

March 25, 1974

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WA-01-1140

Memo to: John Glynn

From: Hans Cregg

Subject: Keyport Wastewater Treatment Plant Efficiency
Survey.



On January 15, 1974, an efficiency study was conducted on the Keyport Wastewater Treatment Plant.

Heavy rainfall during the previous week made flow measurement impractical. The Weir designed for this purpose was overflowing; consequently the volumes of water handled were well beyond the intended capacity of the plant.

All reductions - BOD, COD and solids - were negative. It is felt that this condition was precipitated by two factors:

- 1) the large volumes of water entering the plant (due to infiltrating rainwater) dilute the actual sewage and are responsible for the lower than normal BOD, COD and solids values.
- 2) the aeration tank is being over-aerated and nitrification has taken place. The resulting pinpoint solids are carried in suspension to the receiving waters. This condition gives rise to high effluent BOD, COD and solids values.

In addition, no chlorination of the effluent took place. The chlorinator was in a state of disrepair and apparently had been in this condition for a number of weeks. The resulting high coliform counts bring this deplorable situation into sharp focus.

The operator indicated that he devotes between 1/2 and 1 hour per day to the plant. It is felt that this amount of time is inadequate if the plant is to be run in an efficient manner.

HC:jmh

STP SURVEY REPORT FORM
(EFFICIENCY STUDY)

City Keyport Plant Type Primary Population Served Design Capacity
 Receiving Water _____ Engineer _____
 Date 1/15/74 Survey Period 8 hours Survey Personnel H. Cregg
 Comp. Sampling Frequency Every 1/2 hr. Weather Conditions Heavy rain
 (last 48 hours)
 Sampling Alequot 1000 ml.

PLANT OPERATION

Total Flow _____ How Measured Weir
 Max. (Flow) _____ Time of Max. _____ Min. _____ Time of Min. _____
 Pre Cl₂ None #/day Post Cl₂ None #/day

FIELD RESULTS

Determinations	Influent				Effluent			
	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp. °C	10.8	8.4	9.0	8.8	9.0	8.7	8.8	8.8
pH	6.7	6.5	---	6.6	7.0	7.0	---	7.0
Conductivity (umhos/cm)	250	150	194	200	200	175	184	180
Settleable Solids	6	4	5	5	35	10	25	30

LABORATORY RESULTS ON COMPOSITE IN PPM

Laboratory Number	Influent	Effluent	% Reduction
	74-0110	74-0111	All reductions are negative, ie. the influent is of better quality than the effluent.
5-Day BOD	<40	93	
COD	54	120	
T.S.	169	240	
T.N.V.S.	87	108	
T.S.S.	41	120	
N.V.S.S.	11	41	
pH	6.9	6.9	
Conductivity	190	170	
Turbidity	15	30	

Keyport

BACTERIOLOGICAL RESULTS

Na₂S₂O₃ added to sample Before sampling after _____ min.

LAB #	SAMPLING TIME	COLONIES/100 MLS (MF)		Cl Residual	
		Total	Fecal	ppm	(after secs.)
74-0112	0900	>4 x 10 ⁴	4800	0	
0113	1230	>4 x 10 ⁴	7500	0	
0114	1500	>4 x 10 ⁴	>4000	0	
0115	1630	>4 x 10 ⁴	est8400	0	

Operator's Name _____ Phone # _____

Comments: EFFLUENT
 NO₃ = 3.15 mg/l
 NO₂ = 0.05 "
 NH₃ = 1.30 "
 T-KN = 4.20 "
 O-PO₄ = 0.80 "
 T-PO₄ = 2.48 "

MEMORANDUM

December 4, 1975

To: Larry Lewis

From: Allen Moore

Subject: Annapolis STP

On January 6, 1975 an efficiency survey was conducted at the Annapolis sewage treatment plant. The plant is highly overloaded mostly during the wet season due to infiltration. The high overloading at the time of the survey is directly reflected in the low reduction between influent and effluent in all the pertinent parameters as shown in the attached STP Survey Report Form. The high fluctuations in pH are probably due to effluents from a laundry and a car wash. I feel that the effluent is too highly chlorinated. The operator tries to maintain the chlorine residual at 3 ppm. The flow was checked at the 90° V-notch weir. The STP recorder showed 1.08 MGD and manual measurement showed 1.01 MGD. The flow remained nearly constant probably due to even, high infiltration. Historically, bypassing of the influent occurred regularly with heavy rains. Recent installation of new pumps now runs all sewage through the STP.

