Segment No. 05-12-07
Publication No. 79-e25
WA-12-1110

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
7272 Cleanwater Lane, Olympia, Washington 98504 206/753-2353

MEMORANDUM
September 12, 1979

To: Rick Pierce/Ron Robinson

From: Shirley Prescott/Art Johnson

Subject: Water Quality Survey on Flett Creek, July 30, 1979

INTRODUCTION

The Department of Ecology (DOE) Southwest Regional Office has recently received numerous complaints of objectionable odor and turbidity along South Tacoma's Flett Creek. In response to these complaints, a one-day water quality survey was conducted on July 30, 1979 to determine the cause of these problems.

The portion of Flett Creek sampled in this survey is shown in Figure 1. The study area encompasses a rectangular block of about 2.5 miles, including farm lands, commercial and residential districts. This is a part of the Chambers Creek basin which empties into Class A waters of Puget Sound.

Flett Creek flows through thick beds of peat in most of this area. Ground and surface waters are in direct continuity except down stream from South 74th Street (for several hundred feet) where the water table is below the streambed. Stream flow in this section consists of surface water only. Flett Springs, located in the middle of the study area (mile 1.4), is the source of about one-half of the creek flow during the dry season and reaches the creek via Flett Springs ditch.

There are four potential point sources in the study area: (1) Puget Sound Rendering lagoon; (2) Flett Dairy ditch; (3) Clover Park STP discharge pipe; and (4) Mt. View Memorial Park Cemetery. Other potential sources of pollution are the septic tanks serving the South Tacoma and Lakewood areas. Storm sewers serving these communities and draining into Flett Creek are an additional problem during periods of wet weather. Several homes served by septic tanks are located immediately adjacent to Flett Creek in the vicinity of Bridgeport Way and Custer Road. This section of Flett Creek has been the object of most of the resident complaints mentioned above.

METHODS

Water samples were collected at the 10 stations shown in Figure 1. Four parameters were measured in situ: temperature (°C); pH; specific conductance (μmhos/cm); and dissolved oxygen by the Winkler method. In addition, samples were collected, packed in ice, and transported to the DOE Tumwater laboratory for the following analyses:

(1) Turbidity (NTU)
(2) COD (mg/l)
(3) BOD (mg/l)
(4) Fecal Coliform (colonies/100 mls)
(5) Nitrate-N (mg/l)
(6) Nitrite-N (mg/l)
(7) Ammonia-N (mg/l)
(8) Total Kjeldahl-N (mg/l)
(9) Orthophosphate-P (mg/l)
(10) Total phosphate-P (mg/l)
(11) Total Solids (mg/l)
(12) Total Non-volatile Solids (mg/l)
(13) Total Suspended Solids (mg/l)
(14) Total Suspended Non-volatile Solids (mg/l)
(15) Color (color units)

RESULTS

Physical and Chemical

Temperature

Temperatures ranged from 16.4 °C to 20.5 °C. The creek runs mainly through open land with little tree cover or shade. Flows are low during the dry season so the high temperatures are to be expected. The lowest reading (16.4°C) was recorded at station 11 (75th Street) at which point the stream is located in a gulley protected by trees.

pH

pH ranged from 6.4 at Flett Springs (station 7) to 7.1 at station 1. The underlying peat beds are the probable reason for the pH drop. These values are within generally acceptable limits. Flett Springs is the only sampling site not in Flett Creek proper.

Dissolved Oxygen

Stations 3 and 11, with DO levels of 9 mg/l and 7.6 mg/l respectively, were the only stations with levels of dissolved oxygen at or above Class A standards. Samples from stations 1, 4, 8, and 9 had no detectable dissolved oxygen, and the remaining stations ranged in value from 3.1 mg/l to 5.8 mg/l. The creek is choked with grass and aquatic

plants throughout most of the study area. In those areas where the creek is moving a little more and there is some tree cover, the DO's do come up. However, it is probable that nighttime DO's would be low.

Specific Conductance

Electrical conductivity did not change greatly between stations, but values were highest at stations 8, 9, and 10 in the area of Bridgeport Way and Custer Road. These stations were located adjacent to the three homes served by septic tanks. Dye was introduced into the system in two homes but we did not detect dye traces in the creek during the study period. The residents agreed to notify DOE personnel if dye began to show in Flett Creek. No notification was received.

