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MEMORANDUM
December 19, 1986

To: Carl Nuechterlein and Larry Peterson

From: Joe Joy

Subject: Results of September 15, 1986, Touchet River Survey in Waitsburg

INTRODUCTION

A very brief investigation of the Touchet River in Waitsburg was conducted on September 15, 1986, by Joe Joy, Marc Heffner, and Will Kendra of the Water Quality Investigations Section (WQIS). The investigation was requested after you obtained the results of our September 1985 receiving water survey of the Waitsburg WTP (Joy, 1986). In that report we observed substantial in-stream increases in chloride, dissolved solids, nitrate, and alkalinity originating within the town and above the WTP; i.e., the source or sources were located between river mile (r.m.) 43.4 and 44.8. Yake and Cloud's (1979) survey recorded similar increases. Data from these surveys suggested the unknown source(s) had a greater impact on water quality and benthic invertebrate populations than the WTP effluent (Joy, 1986).

The reach of the Touchet River within Waitsburg contained several possible sources of the wastes (Figure 1):

- The Smith Canning Company - retort waste discharge pipe; land-applied wastewater runoff; brine pit leachate.
- The Brea Agricultural Chemicals site - abandoned lagoon and fertilizer storage area leachate.
- Wilson Creek non-point runoff.
- Fertilizer-laden ground water.

You asked us for better definition of the source(s) to direct enforcement or other actions.