AWM:ee

STP Survey Report Form

Efficiency Study

City Annapolis Plant Type Spirogestor Pop. Served 5000 Design .5 MGD
 Capacity
 Receiving Water Sinclair Inlet Perennial X Intermittent _____
 Date 6 Jan. 75 Survey Period 1000 - 1600 Survey Personnel Allen Moore
 Comp. Sampling Frequency hourly Sampling Alequot 1000 ml ^x $\frac{\text{flow (MGD)}}{\text{max. flow (MGD)}}$
 Weather Conditions (24 hr) .9 inch rain Are facilities provided for complete by-
 pass of raw sewage? X Yes _____ No/Frequency of bypass 0
 Reason for bypass _____ Is bypass chlorinated? _____ Yes X No
 Was DOE Notified? _____ Discharge - Intermittent _____ Continuous X

Plant Operation

Total flow 270,000 gal. How measured 90° V-notch weir - totalizer
 Maximum flow _____ Time of Max. _____
 Minimum flow _____ Time of Min. _____
 Pre Cl₂ 15 #/day Post Cl₂ 31 #/day

Field Results

Influent

Effluent

Determinations	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp °C	14.0	12.0		13.0	13.5	12.0		12.5
pH (Units)	9.4	6.7		7.2	8.2	7.3		7.8
Conductivity (µmhos/cm ²)	800	450		500	500	450		500
Settleable Solids (mls/l)	4.5	2.5	3.5	3.0	2.25	2.0	2.12	2.0

Laboratory Results on Composites

	Influent	Effluent	% Reduction	lbs/day
Laboratory No.	<u>75-0026</u>	<u>0027</u>		
5-Day BOD ppm	<u>78</u>	<u>66</u>	<u>16</u>	
COD ppm	<u>197</u>	<u>162</u>	<u>18</u>	
F.S. ppm	<u>356</u>	<u>320</u>	<u>11</u>	
F.N.V.S. ppm	<u>209</u>	<u>197</u>	<u>06</u>	
F.S.S. ppm	<u>69</u>	<u>50</u>	<u>28</u>	
V.V.S.S. ppm	<u>5</u>	<u>2</u>	<u>96</u>	
pH (Units)	<u>8.0</u>	<u>7.6</u>		
Conductivity (µmhos/cm ²)	<u>460</u>	<u>450</u>		
Turbidity (JTU's)	<u>58</u>	<u>34</u>		

M E M O R A N D U M

January 14, 1976

To: John Glynn

From: Allen Moore

Subject: Keyport STP Efficiency Survey

The Keyport STP received an efficiency survey on January 7, 1975. The plant was fairly well maintained. BOD reduction was fair. The effluent was too highly chlorinated with residuals between 2.0 and 3.0 ppm. The field and lab data is summarized on the Data Summary sheet and the STP Survey Report Form.

AWM:ee

STP Survey Report Form

Efficiency Study

City Keyport Plant Type Secondary Pop. Served _____ Design Capacity _____
 Receiving Water Liberty Bay Perennial Intermittent _____
 Date 7 Jan. 75 Survey Period 0900 - 1630 Survey Personnel Allen Moore
 Comp. Sampling Frequency Hourly Sampling Alequot Max. flow X 1000 ml
 Weather Conditions (24 hr) cold, no rain/snow
 until 1000 Are facilities provided for complete by-pass of raw sewage? Yes No/Frequency of bypass _____
 Reason for bypass _____ Is bypass chlorinated? Yes No
 Was DOE Notified? _____ Discharge - Intermittent _____ Continuous _____

