, the park flow was estimated to be 5,700 gpd. The park BOD_5 concentration observed during the inspection (150 mg/L) may be low because of sampling problems. BOD_5 loading estimate based on attendance was 0.1 lb/day/person and on flow was 0.06 lb/day/person. (See Table 5 for assumptions and calculations.) Both appear to be reasonable when compared to Ecology design basis criteria (1985) for resort camps of this type.

Comparison of laboratory analyses is found on Table 6. Both the Omak and the operator analyses of BOD_5 were substantially lower than the Ecology analysis. The operator analysis of total suspended solids also was substantially lower. Further comment is not possible since laboratory observations were not made during the survey.

RECOMMENDATIONS

1. Further evaluation of the dissolved oxygen problems in the treatment lagoons is needed. More frequent monitoring is suggested.
2. Steps should be taken to control weed growth around the facility.
3. Laboratory procedures at the treatment plant should be evaluated.

DC:cp

Attachments

REFERENCES

APHA-AWWA-WPCF, 1985. Standard Methods for the Examination of Water and Wastewater, 16th Ed., 1134 pp.

Beck, R.W. and Assoc., 1986. Amendment for the Conconully Lakes Study Area.

Ecology, 1985. Criteria for Sewage Works Design (revised). Washington Department of Ecology. DOE 79-5

EPA, 1977. Operations Manual Stabilization Ponds. U.S. Environmental Protection Agency. EPA-430/9-77-012, August 1977.

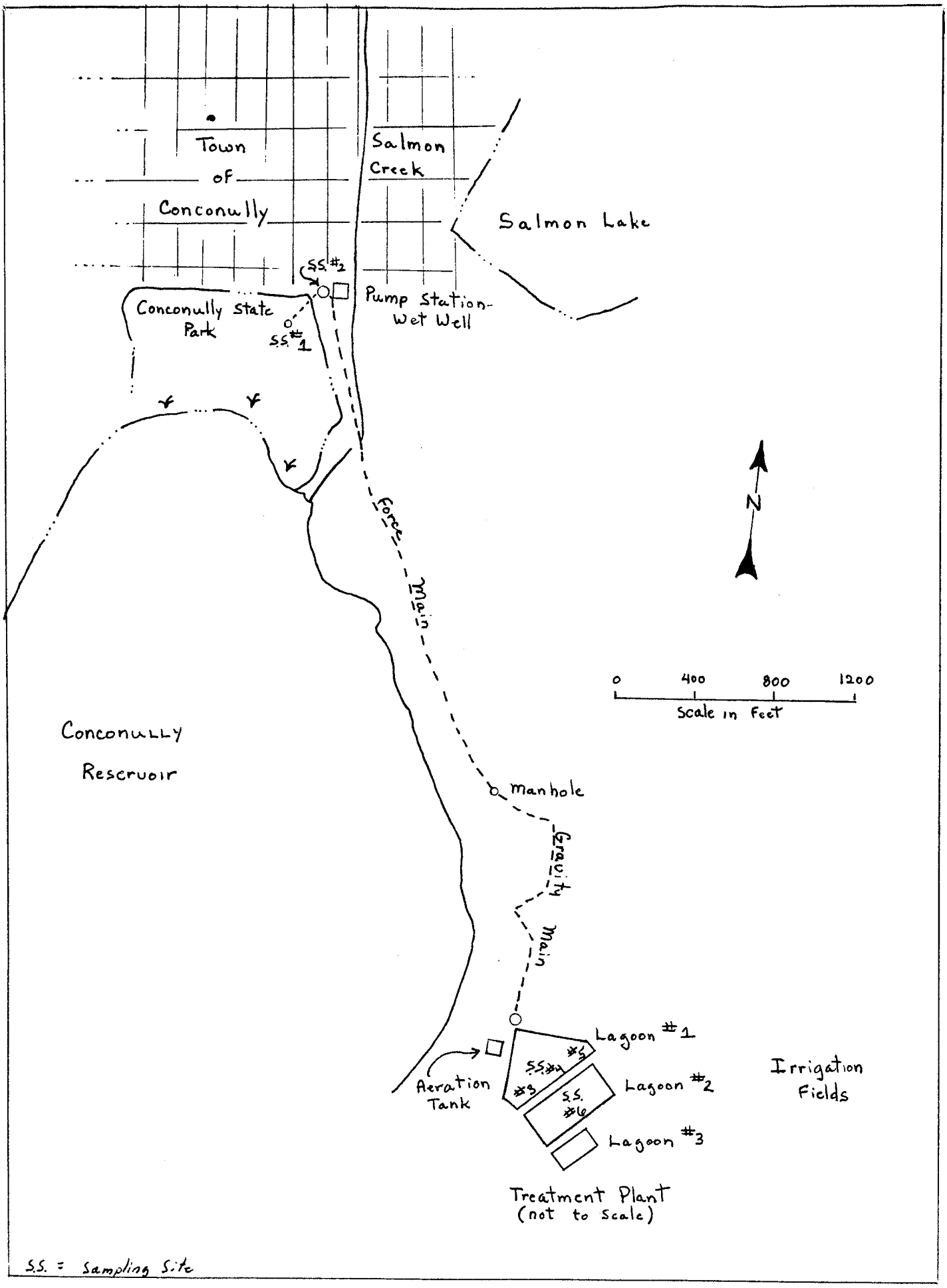

Figure 1. Map of Conconully, Washington, locale showing location of treatment plant in relation to the town and adjacent state park (map courtesy of R.W. Beck, 1986).