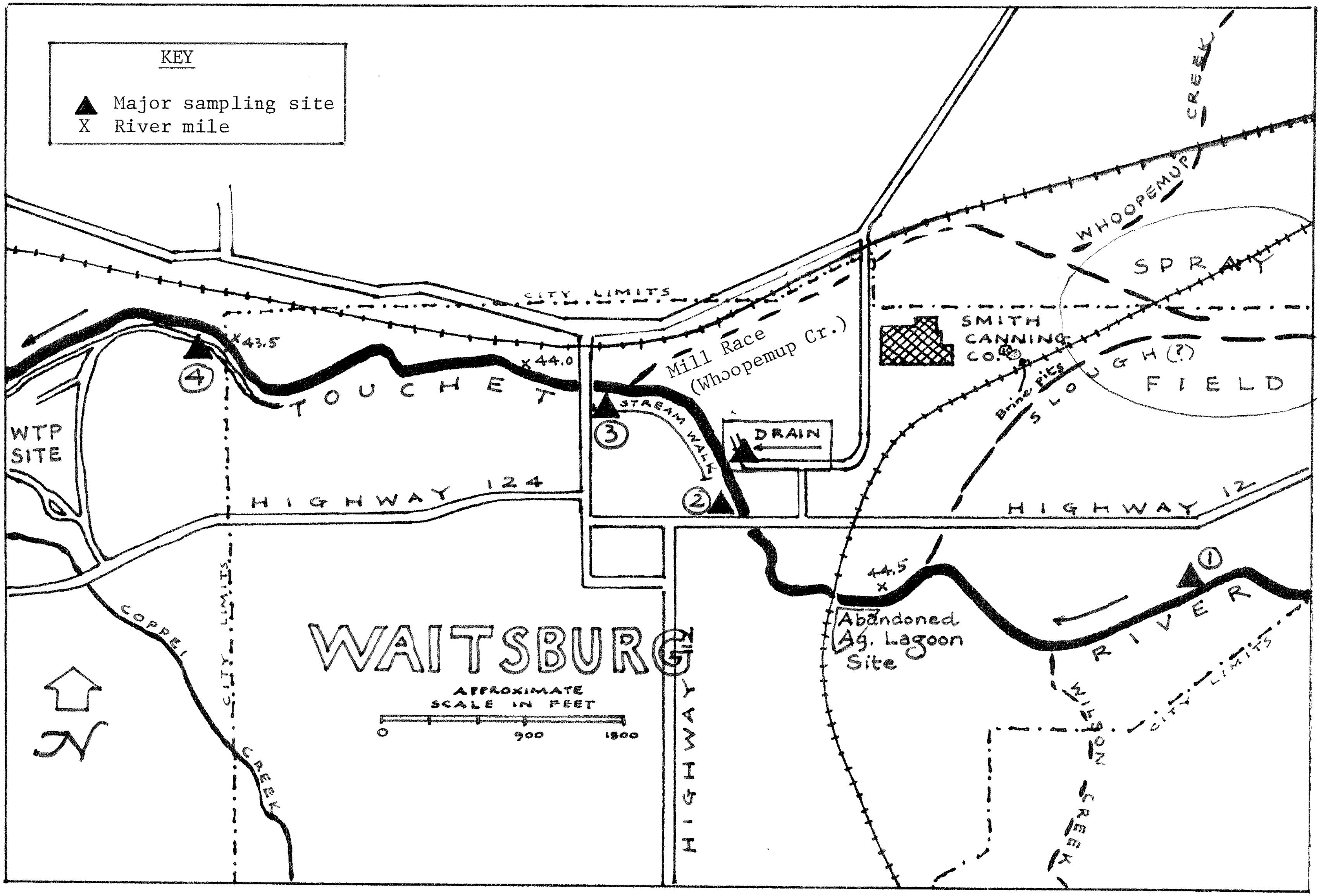

Figure 1. The September 15, 1986, water quality investigation of the Touchet River in Waitsburg.

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SURVEY DESCRIPTION

Yake and Cloud (1979) and Joy (1986) have described the Touchet River/Waitsburg study area (Figure 1). Our strategy in this investigation was to define the impact area of the source(s) using a field conductivity probe, and to confirm our findings with grab samples for more complete laboratory analyses.

On September 15, 1986, conductivity measurements at stations 4 and 1 indicated in-stream water quality conditions similar to September 1985; i.e., 35 umhos/cm increase from source(s) within Waitsburg (Table 1). Station 2 found little change in conductivity from Station 1. Station 3 conductivity was high, like Station 4. We then decided to walk the river reach between Stations 3 and 2 to find the source causing the conductivity increase (Figure 1). We used the conductivity probe on lateral transects in the river as a tracing instrument.

Grab samples taken at four sites were stored on ice in the dark and received by the Manchester Environmental Laboratory via air freight within 24 hours. All analyses listed in Table 1 were performed under approved procedures (USEPA, 1983; APHA-AWWA-WPCF, 1985).

RESULTS

The streamwalk transects are presented in Figure 2. A definite conductivity gradient, increasing from left to right bank, was detected about 100 feet upstream of the Main Street Bridge (Station 3). Extreme left-bank conductivities were as low or lower than the conductivity recorded at Stations 1 and 2 (Table 1). Mid-channel conductivities were consistently 130 umhos/cm, while the 150 umhos/cm section of water became more narrow as we proceeded upstream. The Mill Race Slough (Whoopemup Creek) contained no water (Figure 2).

The highest conductivity water became limited to a narrow band hugging the right bank. We detected a small point source discharge with a conductivity greater than 1,000 umhos/cm at r.m. 44.2, approximately 350 feet downstream from the Highway 12 bridge (Figure 2). The discharge pipe headbox was located at the top of the bank at the base of East Second Street (Metsker Map, pg. 44-A of Walla Walla Co.). We thought it might be the Smith Canning Company retort water discharge line you described in your June 1986 letter (Peterson, 1986). It appeared to be flowing at a steady rate. Elmer Hayes, the city of Waitsburg WTP operator, confirmed that the drain was from the Smith Canning Company, but that the cannery hadn't been in operation for over two weeks. The office manager at the cannery also confirmed this--no one else was at the plant. I spoke with the quality control supervisor over the phone. I informed him of my survey and suggested

Table 1. Field and laboratory data form the September 15, 1986, Touchet River investigation in the vicinity of Waitsburg. All values are mg/L unless otherwise indicated.

