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DEPARTMENT OF ECOLOGY
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MEMORANDUM
July 5, 1979

To: Harold Porath

From: Eric Egbers

Subject: Cashmere STP Class II Inspection

Introduction

A Class II inspection was conducted at the Cashmere Sewage Treatment Plant (STP) on April 24-25, 1979. In attendance were Eric Egbers (DOE Water and Wastewater Monitoring Section), Harold Porath (DOE Central Regional Office), and Charles Cruickshank (Cashmere STP Operator). Composite and grab samples were collected, split with the operator, and transported to DOE laboratories in Tumwater and Redmond for analysis.

The Cashmere sewage treatment facility consists of three facultative lagoons operated in series. The first and largest cell is mechanically aerated by three 25 hp aerators. The remaining two cells are used primarily as settling basins. Influent flow enters the first cell via two separate lines. One line carries wastewater from the town of Cashmere. The other carries wastewater from the area's largest industry, Tree Top, Inc. Tree Top, Inc. processes local fruit and foreign fruit juice concentrate to produce frozen apple juice concentrate. Wastewater leaves the aerated cell and proceeds to the second and third cells. From the final cell, the flow is chlorinated and enters the chlorine contact chamber. It spills over a 90° V-notch weir and enters the Wenatchee River, waterway segment no. 21-45-01, at approximate river mile 9.0. The five-year strategy identifies this segment as currently meeting the state and federal water quality goals.

Findings and Conclusions

At the time of this inspection, Cashmere STP was in compliance with its NPDES permit monthly effluent limitations, although they were approaching the upper permit limits for total suspended solids (mg/l) and pH. The high values for these parameters appear to be primarily due to the substantial algal community within the stabilization cells.

Influent flow and BOD load to the plant were within typical ranges for a town the size of Cashmere (Hammer, 1975). Tree Top's contribution to the load on the plant is seasonally variable. At the time of this inspection, the STP was actively discharging to the river. During the summer, evaporation exceeds inflow and the lagoons operate in a non-overflow mode.

The flow measuring device on the effluent was examined for accuracy and found to be in need of calibration. Mr. Cruickshank agreed to have this done as soon as possible.

The wastewater entering the aerated faculative cell from Tree Top, Inc. contains substantial amounts of pulp and diatomaceous earth. Evidence of these solids can be seen where the influent line discharges to the cell.

A substantial solids buildup within a lagoon can have several detrimental effects;

1. It can decrease the effective volume within the cell, and thus treatment efficiency.

2. It can decrease circulation within the cell.

3. It can increase the need for costly solids removal (periodic dredging).

For these reasons, removal of solids is preferable before introduction to the treatment plant rather than after.

Although meeting their NPDES limitations, the facility was not achieving the degree of treatment characteristic of a well designed aerated faculative lagoon. The corners of the cell have reached anaerobic conditions, apparently due to poor circulation. This has reduced the effective volume of the cell and produced a definite odor problem. The offensive smell of hydrogen sulfide (H_2S) gas was quite strong at the time of this inspection. Also, bubbles of hydrogen sulfide or methane gas and a scum layer were noticed in the corners of the cell.

In summary, the following are recommended:

1. Removal of the solids island at the Tree Top, Inc. discharge pipe. This should increase the effective volume and improve circulation.

2. Removal of solids from the Tree Top, Inc. wastewater before entrance to the treatment lagoon.

3. Improve circulation through the aerobic faculative cell to eliminate the "dead" corners and improve wastewater treatment.

In conjunction with the regional follow-up inspection (mid-August 1979), the following recommendations should be reviewed with the operator, noting those which have been implemented:

1. The calibration of the flow measuring device.

2. Review of laboratory procedures recommendations as specified in the following section of this memo.

Review of Laboratory Procedures and Techniques

Laboratory and sampling procedures were reviewed with Mr. Cruickshank on April 24, 1979. The operator is very conscientious in his work and receptive to any suggestions made to improve his laboratory techniques.

Laboratory procedures and techniques were quite good. A comparison of the analyses performed on the split samples was also quite good, with the exception of BOD_5 (mg/l) from the Tree Top, Inc. discharge to the plant (Table 1).