Table 1. Inspection Sampling Schedule - Conconully POTW, July 1986. All values mg/L unless noted.

	Station Number	Date	Time	Field Analysis				Laboratory Analysis							
				pH (SU)	Spec. Cond. (umhos /cm)	Temp. (°C)	Dissolved Oxygen	pH (su)	Spec. Cond. (umhos /cm)	COD	BOD_5	Nutrients (5)	Solids (4)	Turbidity (NTU)	Chlorides
Grab Samples															
Influent (State Park)	1	7/12	0750	X	X	X									
		7/12	1030	X	X	X									
		7/12	1240	X	X	X									
		7/12	1440	X	X	X									
Influent (Wet Well)	2	7/12	0730	X	X	X									
		7/12	1010	X	X	X									
		7/12	1215	X	X	X									
		7/12	1430	X	X	X									
		7/12	1600	X	X	X									
		7/12	1730	X	X	X									
		7/13	0730	X	X	X									
		7/13	0855 1/	X	X	X		X	X	X	X	X	X	X	X
Effluent															
Pond No. 1	3	7/12	0850	X	X	X	X								
		7/12	1305	X	X	X	X								
		7/12	2/					X	X	X	X	X	X	X	X
	4	7/12	0900	X	X	X	X								
		7/12	1320	X	X	X	X								
		7/12	2/					X	X	X	X	X	X	X	X
	5	7/12	0915	X	X	X	X								
		7/12	1340	X	X	X	X								
		7/12	2/					X	X	X	X	X	X	X	X
Pond No. 2	6	7/12	0925	X	X	X	X								
		7/12	1355	X	X	X	X								
		7/12	2/					X	X	X	X	X	X	X	X
Grab Composite Sample															
Influent* (State Park)	1	7/13	0840	X	X	X		X	X	X	X	X	X	X	X
24-Hour Composite Sample															
Influent** (Wet Well)	2	7/12 7/13	0700 0725	X	X	X		X	X	X	X	X	X	X	X

AV/OP3/86/120107(1)

1/ A grab sample was collected to compare with 24 hour composite samples results for determilning if grab used for POTW DMR's are representative of actual plant loadings -- operator normally collects DMR grabs at approximately 0900.

2/ Two grab samples (morning-afternoon) were collected for sampling points (G-1, G-2, G-3, G-4). For treatment lagoon field measurements (7/12), grabs were composited for later laboratory analysis.

*Manually composited at time listed on table 2 (see text) - low flows did not allow for 24-hour automatic composite sampling.

**24-hour time-paced composite. Approximately 225 mL of sample were collected every 30 minutes during the compositing period.

Table 3. Grab and Composite Sample Analytical Results - Conconully POTW, July 1986. All values mg/L unless noted.

	Station Number	Date	Time	Field Analysis				Laboratory Analysis													
				pH (SU)	Spec. Cond. (umhos /cm)	Temp. (°C)	Dissolved Oxygen	pH (SU)	Spec. Cond. (umhos /cm)	COD	BOD_5	Nitrate -N	Nitrite -N	Ammonia -N	$O\text{-}PO_4$ -P	$T\text{-}PO_4$ -P	Total Solids	TNVS	TSS	TNVSS	Turbidity (NTU)	Chlorides
Influent (State Park)	1	7/12	0750	7.8	300	13.2															
		7/12	1030	8.7	780	10.6															
		7/12	1240	7.9	371	14.4															
		7/12	1440	7.5	400	14.4															
(Wet Well)	2	7/12	0730	7.6	960	12.0															
		7/12	1010	8.8	690	14.5															
		7/12	1215	8.3	595	15.1															
		7/12	1430	8.2	508	15.1															
		7/12	1600	7.9	540	14.6															
		7/12	1730	8.2	540	14.6															
		7/13	0730	7.4	510	12.2															
		7/13	0855 1/	8.0	580	13.5		8.7	898	420	280	.38	.09	18	6.2	9.8	560	240	120	5	38	34
Effluent 2/																					
Pond No. 1	3	7/12	0850	7.7	320	16.7	0.4														
		7/12	1305	7.7	321	18.7	0.8														
		7/12	3/					8.0	331	67	40	.01	.01	2.0	2.6	3.2	260	130	3	1	4	11
	4	7/12	0900	7.8	329	16.9	0.7														
		7/12	1320	7.9	321	18.3	0.8														
		7/12	3/					8.0	333	71	40	.01	.01	2.1	2.8	3.3	270	130	9	1	6	11
	5	7/12	0915	7.7	330	16.7	0.2														
		7/12	1340	7.7	321	18.4	0.3														
		7/12	3/					7.9	330	64	40	.01	.01	2.2	2.6	3.2	250	140	3	1	5	11
Pond No. 2	6	7/12	0925	8.7	311	17.3	0.6														
		7/12	1355	8.9	308	19.3	1.2														
		7/12	3/					7.9	324	79	40	.05	.04	1.1	1.7	2.4	280	150	4	1	6	14
Grab Composite Sample*																					
Influent (State Park)	1	7/13	0840	8.0	500	2.6		8.7	870	180	150	.14	.11	16	5.7	7.2	470	210	54	6	17	39
24-hour Composite Sample																					
Influent (Wet Well)	2	7/13	0725	7.8	625	2.2		8.7	750	380	240	.31	.08	19	4.6	8.3	550	240	130	13	44	43