Station Number	1	2	Drain	3	4
River Mile	44.78	44.30	44.23	44.04	43.44
Time	1250	1315	1400	1320	1230
Field Data					
Temperature (^{o}C)	15.3	16.0	18.0	16.0	15.5
Flow (cfs)	*	*	0.04	*	*
Sp. Conductivity (umhos/cm)	115	120	>1000	150	150
Laboratory Data					
pH (S.U.)	8.9		7.8	9.0	8.9
Sp. Cond. (umhos/cm)	122		1360	158	158
Fecal Coliform (#/100 mL)	9		210	8	6
NO_3-N	0.09		5.5	0.32	0.34
NH_3-N	0.01		0.05	0.01	0.01
Total Phos.-P	0.08		0.18	0.08	0.08
Total Susp. Solids	5		1	5	3
Chloride	3.4		270	11	9.5
Rec. Oil & Grease	--		3	--	--
COD	8		12	8	8

*No sample taken

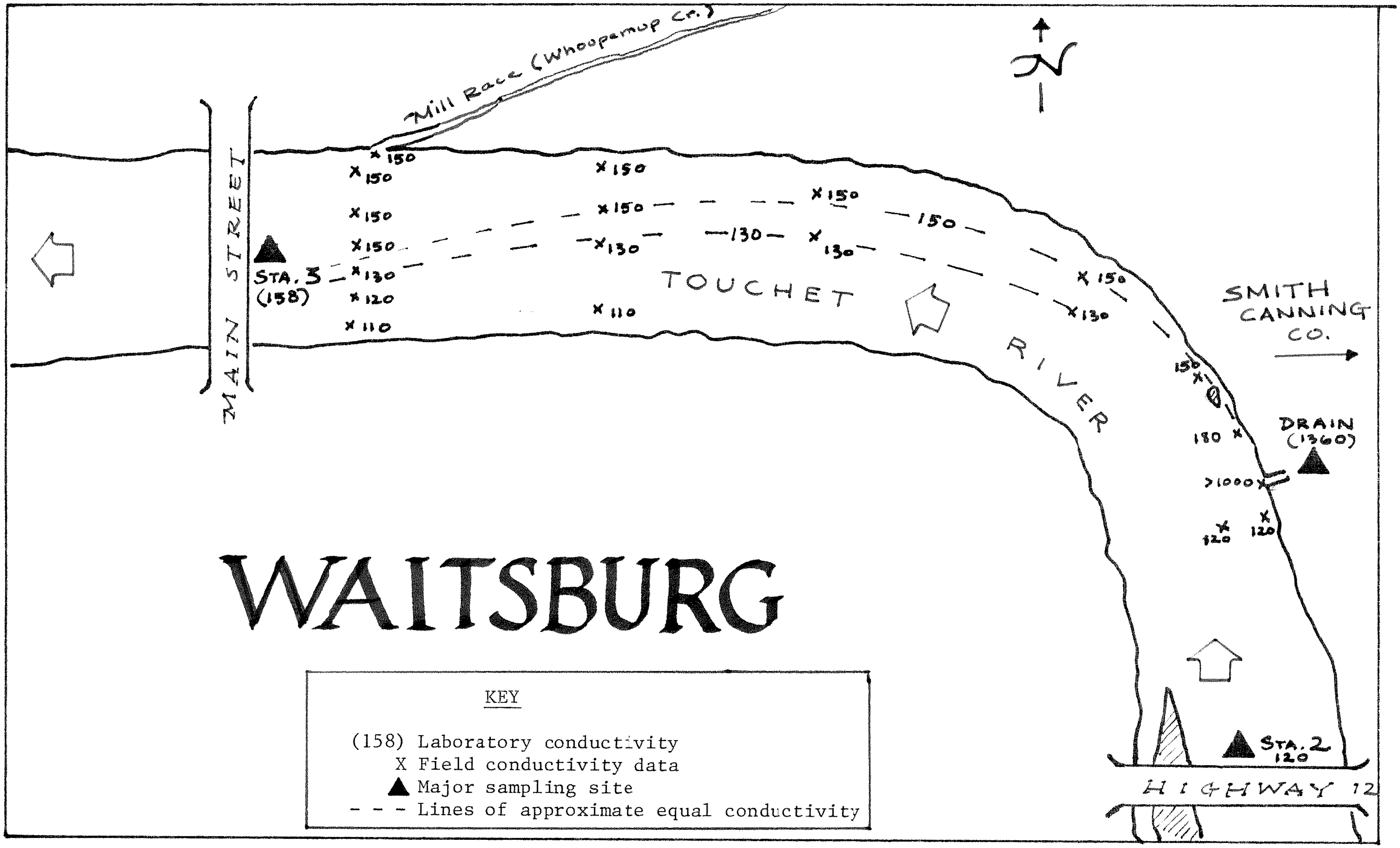

Figure 2. Conductivity transect data collected from the Touchet River between river mile 44.3 (Station 2) and 44.0 (Station 3) on September 15, 1986. All values are umhos/cm.

he come and check the plant and take his own samples, and that you would be contacting him on this matter.

The WQIS staff returned to the headbox of the drain and measured its flow using a five-gallon bucket and stopwatch. The flow rate did not appear any different than when we first observed it.

The point source grab sample (drain) proved to have elevated chloride, NO_3, and fecal coliform levels (Table 1). Just above the confluence of this point source and the river, the in-stream right-bank conductivity was 120 umhos/cm, as it had been at mid-channel at Station 2.

DISCUSSION

A mass balance calculation was performed using:

- The field and laboratory chemical data.
- The drain discharge volume measured at the site.
- The Touchet River discharge volume obtained from USGS[1].

The results of the 1986 investigation mass balance are shown in Table 2. There appears to be an incongruity between the mass of conservative waste elements (chloride, specific conductivity) from the drain and the in-stream increase of these elements downstream of the drain. The drain wastewater would have to be 20 times the volume, or 20 times the waste strength we measured to provide the increase in conductivity and chloride detected downstream at Stations 3 and 4.