Biochemical Oxygen Demand - 5-Day

BOD_5 analysis is performed on the municipal influent, Tree Top, Inc. influent, and the chlorinated effluent. Analysis is performed weekly, except during nondischarge periods. A YSI dissolved oxygen meter and probe is used to obtain dissolved oxygen concentrations and is calibrated using the Winkler-Azide modification method. Procedures and techniques are performed according to *Standard Methods for the Examination of Water and Wastewater, 14th Edition,* 1975. As an additional reference, a copy of the Department of Ecology's *Laboratory Test Procedure for Biochemical Oxygen Demand of Water and Wastewater,* August 1977, was sent to Mr. Cruickshank following the inspection.

A discrepancy was noted earlier between the results from the sample split of the Tree Top, Inc. influent BOD_5. After discussing this problem with the operator, it was learned that the wastewater from Tree Top, Inc. is often very alkaline and that he has not been adjusting the pH of his sample prior to setting up his test. The high pH of the sample may retard micro-organism respiration and growth. To establish a viable population of micro-organisms, seeding the sample would be necessary. Mr. Cruickshank seeds his chlorinated effluent samples, so adoption of seeding procedures on Tree Top samples should present few difficulties.

After reviewing the Laboratory Procedural Survey, several other items warrant mentioning. The operator refrigerates his grab composite prior to setting up for analysis. The sample is taken directly from the refrigerator and analyzed. By warming the sample to room temperature (18-20°C), the operator will alleviate any potential interference from the cold temperature. Seed material is presently collected from the unchlorinated effluent just prior to chlorination. Settled influent is preferred over lagoon effluent

as a seed because anomalies may result from algal respiration in the BOD test. This seed should be used for all samples. Also, seed material should be added to the dilution water containing the sample, not to the bottle prior to incubation, as has been the practice of the operator. Finally, the placement of the thermometer within the incubator was discussed. At the time of the inspection, a thermometer was hanging from the shelf within the incubator, below the level of the samples. Temperature gradients can exist within an incubator, so immersing the thermometer in a flask filled with water at the same level as the samples is preferable and will yield a more accurate record of temperature.

In conclusion, recommendations were:

1. Adjust the sample pH to about 7 if outside the range 6.5 to 8.0 and record on the analysis sheet.

2. Allow samples to equilibriate to room temperature (18-20°C) before set-up.

3. Collect seed material from the municipal influent to insure a viable population of micro-organisms.

4. Seed all samples, especially the influent sample from Tree Top, Inc. Add the seed to the dilution water containing the sample.

5. Immerse the incubator thermometer in a waterbath and place on the same shelf as the samples.

Total Suspended Solids

TSS analysis is performed on the municipal influent, Tree Top, Inc. influent, and chlorinated effluent. Collection and analysis is performed weekly, except during no discharge periods. The Gooch Crucible apparatus is used, employing the approved Reeve Angel 934AH filter paper. Procedures and techniques are performed according to *Standard Methods for the Examination of Water and Wastewater, 14th Edition*, 1975. As an additional reference, a copy of the Department of Ecology's *Solids-Test Procedures* was sent to Mr. Cruickshank following the inspection.

TSS sample technique and analysis is very good. The only noted discrepancy is the amount of sample filtered. A minimum of 50 ml of sample is recommended to obtain an adequately representative aliquot, and the operator was filtering a maximum of 10-20 ml in

approximately 5 minutes. Since less than 50 ml of sample was filtered, it is recommended that the operator perform duplicate or triplicate filtrations, utilizing new crucibles and filters (pre-washed, dried, and weighed), of lesser volumes so the end amount of sample is at least 50 ml.

Fecal Coliform

Fecal coliform analysis is performed on the chlorinated effluent. The membrane filter technique is used, employing purchased M-FC broth ampoules. Analysis is performed weekly and appears to be adequate.

Total Residual Chlorine

TRC is determined by the use of the EPA and DOE accepted DPD method (LaMotte test kit).

pH

A Corning #5 pH meter with reference probe is used to determine pH. The meter is calibrated daily using #7 buffer solution only.