Plant Operation

Total flow 15,750 in 7 hr. or .054 MGD How measured 3" Parshall flume hand measure
 Maximum flow .089 MGD Time of Max. 1600
 Minimum flow .025 MGD Time of Min. 1100
 Pre Cl₂ _____ #/day Post Cl₂ 3.5 #/day

Field Results

Influent

Effluent

Determinations	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp °C	11.5	10.0		11.0	10.0	9.0		9.5
pH (Units)	7.0	6.7		6.9	6.4	6.2		6.3
Conductivity (µmhos/cm ²)	450	275		375	375	350		375
Settleable Solids (mls/l)	3.0	0.2	1.4	1.0	0.1	0	T	T

Laboratory Results on Composites

	Influent	Effluent	% Reduction
Laboratory No.	<u>75-0052</u>	<u>75-0053</u>	
5-Day BOD ppm	<u>78</u>	<u>18</u>	<u>77</u>
COD ppm	<u>126</u>	<u>39</u>	<u>70</u>
T.S. ppm	<u>245</u>	<u>228</u>	<u>7</u>
T.N.V.S. ppm	<u>125</u>	<u>124</u>	<u>1</u>
T.S.S. ppm	<u>53</u>	<u>24</u>	<u>55</u>
N.V.S.S. ppm	<u>10</u>	<u>5</u>	<u>95</u>
pH (Units)	<u>6.9</u>	<u>6.4</u>	<u>50</u>
Conductivity (µmhos/cm ²)	<u>270</u>	<u>290</u>	
Turbidity (JTU's)	<u>25</u>	<u>10</u>	

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

WATER QUALITY LABORATORY

DATA SUMMARY

ORIGINAL TO: A.W. Moore
COPIES TO:
.....
.....
LAB FILES:

Source KEYPORT STP

Collected By AWM

Date Collected 1-6-75

Goal, Pro./Obj. _____

Log Number:	75-0052	53	54	55	56	57	58	59	60	61	STORET
Station:	INF	eff	PFT-0900	1000	1100	1300	1500	1600	LIBERTY	RAY	
pH	6.9	6.4									00403
Turbidity (JTU)	25.	10.									00070
Conductivity (umhos/cm)@25°C	270.	290.									00095
COD	126	39									00340
BOD (5 day)	78	18									00310
Total Coliform (Col./100ml)	-	-	<20	EST 20	<20	<20	EST 20	<20	EST 20	<20	31504
Fecal Coliform (Col./100ml)	-	-	<10	<10	<10	<10	<10	<10	<10	<10	31616
NO3-N (Filtered)	-	.02									00620
NO2-N (Filtered)	-	.02									00615
NH3-N (Unfiltered)	-	.24									00610
T. Kjeldahl-N (Unfiltered)	-	1.64									00625
O-PO4-P (Filtered)	-	2.30									00671
Total Phos.-P (Unfiltered)	-	2.40									00665
Total Solids	245	228									00500
Total Non Vol. Solids	125	124									
Total Suspended Solids	53	24									00530
Total Sus. Non Vol. Solids	10	5									

Note: All results are in PPM unless otherwise specified. ND is "None Detected"
Convert those marked with a * to PPB (PPM X 10³) prior to entry into STORET