This survey's chloride, conductivity, and nitrate values were combined with in-stream data from Yake and Cloud (1979) and Joy (1986) to generate theoretical discharge volumes for the unknown source(s). The average estimated wastewater volume of 1.1 cfs matches the volume back-calculated for the 1986 investigation (Table 2).

As another check, the distance required for complete transverse mixing was calculated for the discharge (Table 3). The results indicated mixing should have been complete by Station 4, 0.8 mile downstream of the drain. Since there was little difference between Station 4 and

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[1] The mean daily flow for the Touchet River at Bolles (r.m. 40.1 - Station #140170000) for September 15, 1986, was 39 cfs. From experience by Yake and Cloud (1979) and Joy (1986), 36 cfs could be expected at r.m. 44.

Table 2. Mass balance calculations for the drain at rm 44.2 of the Touchet River at Waitsburg.
Data are from: this report-1986; Joy(1986)-1985; Yake and Cloud(1979)-1979.

Year	Parameter	Units	Upstream	Drain	Downstream	Theoretical ** downstream concentration	Volume of drain to effect observed downstream change
1986							
	Flow	cfs	36	0.04	36		
	Sp. Cond.*	umhos/cm	120	1360	150	122 umhos/cm	0.9 cfs
	Sp. Cond.	umhos/cm	122	1360	158	124 umhos/cm	1.1 cfs
	Chloride	mg/L	3.4	270.0	9.5	3.7 mg/L	0.8 cfs
	Tot. In. N	mg/L	0.10	5.55	0.35	0.11 mg/L	1.7 cfs
						Average =	1.1 cfs
1985							
	Flow	cfs	53		54		
	Sp. Cond.*	umhos/cm	102	(1360)***	120		0.8 cfs
	Sp. Cond.	umhos/cm	106	(1360)	142		1.6 cfs
	Sp. Cond.*	umhos/cm	106	(1360)	127		0.9 cfs
	Sp. Cond.	umhos/cm	107	(1360)	131		1.0 cfs
	Chloride	mg/L	1.1	(270)	4.5		0.7 cfs
	Chloride	mg/L	1.3	(270)	4.7		0.7 cfs
	Tot. In. N	mg/L	0.13	(5.5)	0.35		2.3 cfs
	Tot. In. N	mg/L	0.16	(5.5)	0.36		2.1 cfs
1979							
	Flow	cfs	32		32		
	Sp. Cond.*	umhos/cm	125	(1360)	142		0.4 cfs
	Sp. Cond.*	umhos/cm	120	(1360)	148		0.7 cfs
	Tot. In. N	mg/L	0.19	(5.5)	0.35		1.0 cfs
	Tot. In. N	mg/L	0.20	(5.5)	0.34		0.9 cfs
						Average =	1.1 cfs