Recommendations

1. Obtain #4 and #10 buffer solutions to insure an accurate and complete calibration of the meter.

EE:cp

Attachments

Class II Field Review and Sample Collection
24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent (Mun.) aliquot - 250 ml/30 min.	4/24 @ 0920	Within manhole just outside lift stati approx. 0.25 miles from lagoons
2. Influent (Tree Top) aliquot - 250 ml/30 min.	4/24 @ 0945	Within manhole just outside lift stati on Tree Top side of river
3. Unchlor. Eff. aliquot - 250 ml/30 min.	4/24 @ 0900	At manhole prior to chlorinator and contact chamber
4. Chlor. Eff. aliquot - 250 ml/30 min.	4/24 @ 0840	At discharge end of chlorine contact chamber prior to weir

Grab Samples

	Date and Time	Analysis	Sample Location
1.	4/25 @ 0835	Fecal Coliform	Chlorinated effluent
2.	4/25 @ 1030	Fecal Coliform	Chlorinated Effluent
3.			
4.			
5.			
6.			

Flow Measuring Device

1. Type - Weir, 90° V-notch
2. Dimensions -

a. Meets standard criteria /X/ Yes

/ / No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	0.286 mgd	0.225 mgd	79%
2.			
3.			

/ / is within accepted 15% error limitations

/X/ is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
Temperature	4/25 @ 0915	Influent (Municipal)	5.4
Conductivity	4/25 @ 0915	Influent (Municipal)	960
pH	4/25 @ 0915	Influent (Municipal)	8.0
Temperature	4/25 @ 0935	Influent (Tree Top)	8.3
Conductivity	4/25 @ 0935	Influent (Tree Top)	>1000
pH	4/25 @ 0935	Influent (Tree Top)	9.2
Temperature	4/25 @ 0850	Unchlorinated Effluent	9.8
Conductivity	4/25 @ 0850	Unchlorinated Effluent	950
pH	4/25 @ 0850	Unchlorinated Effluent	8.8
Temperature	4/25 @ 0830	Chlorinated Effluent	8.8
Conductivity	4/25 @ 0830	Chlorinated Effluent	980
pH	4/25 @ 0830	Chlorinated Effluent	8.6
Total Chlorine Residual	4/25 @ 0835	Chlorinated Effluent	1.4
Total Chlorine Residual	4/25 @ 1030	Chlorinated Effluent	1.3

Table I

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

	DOE				CASHMERE STP				NPDES (monthly average)
	Influent Municipal	Influent Tree Top	Unchlor. Effluent	Chlorinated Effluent	Influent Municipal	Influent Tree Top	Unchlor. Effluent	Chlor. Eff.	
OD_5 mg/l	170	>3600	58	84	212	1188	92	109	105
bs/day	244	>510		149	304	168		193	274
SS mg/l	100	270	110	130	100	281		91	133
bs/day	144	38		230	144	40		161	347
otal Plant Flow GD	0.172**	0.017**		0.212					0.313
H	7.4	9.0	8.4	8.5					6.5-8.5
ecal Coliform (col/100 ml)				42 est. <20					200
urbidity (NTU)	54	40	31	33					
OD (mg/l)	310	5400	260	280					
O_3-N (mg/l)	0.6	3.9	<0.1	<0.1					
O_2-N (mg/l)	<0.1	0.1	<0.1	<0.1					
H_3-N (mg/l)	17	1.6	1.8	1.8					
-PO_4-P (mg/l)	4.8	7.8	4.8	5.0					
otal Phos-P (mg/l)	7.9	13	6.4	6.8					
otal Solids (mg/l)	680	5500	1300	730					
. Non Vol Solids (mg/l)	410	1000	720	390					
. Sus. Non Vol Solids (mg/l)	2	200	<5	<5					
rthophenolphenate (ppb)	<2			<2					

*Field analysis "<" is "less than" and ">" is "greater than"

**The total of these flows does not necessarily represent total influent flow entering the plant, because of the possibility of infiltration and inflow into the sewer system from Tree Top's discharge line which lies beneath the Wenatchee River.

Table 2
Overall Plant Efficiency

	lbs incoming/day	lbs discharged/day	% Reduction
BOD	811*	149	82
TSS	182	230	(Total Net Increase)

