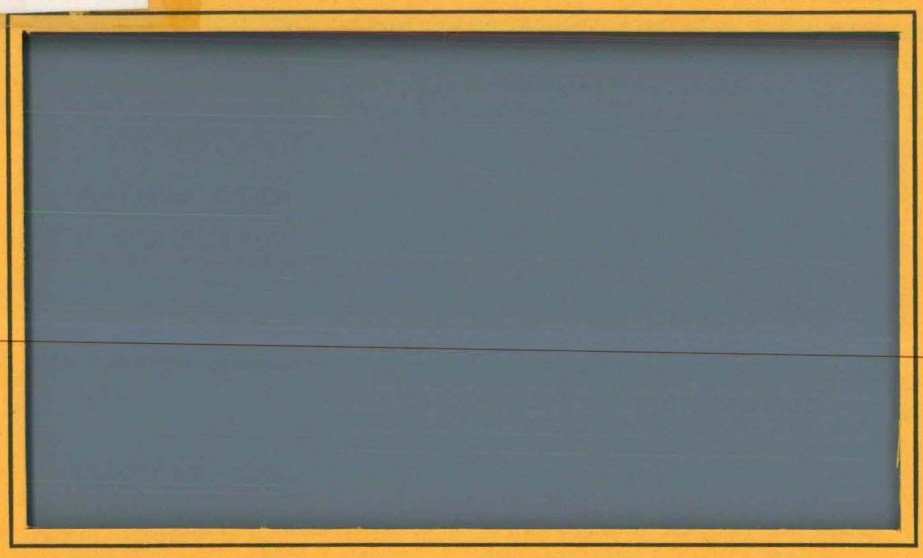

A REPORT FROM

The State Hygienic Laboratory

MEDICAL LABORATORIES BUILDING

THE UNIVERSITY OF IOWA

IOWA CITY, IOWA 52242

Winter Water Quality Survey
of the
North Raccoon River
#77-31

Prepared for the Iowa Department of Environmental Quality by the University of Iowa, State Hygienic Laboratory.

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April 1977

ABSTRACT

A low-flow winter water quality survey of the North Raccoon River was performed during January 1977. Results of the survey indicate several point source discharges had a dramatic effect on stream water quality. Ammonia nitrogen levels ranged from 0.68 mg/L to 31 mg/L and was greater than 2 mg/L at 11 of the 12 stations. The range of values for fecal coliforms was from <10 to 280,000 per 100 ml with 7 stations having values greater than 2000 per 100 ml. Dissolved oxygen ranged from 0.0 mg/L to 11.7 mg/L and was below 4 mg/L at 9 of the 12 stations. The point source discharge from the Oscar Mayer lagoon at Perry had the most significant deteriorating effect on river water quality. Because of the extreme low flows encountered during the survey Iowa's Water Quality standards for fecal coliform, ammonia-N and dissolved oxygen may not be applicable.

INTRODUCTION

The North Raccoon River, with a drainage area of approximately 2,200 square miles, originates near Leverett, Iowa in northern Buena Vista county and flows southeasterly for approximately 175 miles to its confluence with the South Raccoon River near Van Meter, Iowa. The combined rivers form the Raccoon River which discharges into the Des Moines River at Des Moines, Iowa. Although the Raccoon carries an extremely heavy silt load and fluctuates violently, it is an excellent fishing stream for channel catfish with many stretches producing fine smallmouth bass and walleye fishing (Iowa Conservation Commission).

Several water quality surveys have been conducted on the Raccoon River by the State Hygienic Laboratory (Reports #71-41, #72-49, #72-53 and #75-21). The objective of this survey was to obtain data on the current water quality in the North Raccoon River which would aid in verification of wasteload allocations and assess the impact of several municipal and industrial waste discharges on the North Raccoon River during winter low flow - ice cover conditions.

From its confluence with the Des Moines River to the Buena Vista county line, the North Raccoon River is designated as a class-B warmwater stream and is subject to applicable Iowa Water Quality Standards.

Figure 1 is a map of the North Raccoon showing sampling locations. Table 1 lists the sampling stations and approximate locations of each.