* Field instrument values, others are laboratory values. Multiple values for a year indicate two sampling days.

** The mixed concentration one would expect to find downstream of the drain based on the measured concentrations and volumes in the river and drain.

*** Concentrations ( ) are the 1986 drain values.

Table 3. Estimated longitudinal distance required for 95 percent complete lateral dispersion of drain wastewater at r.m. 44.2 of the Touchet River at Waitsburg, September 15, 1986. Equation from Mills, *et al.* (1986).

$L = 0.4\ w^2 u/Ey$

where: L = distance required for 95% complete transverse mixing (ft)
w = width of river (ft)
u = mean velocity (ft/sec)
Ey = transverse mixing coefficient, and

$Ey = ah(ghs)^{0.5}$

h = mean river depth (ft)
g = 32 ft/sec
s = slope of channel (ft/ft)
a = factor for channel sinuosity (0.4 to 0.8 for most natural streams[1/])

The Touchet River on September 15, 1986, had a flow of 36 cfs, similar to 32 cfs measured by Yake and Cloud (1979). Using their data and slope data from the USGS map, the variables for 1986 are:

w = 28 ft
u = 1.4 ft/sec
h = 0.8 ft
s = 0.005 ft/ft
a = 0.7

so, $Ey = (0.7)90.8)(32*0.8*0.005)^{0.5}$
$= 0.20$

and, $L = 0.4(28)^2\ 1.4/0.200 = 2190$ ft = 0.42 mi

[1/] Fischer (1979, pg. 112) suggests these "a" values, and further states "a" increases with increasing channel meandering and sidewall irregularities.

Station 3 sample data, mixing was probably near complete at Station 3 (Table 1). Therefore, mass balances using Station 3 or 4 data should be representative of a total mix condition.

No firm conclusions explaining the situation can be made from the data collected during the investigation. Three possible explanations are:

- The discharge rate from the drain was not constant over the course of the investigation, and we measured it during a low-flow cycle.

- The laboratory results for the drain samples were in error.

- Ground water inflow from adjacent right-bank uplands contributed the major portion of wastewater volume.

In your letter to the Smith Canning Company (Patterson, 1986), it was evident that wastewater disposal practices at the cannery are unclear. The disposal mechanisms and volume and characteristics of wastewater discharged from the retorts to the river have not been documented. Therefore, a containment system with intermittent discharges two weeks after shut-down is a possibility that needs to be closely investigated.

No duplicate samples of the discharge from the drain were collected, so laboratory analytical error of a wasteload component could be possible. However, errors in all three components (chlorides, conductivity, and nitrates) used in the mass balance are highly improbable. The analyses use different analytical instruments, and the nitrates are are tested from a different sample bottle than chloride and conductivity.

Subsurface drainage from right bank areas could also be a possible explanation for the total contaminant increases observed in the river. The drain could have been carrying infiltrated ground water from the general vicinity instead of effluent generated directly within the plant. A majority of the contaminated ground water could have been flowing into the riverbed along that river reach. Unlined brine pits, the wastewater spray-irrigation fields, and general agricultural activities at the cannery site could have contributed these contaminants to the ground water. Shallow well and source analyses would be necessary to establish this condition.