Nutrients

Nutrient concentrations were high at all stations. Dissolved orthophosphate ($O\text{-}PO_4\text{-}P$), an important indicator of algal bloom potential in streams, was far above the threshhold levels of .01 mg/l (Klein, 1959).

Nitrate (NO_3) levels were high at station 7, Flett Springs, and at the most downstream station, number 11 at 75th Street. Nitrate at Flett Springs was 2.4 mg/l and at 75th Street 2.6 mg/l, both far exceeding the .3 mg/l algal bloom threshhold limit. All other stations were below this .3 mg/l level.

Ammonia levels were acceptable at only three stations with values less than the .2 mg/l level. Values ranging from .56 to 1.7 mg/l were found in the area of the septic tanks adjacent to the creek (stations 8, 9, and 10), the STP outfall (station 6), and at Lakewood Drive (station 4).

The Kjeldahl nitrogen values were all high, ranging from 1.0 mg/l to 5.6 mg/l. Flett Springs was lower than the creek with .65 mg/l. These high values are indicative of organic pollution.

Biochemical Oxygen Demand (BOD_5)

BOD_5 at station 1 was 49 mg/l which is high for stream waters. While BOD is not a pollutant itself, it acts to lower the dissolved oxygen content particularly in slow, sluggish waters. Other stations ranged from 4 mg/l to 11 mg/l, all of which were high.

Chemical Oxygen Demand (COD)

COD above about 50 mg/l suggests contamination by excessive quantities of organic material. The potential for oxygen depletion increases as COD rises above 50 mg/l. Station 1 had a COD value of 150 mg/l and no detectable DO. Station 7 and 11 had low COD values of 2 mg/l and DO values of 5.7 mg/l and 7.6 mg/l, respectively.

Solids

Total suspended solids are mainly organic in nature and follow the pattern of fairly high organic pollution throughout the study area.

Turbidity

Turbidities of 1 to 7 NTU were recorded for all sites sampled, with the exception of stations 1 and 10 with values of 21 and 38, respectively. The creek was dry at the USGS gaging station and samples were taken several hundred feet down stream. The creek in this area was ponded and consisted mainly of surface water runoff. Station 10, located just below the Schottel residence, is an area where stream banks have been planted and beautified. It is possible that foot traffic and watering of the plantings could be contributing to the higher turbidity here.

Color

Flett Creek waters were highly colored throughout the study area (except for Flett Springs), apparently due to the leachate emanating from the peat soils which make up much of the lands adjacent to the stream.

Bacteriological

Fecal Coliforms

Fecal coliform values ranged from 50 colonies/100 ml to 3100 colonies/100 ml. The high value occured at station 6 (Flett Dairy ditch and Clover Park STP discharge). In the area of several homes adjacent to the creek (stations 8, 9, and 10), values ranged from 50 colonies/100 ml to 130 colonies/100 ml, indicating some treatment and dieoff occurring in the septic systems. The other six stations ranged from 200 colonies/100 ml to 800 colonies/100 ml, indicating bacterial contamination along the length of the study area.

Flett Springs had a value of 58 colonies/100 ml which would appear to indicate some groundwater contamination.

SUMMARY AND CONCLUSIONS

At the time of this study, Puget Sound Rendering was not having a measurable impact on Flett Creek. All waste appeared to be contained in their lagoon. During periods of wet weather, Flett Creek may inundate the Puget Sound lagoon and pollute the creek downstream.

The only other point sources on the creek were Clover Park STP and Flett Dairy discharges at station 6. Nutrient and bacteria levels were high. A further check on both of these operations is advisable.

Results showed high values for conductivity, nutrients, and solids in the area of septic tanks near the streambank (stations 8, 9, and 10), as well as station 4 which is a probable drainage area for other residences.

At this point in time, Flett Creek appears to be a wasteway for the surrounding area. During the wet season, this tiny creek, fed by storm sewers, becomes a torrent of water creating a flooding problem. This problem is apparently being considered by the City of Tacoma in their flood control facilities project on Flett Creek. The final E.I.S. was received by DOE in June of this year and possibly contemplated action will alleviate this problem. A sewer treatment plant serving the South Tacoma-Lakewood areas would possibly allow the creek to one day return to a somewhat healthier state.