Overall Cell Dimensions

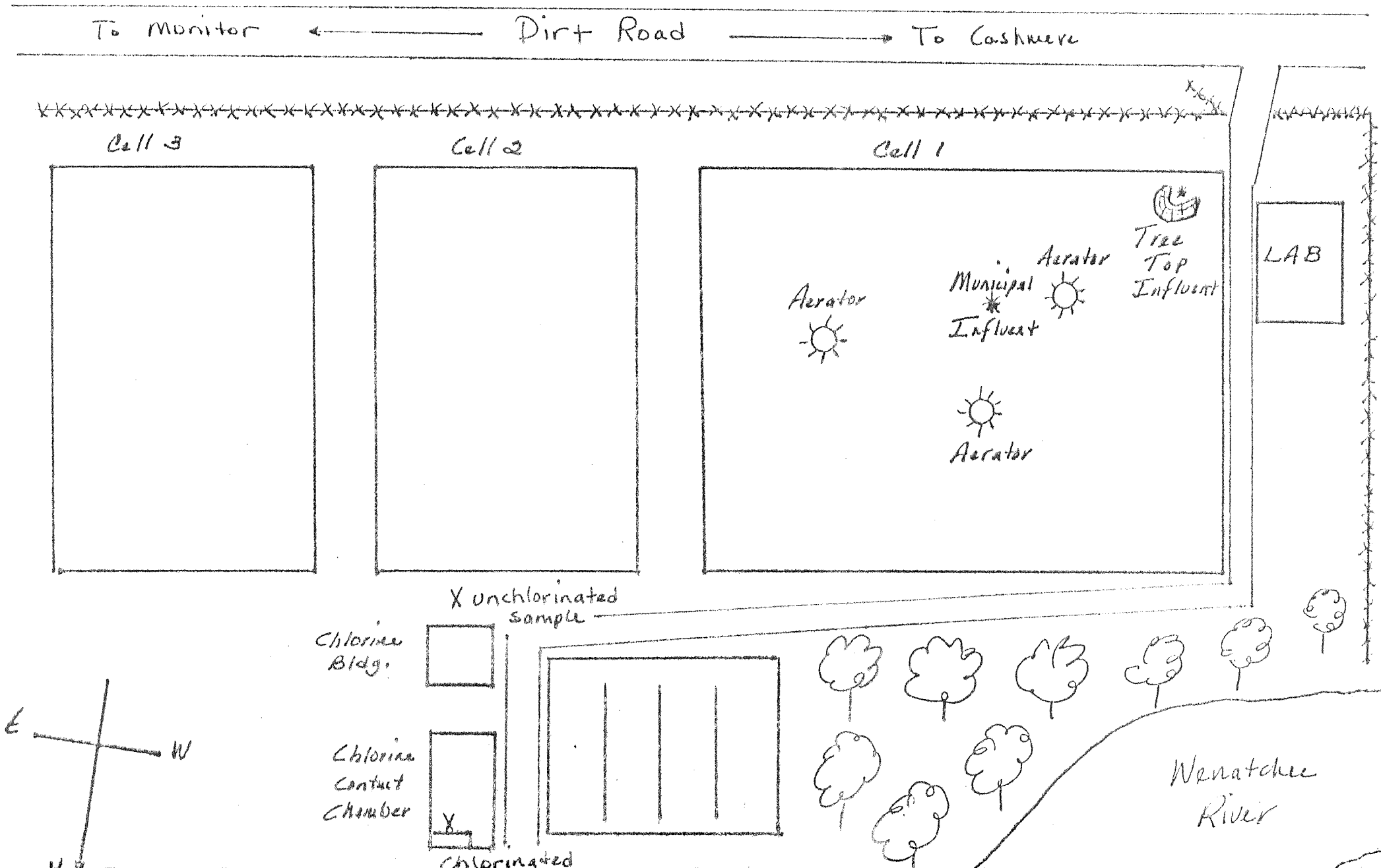
	Size			Approx. Avg. Depth	Volume (m gallons)		Aeration		
	ft^2	ft^3	Acres		Design	Actual	No. of Aerators	hp/Aerator	hp/m Gallon
Cell #1 (Aerated)	424,277	1,697,108	9.7	4 ft.	16.3	12.7	3	25	5.9**
Cell #2	219,960	879,840	5.1	4 ft.	7.1	6.6			
Cell #3	192,414	769,656	4.4	4 ft.	6.9	5.8			
Total	836,651	3,346,604	19.2	4 ft.	30.3	25.1			