Summary By Stephen P. Roll Date 1-27-75

Figure 1. Coal Creek Slough sampling stations, July 21, 1991

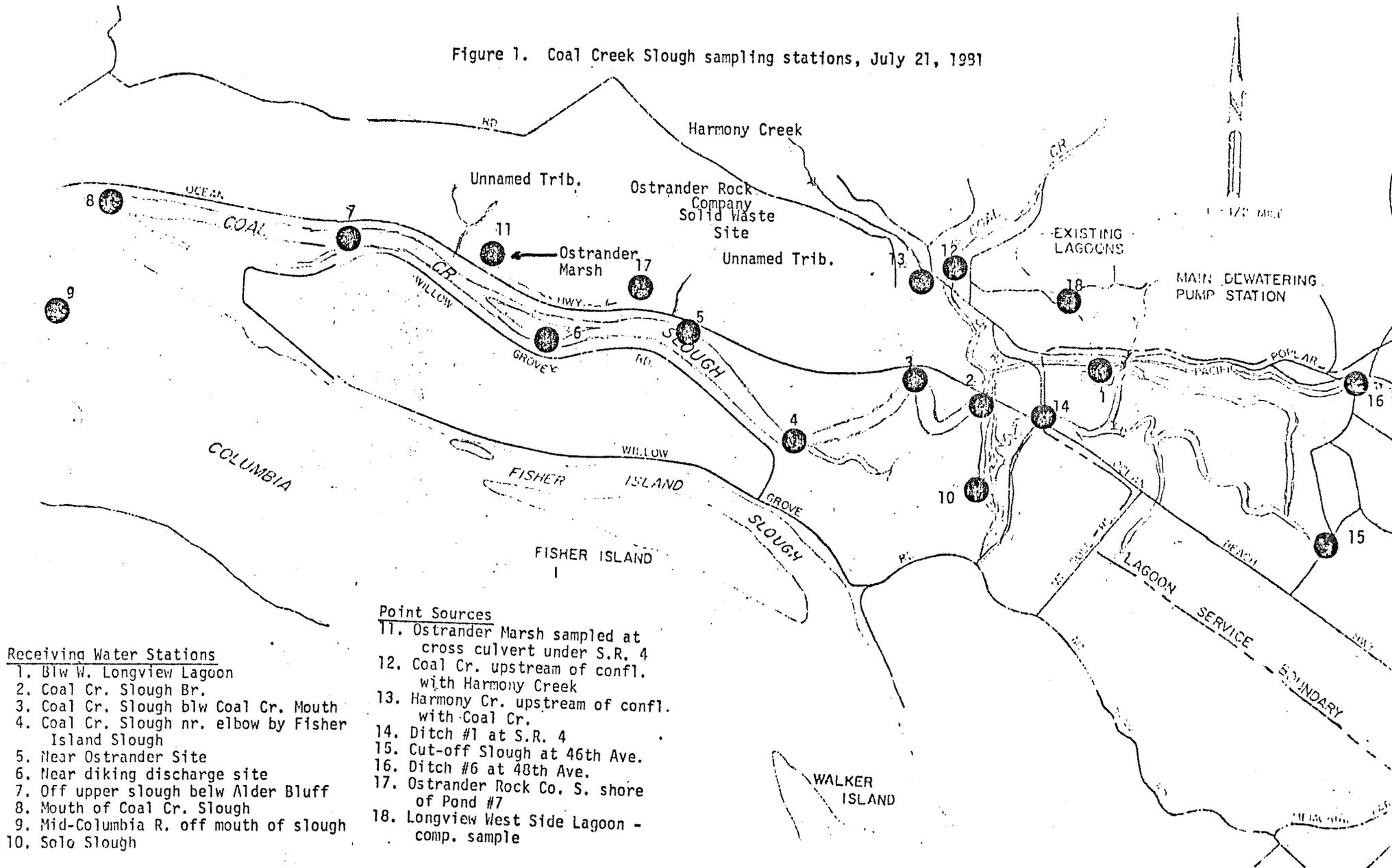


Table 1. Water quality in Coal Creek Slough, July 21, 1981.