Flett Creek appears to be in a general state of eutrophication, resulting not only from its hydrology and geology, but also human influences. Surface and ground waters are in direct continuity with each other. With this interaction of waters in an area generally rural in nature, including domestic and farm animals as well as the use of septic tanks, the results are not unexpected. This small creek might have survived man's impact in the immediate area, but the impact of landfill, storm sewer construction to drain a large, unsewered area, along with population expansion has had a significant detrimental effect.

SP:AJ:cp

Attachments

REFERENCES

Bernhardt, J. B., June 1976. *Evaluation of Woodwaste Fill,* Interoffice Memorandum.

Bernhardt, J.B. and W. Yake, February 1979. *Assessment of Wastewater Treatment and Receiving Water Quality - South Fork of the Palouse River at Pullman, Wa.,* Project Report DOE-PR-5, 46 p.

Klein, L., 1959. *River Pollution 1, Chemical Analysis,* Academic Press, Inc., New York, 206 p.

Tacoma, City of, Department of Public Works, June 1979. *Final Environmental Impact Statement for the South Tacoma Flood Control Facilities on Flett Creek,* 66 p.

Tomlinson, M., 1974. *Flett Creek Water Quality Survey,* DOE, Memorandum Report.

Veatch, F.M., G.E. Kimmel, E.A. Johnston, 1966. *Surface and Groundwater Conditions During 1959-61 in part of Flett Creek Basin, Tacoma, Wash.,* USGS, Open-File Report, 42 p.