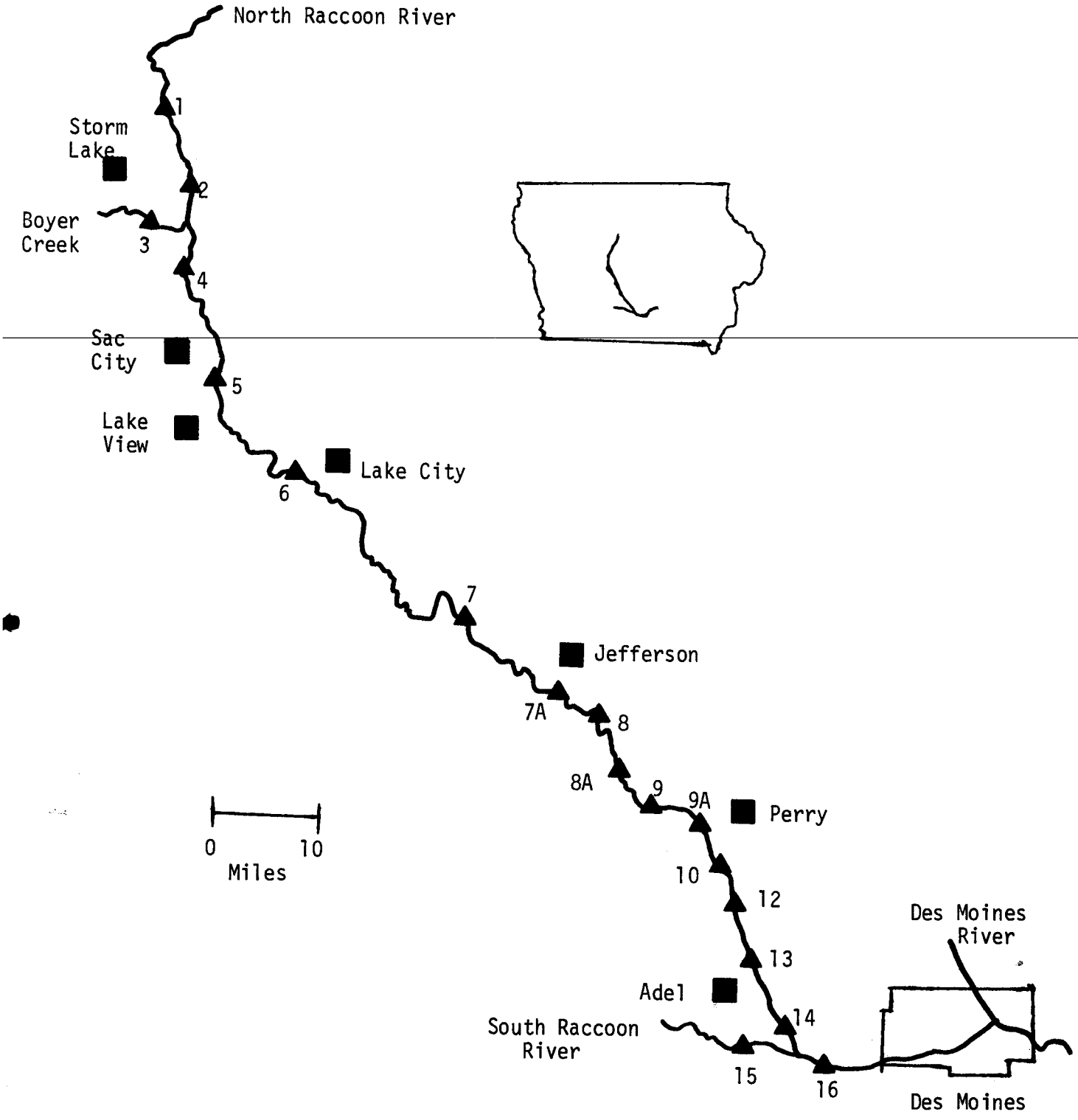


Figure 1. Map of the North Raccoon River Showing Sampling Stations

TABLE 1

North Raccoon River Sampling Locations
24 January 1977

STATION		LOCATION
1	North Raccoon River	Buena Vista Co. Rd., T91N, R36W, Sec. 26/35
2	North Raccoon River	Buena Vista Co. Rd., T90N, R36W, Sec. 24/25
3	Boyer Creek	Buena Vista Co. Rd. M-50, T90N, R36W, Sec. 27/28
4	North Raccoon River	Sac Co. Rd. D-15, T89N, R36W, Sec. 13/24
5	North Raccoon River	Sac Co. Rd. D-42, T88N, R36W, Sec. 36
6	North Raccoon River	Calhoun Co. Hwy 175, T86N, R34W, Sec. 17
7	North Raccoon River	Greene Co. Rd. E-53, T83N, R31W, Sec. 11
7A	North Raccoon River	Greene Co. Hwy 4, T83N, R30W, Sec. 20
8	North Raccoon River	Greene Co. Rd., T82N, R30W, Sec. 1
8A	North Raccoon River	Dallas Co. Rd., T81N, R29W, Sec. 3
9	North Raccoon River	Dallas Co. Rd., T81N, R28W, Sec. 5/8
9A	North Raccoon River	Dallas Co. Hwy 141, T81N, R28W, Sec. 8/17
10	North Raccoon River	Dallas Co. Rd. P-58, T81N, R28W, Sec. 34
12	North Raccoon River	Dallas Co. Hwy 44, T79N, R27W, Sec. 6
13	North Raccoon River	Dallas Co. Hwy 169, T79N, R27W, Sec. 29
14	North Raccoon River	Dallas Co. I-80, T78N, R27W, Sec. 21/16
15	South Raccoon River	Dallas Co. I-80, T78N, R27W, Sec. 17/20
16	Raccoon River	Dallas Co. Rd. R-16, T78N, R27W, Sec. 22

Provisional flow data for the North Raccoon River were obtained from the U.S. Geological Survey. As a result of the extreme low flows and heavy ice cover, the flow values presented below are very provisional and final figures may be markedly different.

	7 day Q10	24 Jan.1977
North Raccoon River at Sac City	6.5 cfs*	0 cfs
North Raccoon River at Jefferson	12 cfs	4 cfs
Raccoon River at Van Meter	31 cfs	55 cfs

* 7 day Q_2

According to the flow values obtained, discharge on the North Raccoon River was below the 7 day 10 year low flow for most of its reach. Field observations made by the U.S. Geological Survey indicated there was no flow in the North Raccoon at Sac City, February 1, 1977. Zero flow at Sac City was also observed in our survey as we were unable to find any flowing water upstream from the town of Sac City. River flow below Sac City was created by the effluent from the municipal treatment plant.