AV/OP3/86/120107(2)

1/ 4000 mL grab sample to compare POTW sampling method with 24-hour automatic composite sample.

2/ Treated wastewater from primary and secondary treatment cells.

3/ Comment 2/, Table 1.

*See Table 2 in text for sample schedule and volumes.

Table 4. Plant Loading Parameters and Percent Reduction for Conconully POTW, 1986

Flow: 22,180 gpd influent State Park 1/ 5,680 gpd

Sampling Site	Plant Loadings											
	BOD_5			COD			TSS			NH_3/NH_4+		
	(mg/L)	(lbs/day)	(% Red.)	(mg/L)	(lbs/day)	(% Red.)	(mg/L)	(lbs/day)	(% Red.)	(mg/L)	(lbs/day)	(% Red.)
State Park	150	7.1		180	9		54	3		16	.75	
Combined Influent	240 2/	44		380	70		130	24		19	3.5	
Primary Pond												
G-1	40	7.4	83	67	12	83	3	1	96	2	.4	89
G-2	40	7.4	83	71	13	82	9	2	92	2	.4	89
G-3	40	7.4	83	64	12	83	3	1	96	2	.4	89
Secondary Pond												
G-4	40	7.4	83	79	15	79	4	1	96	1	.2	94

AV/OP3/86/120107A(1)

1/ Park flow = Total flow - Town flow (Town flow = 16,500 gpd estimate)

Table 5. Population Loading Estimates for the Town of Conconully and Associated State Park, July 1986

Ecology Design Basis: 1/	Full time residents	100 gpd/person, 0.2 lbs BOD_5/day/person			
	Resort visitor	50 gpd/person, 0.05 lbs BOD_5/day/person			
Inspection Data:	Treatment Plant		State Park		
BOD_5	240 mg/L	44 lbs/day	150 mg/L		
Flow	22,180 gpd				
Population Served Estimate:	BOD_5 Loading Basis	Flow Basis	Town Population 2/	Park Visitors	
Full time equivalents	220	222	165	57	
Park part-time equivalents				228	
Flow (gpd) Estimate:	Totalizer 3/	Town	Park		
Population served basis	22,180	16,500	5,680		
BOD_5 Loading Estimate (lbs/day):				Total	
Population served basis:		33	11.4	44.4	
Inspection concentration basis:		33	7.1	40.1	
BOD_5 Loading per Person (lbs/day):					
Population served basis:				.1	
Inspection concentration basis:				.06	

AV/OP3/86/120107B(2)

1/ Ecology, 1985 Criteria for Sewage Works Design.
2/ Town population from plant operator.
3/ 24-hour flow recorded at lift station during survey.

Table 6. Comparison of Laboratory Results on Ecology Samples Collected During Conconully Inspection, July 1986

Sample	Laboratory	BOD_5 (mg/L)	TSS (mg/L)
Influent 1/	Omak	187	
Influent 1/	Operator 2/	167	72
Influent 1/	Ecology	240	130
Influent 3/	Ecology	280	120

AV/OP3/86/120107B(3)

1/ 24-hour time composited sample split 3 ways for analysis.

2/ Analysis performed by Conconully operator at Omak Laboratory.

3/ Influent grab collected 7/13 to compare grab results (method routinely used by operator for DMR's) with 24-hour composite.

Appendix I. Weekend Attendance Records for the Conconully State Park for April-July, 1985 and 1986

	1985				1986			
	Saturday		Sunday		Saturday		Sunday	
	Date	Attendance	Date	Attendance	Date	Attendance	Date	Attendance
April	6	41	7	57	5	95	6	102
	13	28	14	57	12	84	13	91
	20	64	21	264	19	133	20	207
	27	194	28	257	26	88	27	63
May	4	187	5	235	3	179	4	424
	11	262	12	265	10	464	11	366
	18	401	19	503	17	1041	18	940
	25	1356	26	979	24	2345	25	3047
					31	863		
June	1	265	2	164			1	853
	8	319	9	367	7	879	8	1015
	15	364	16	327	14	662	15	802
	22	528	23	451	21	1209	22	1050
	29	517	30	403	28	973	29	803
July	6	724	7	518	5	2756	6	2552
	13	364	14	437	12	743	13	382
	20	643	21	949	19	1138	20	1540
	27	722	28	525	26	1673	27	1211

AV/OP3/86/120107B(1)