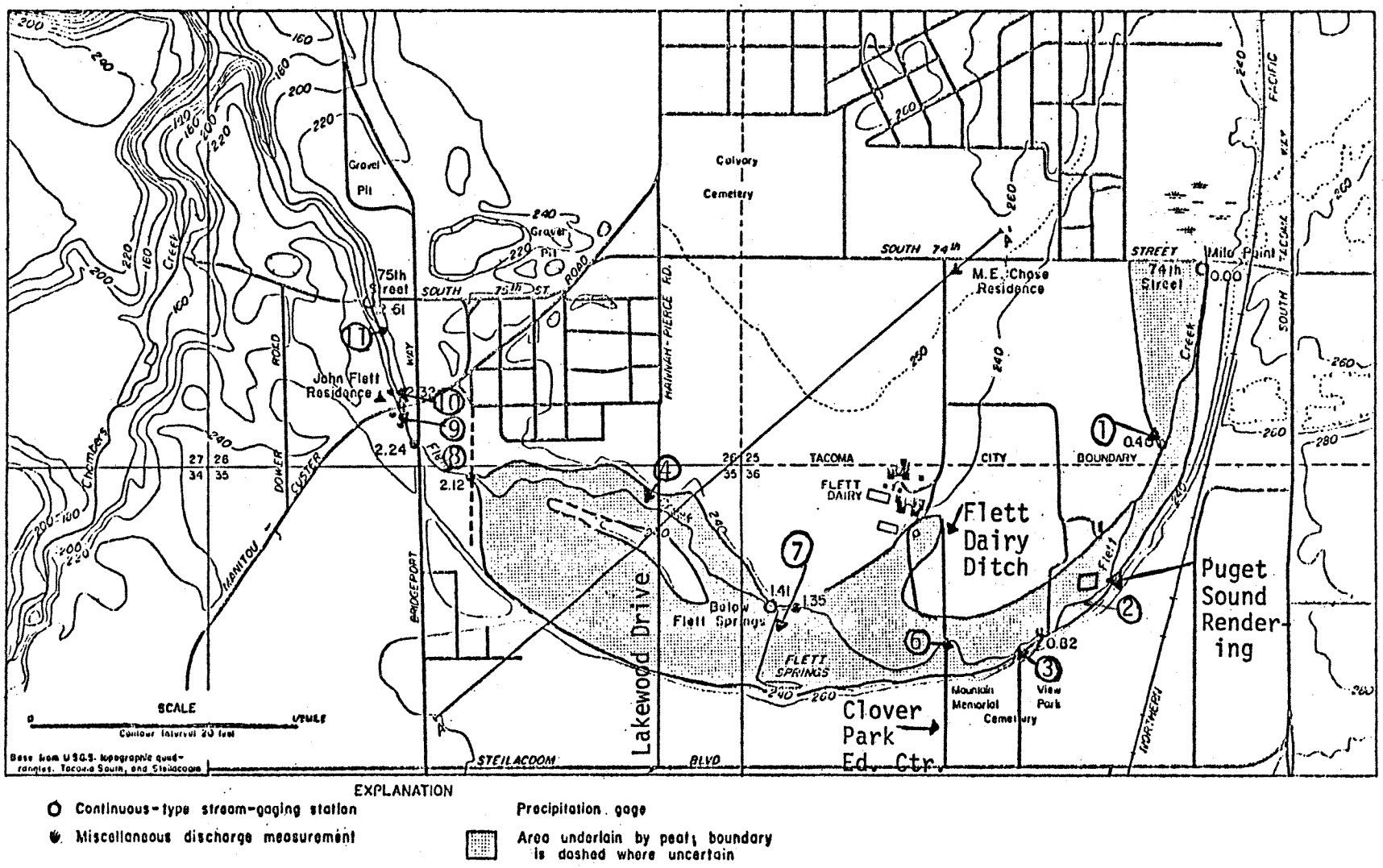

Figure 1. Study area and station locations in lower Flett Creek, July 30, 1979. Approximate areal extent of peat is indicated by shading.

Table 1. Summary of Water Quality Data Collected by DOE, Flett Creek, July 30, 1979.

Station Number in Downstream Order	Description**	Temp. °C	pH	Dissolved Oxygen (mg/l)	Conductivity (μmhos/cm)	NO_3-N (mg/l)	NO_2-N (mg/l)	NH_3-N (mg/l)	Total Kjeldahl (mg/l)	O-PO_4-P (mg/l)	T-PO_4-P (mg/l)
1	Near 74th Street Gage Station	19.2	7.1	N.D.	223	< .01	.02	.42	5.6	.45	.42
2	Creek below Puget Sound Lagoon	18.9	7.0	4.6	227	< .01	< .01	.15	1.0	.18	.19
3	Valley Chapel Road (Cemetery)	17.2	7.0	9.0	216	< .01	< .01	.07	3.5	.12	.34
6	Flett Dairy Ditch and Clover Park STP	20.0	7.0	3.1	177	.06	< .01	.56	1.7	.20	.25
7	Flett Springs	18.9	6.4	5.7	171	2.4	< .01	.07	.65	.05	.07
4	Lakewood Drive	20.6	6.6	N.D.	309	< .01	< .01	1.7	5.0	.67	.13
8	Above Brick House	17.2	6.6	N.D.	295	.03	< .01	1.1	3.1	.72	.13
9	Brick House	17.8	6.6	N.D.	268	< .01	< .01	1.1	2.6	.55	.11
10	Schottel House	17.2	7.0	5.8	286	.05	< .01	.86	5.2	1.3	.08
11	75th Street Gage Station	16.4	7.0	7.6	224	2.6	< .01	< .01	.38	.25	1.5

N.D. = None Detected

**All Flett Creek Stations with exception of #7 - Flett Springs

Table 1. Summary of Water Quality Data Collected by DOE, Flett Creek, July 30, 1979 - Continued.

Station Number in Downstream Order	Description**	BOD_5 (mg/l)	COD (mg/l)	Total Solids (mg/l)	Total Non-Volatile Solids (mg/l)	Total Suspended Solids (mg/l)	Total Suspended Non-Volatile Solids (mg/l)	Turbidity (NTU's)	Color (Color Unit)	Fecal Coliform (Colonies/100 mls)
1	Near 74th Street Gage Station	49	150	280	150	100	23	21	280	690
2	Creek below Puget Sound Lagoon	6	22	150	110	7	2	3	88	410
3	Valley Chapel Road (Cemetery)	11	28	160	120	21	4	6	71	200
6	Flett Dairy Ditch and Clover Park STP	8	28	150	110	17	8	6	79	3100
7	Flett Springs	<4	2	130	89	<1	<1	1	8	58
4	Lakewood Drive	<4	22	210	160	12	6	7	140	210
8	Above Brick House	<4	20	200	160	11	5	7	110	100
9	Brick House	<4	18	200	160	4	1	5	110	130
10	Schottel House	8	36	230	180	55	30	38	88	50
11	75th Street Gage Station	<4	2	160	120	·3	<1	4	25	800

**All Flett Creek Stations with exception of #7 - Flett Springs