Another indication of a right-bank source influence was the 5 umhos/cm rise in conductivity between Stations 1 and 2 (Table 1). It seemed insignificant during the investigation compared to the 20 umhos/cm increase between Stations 2 and 3. However, a source with a waste strength and four times the volume of the drain identified at r.m. 44.2 would be required to produce the 5 umhos/cm in-stream increase. The slough entering the right bank at r.m. 44.5 could have been a source of the increase, but we did not notice it as we drove along

Highway 12. Maps show the slough going through the spray field area used by the cannery to dispose of its wastes (Figure 1). There is a strong possibility the slough was dry as was Mill Race (Whoopemup Creek). Ground water or another drain are other possibilities for investigation.

Wilson Creek and the abandoned Brea Agriculture lagoon site are less likely sources of the contamination because of their left bank placement (Figure 1). Left-bank conductivities 0.3 mile below these sites were as low or lower than the mid-channel conductivity at Station 1, detected above the sites (Figure 2, Table 1).

SUMMARY

The recurrent low-flow period water quality contamination problem in the Touchet River at Waitsburg was not positively confirmed, but it centered around a drain that was discharging at r.m. 44.2. The drain normally carries retort water and other unknown wastes from the Smith Canning Company. However, the Smith Canning Company had not been operating for at least two weeks prior to the investigation. Sources of the wastewater within the plant to the drain remain uncertain.

The mass balance calculation using river and wastewater chemical data and field data collected on September 15 are incongruous. The volume of drain discharge or the strength of the wastewater is 1/20 of what would be necessary to cause the observed in-stream increases in conductivity and chlorides.

The probability of the incongruity being a matter of poor analytical data appears less likely than two other explanations. The first explanation assumes wastewater from the plant is stored and is intermittently discharged afterward, and that we may have measured the flow rate during a low cycle in the pump mechanism.

The second explanation assumes that ground water carried wastes into the drain and river from the vicinity of the Smith Canning Company spray fields, brine pits, and grazing lands. Subsurface discharge of ground water into the right bank of the river between r.m. 44.1 and 44.7 could be the major source of contamination. Mixing of ground water and river water by Station 3 would be complete, assuming ground water entered from the entire right side of the channel; i.e., the river width variable w, in Table 3 equals 14 feet.

Wilson Creek and the abandoned Brea Agriculture site are less likely sources of the observed contamination because left bank field conductivities were much lower than right bank.

RECOMMENDATION

1. Confirm the source and contaminant strength of wastewater in the drain located at r.m. 44.2 with and without the cannery being in operation.

2. Concentrate action on the Smith Canning Company site.

3. Evaluate potential areas for ground water impact and, if necessary, collect ground water quality and movement data between r.m. 44.1 and 44.7.

JJ:cp

Attachments

cc: Norm Glenn
Lynn Singleton

REFERENCES

APHA-AWWA-WPCF, 1985. Standard Methods for the Examination of Water and and Wastewater, 16th Ed., American Public Health Assoc., Washington, D.C.

Fischer, H.B., E.J. List, R.C.Y. Koh, J. Imberger, and N.H. Brooks, 1979. Mixing in Inland and Coastal Waters, Academic Press, New York, NY, 483 pp.

Joy, J., 1986. "Waitsburg wastewater treatment plant receiving water survey," Memorandum to Carl Nuechterlein, Ecology Eastern Regional Office, dated July 24, 1986, Spokane, WA. 10 pp.

Mills, W.B., et al., 1986. Handbook: Stream Sampling for Waste Load Allocation Applications, EPA 625/6-86/013. USEPA, Cincinnati, OH. 58 pp.

Peterson, L., 1986. Letter to Mr. Russ Krey, Manager, Smith Canning and Freezing Company, June 9, from Ecology Eastern Regional Office, Spokane, WA. 3 pp.

USEPA, 1983. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, Cincinnati, OH.

Yake, W.E. and G. Cloud, 1979. "The effects of Waitsburg wastewater treatment plant effluent on Coppei Creek." Memorandum to Phil Williams, Ecology Eastern Regional Office, dated November 27, 1979. 10 pp.