Time	Station	Depth (ft)	Temp. (°C)	Conductance (umhos/cm)	pH (S.U.)	Diss. Oxygen (mg/L)	Percent Sat.	Fecal Coliform (col/100 ml)	Secchi (in)	Turb. (NTU)	TSS (mg/L)	NO ₃ -N (mg/L)	NO ₂ -N (mg/L)	NH ₃ -N (mg/L)	Un-ionized Ammonia (mg/L)	T-PO ₄ -P (mg/L)	COD (mg/L)	BOD (mg/L)	Tannin & Lignin (mg/L)
1300	1. Below West Longview Lagoon	0	18.5	332	7.2	6.6	69%	32*	14	23	13	.03	.01	1.5	.0081	1.1	27	5	2.3
		5	18.5		6.4	6.4	67%												
		8	18.5		6.3	6.3	65%												
1240	2. Coal Cr. Slough Br.	0	17.5	200	7.2	6.6	69%	47*	29	15	17	.11	.01	.32	.0020	.07	20	--	1.8
		5	17.5		6.9	6.9	71%												
		10	17.5		7.0	7.0	70%												
1220	3. Second Elbow Below Coal Cr. Mouth	0	18.5	161	7.1	6.6	69%	16*	34	10	10	.10	.01	.16	.0008	.06	4	4	1.4
		5	18.5		6.7	6.7	68%												
		10	18.0		6.7	6.7	68%												
		15	18.0		6.9	6.9	70%												
		17	18.0		6.9	6.9	70%												
1210	4. Near Elbow by Fisher Island Slough	0	18.5	152	7.1	5.1	54%	12*	35	8	12	.11	.01	.14	.0007	.05	12	--	1.2
		5	18.5		5.1	5.1	54%												
		10	18.5		5.2	5.2	55%												
		15	18.2		5.0	5.0	53%												
		20	18.1		4.9	4.9	51%												
		22	18.1		4.9	4.9	51%												
1200	5. 100 ft. Above Ostrander Site	0	18.2	143	7.1	6.0	63%	16*	33	11	10	.11	.01	.08	.0004	.05	4	6	1.2
		5	18.2		6.1	6.1	67%												
		10	18.2		5.8	5.8	60%												
		15	18.2		5.8	5.8	60%												
		20	18.2		5.8	5.8	60%												
		25	18.2		5.7	5.7	59%												
		30	18.2		5.8	5.8	60%												
1150	6. Near Diking Discharge Site	0	18.0	139	7.1	5.5	58%	12*	24	10	12	.10	.01	.09	.0004	.05	8	--	1.1
		5	18.0		5.2	5.2	55%												
		10	18.0		5.2	5.2	55%												
		15	18.0		5.1	5.1	53%												
		20	18.0		5.1	5.1	53%												
		25	18.0		5.1	5.1	53%												
		30	18.0		5.1	5.1	53%												
1140	7. Off Upper Slough Below Alder Bluff	0	18.0	133	7.2	6.8	70%	11*	29	11	17	.05	.01	.08	.0005	.05	4	--	1.3
		5	18.0		6.8	6.8	70%												
		10	18.0		6.9	6.9	72%												
		15	18.0		6.8	6.8	70%												
		20	18.0		6.8	6.8	70%												
		25	18.0		6.8	6.8	70%												
		26	18.0		6.8	6.8	70%												
1120	8. Mouth of Slough	0	18.0	135	7.7	9.2	95%	30	29	16	10	.01	<.01	.05	.0016	.05	8	--	1.2
		5	18.0		9.0	9.0	94%												
		10	18.0		8.5	8.5	88%												
		15	18.0		8.7	8.7	95%												
		20	18.0		8.5	8.5	90%												
		22	18.0		8.5	8.5	90%												
1100	9. Mid-Columbia R. off Mouth of Slough	0	18.0	130	8.2	10.2	105%	88	36	9	16	<.01	<.01	.07	.0043	.06	4	--	1.1
		5	18.0		10.3	10.3	107%												
		10	18.0		10.2	10.2	105%												
		15	18.0		10.2	10.2	105%												
		20	18.0		10.2	10.2	105%												
		25	18.0		10.2	10.2	107%												
		30	18.0		10.2	10.2	105%												
		45	18.0		10.2	10.2	105%												
1225	10. Solo Slough	0	19.0	176	7.5	10.3	104%	14*	35	5	8	.11	.01	.12	.0016	.05	13	5	1.6
		5	19.0		10.3	10.3	104%												
		9	19.0		7.3	7.3	77%												

*Estimated

Table 2. Water quality for Coal Creek Slough point source survey, July 21, 1981.