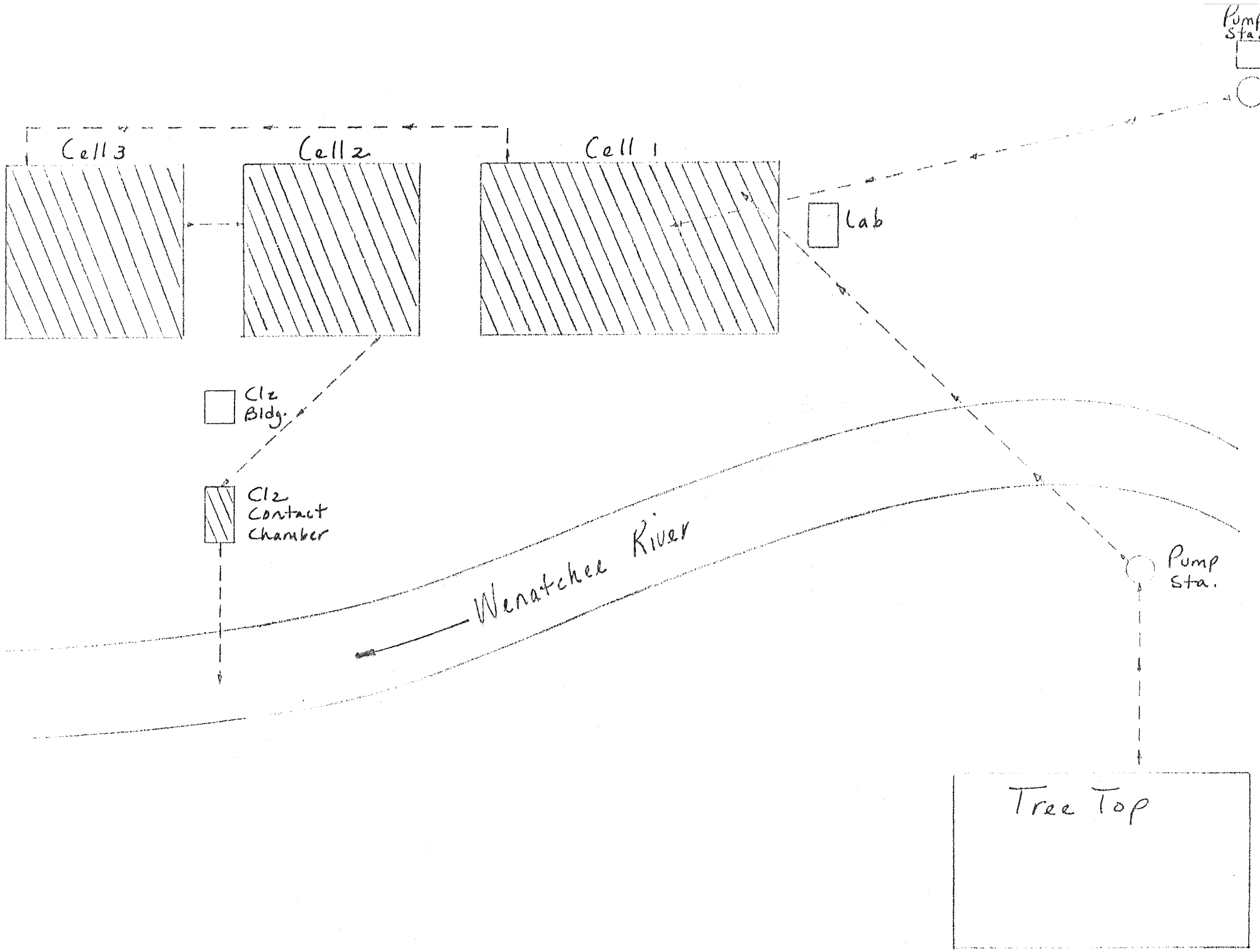
Loading on Cell #1

	Organic Loading				Hydraulic Loading	
	Expected (lbs/day)	Actual (lbs/day)	Expected (lbs/acre/day)	Actual (lbs/acre/day)	Expected (mgd)	Actual (mgd)
Municipal	397***	244	--	25	.149-.199***	.172
Tree Top, Inc.	--	567*	--	59*	--	.017
Total	--	811*	--	84*	--	.189
Design Criteria			30-100****			

*Assuming Tree Top BOD_5 = 4000 mg/l
**DOE design criteria for aerated faculative lagoon = 4-10 hp/m gallon of volume.
***Hammer, 1975.
****Metcalf and Eddy, 1972.

Cashmere STP Lagoons




Pump Sta.
Cell 3
Cell 2
Cell 1
Lab
Cl2 Bldg.
Cl2 Contact Chamber
Wenatchee River
Pump Sta.
Tree Top