Station	Location	Flow (cfs)	pH	Diss. Oxygen (mg/L)	Fecal Coli. (col/100 ml's)	Conductance (umhos/cm)	Turbidity (NTU)	TSS (mg/L)	(lbs/day)	NO ₃ -N (mg/L)	(lbs/day)	NO ₂ -N (mg/L)	(lbs/day)	NH ₃ -N (mg/L)	(lbs/day)	T-PO ₄ -P (mg/L)	(lbs/day)	COD (mg/L)	(lbs/day)	BOD (mg/L)	(lbs/day)	Tannic Acid (mg/L)	(lbs/day)
18	West Longview Lagoon STP	1.03 (.67 MGD)	7.5	8.0	40	442	13	12	67	<.05	.23	<.05	.28	13.0	73	.68	3.5	67	375	4	22	2.7	15
12	Coal Creek	19.65	7.4	11.1	80	41	2	2	212	.24	25.5	<.01	1.1	.05	5.3	.03	3.2	4	424	--		.8	85
13	Harmony Creek	4.29	7.3	10.8	110	36	6	6	139	.20	4.6	<.01	.23	.02	.46	.03	.69	4	93	--		.9	20.1
17	Ostrander Rock Co. Pond #7	.03	8.4	9.3	---	2080	23	20	3.2	.35	.05	.15	.02	1.4	.22	.20	.05	130	21	<40	6.5	7.2	1.2
11	Ostrander Marsh	--	7.1	10.1	---	71	7	20		.68		<.01		.06		.03		8		--		.9	
14	Ditch #10 at at SR 4	--	7.0	2.5	170	341	29	22		<.01		<.01		.08		.09		22		13		2.5	
15	Cut-off Slough 46th Ave.	--	7.6	14.3	86*	257	36	39		.19		.01		.05		.13		44		16		2.7	
16	Ditch #6 - 48th Ave.	--	7.2	8.6	87	156	5	4		.19		.01		.07		.05		18		7		1.2	

*Estimate

Table 3. Summary of metals data collected by WDOE for Coal Creek point source survey, July 21, 1981.

Station Number	Station Description	Copper (mg/L)	Zinc (mg/L)	Iron (mg/L)	Nickel (mg/L)	Chromium (mg/L)	Cadmium (mg/L)	Lead (mg/L)	Manganese (mg/L)
18	West Side Lagoon STP Comp. Effluent	<.01	.01	.4	<.02	<.01	<.01	<.02	.19
12	Coal Creek	<.01	<.01	.2	<.02	<.01	<.01	<.02	<.05
13	Harmony Creek	<.01	<.01	.6	<.02	<.01	<.01	<.02	<.05
14	Ditch #10	<.01	.01	3.0	<.02	<.01	<.01	<.02	1.2
15	Cut-off Slough	<.01	.06	4.0	<.02	<.01	<.01	<.02	.44
16	Ditch #6	<.01	.04	.9	<.02	<.01	<.01	<.02	.06

Criteria for protection of freshwater aquatic life¹ (assuming 50 mg/L hardness)

24-hour average	.0056	.047	1.0 (ref 2)	.056	.003	.00001	.0008	1.0 (ref 3)
maximum allowable	.012	.180		1.10	.021	.0015	.074	

References

- ¹EPA, November 28, 1980. Water Quality Criteria Documents Availability. Federal Register. Vol. 45 No. 23.
- ²EPA, 1977. Quality Criteria for Water. 256 pp.
- ³Davies, P.H. and J.P. Goehle, 1977. Aquatic life - water quality recommendations for heavy metals and other inorganic toxicants in freshwaters. pages 8 - 36 in Water Pollution Studies. Colorado Div. Wildlife Fort Collins, CO 68 pp.