The abnormally harsh 1976-77 winter temperatures and lack of precipitation created water quality problems on several of Iowa's streams. Due to these extreme conditions, the entire segment of the North Raccoon River from Des Moines to Highway 30 west of Jefferson was judged by the Iowa Conservation Commission to be experiencing "winter kill" and was opened for promiscuous fishing in mid-January, 1977. This survey was conducted January 24, 1977, approximately one week after the opening of promiscuous fishing.

RESULTS AND DISCUSSION

Selected chemical and bacteriological data for the North Raccoon River are displayed in Table 2. All data collected may be found on the data sheets included in the appendix.

Sampling station locations were selected to coincide with previous surveys conducted on the North Raccoon River. The first four sites (stations 1-4) were to sample the upper reaches of the North Raccoon and a major waste-carrying tributary, Boyer Creek. Unfortunately, no flowing water could be found at the first four stations. Even the tributary, Boyer Creek, which carries the effluent from Storm Lake's wastewater treatment plant was frozen solid.

Station 5, located downstream of Sac City, had values indicating organic waste, fecal coliforms 11,000 per 100 ml, ammonia nitrogen 2.1 mg/L, filtrable phosphate 0.87 mg/L and a BOD of 7 mg/L. As discussed previously, flow at station 5 was due entirely to the waste discharge of Sac City.

Water quality at station 6 declined slightly compared to station 5. Specific conductance increased to 1600 micromhos, organic nitrogen to 4.2 mg/L, ammonia nitrogen to 2.2 mg/L and chloride to 32 mg/L. The reason for the increases at station 6 may be from the Lake View municipal discharge; further sampling at low flows is needed to clarify the source of the waste. Station 7, located upstream from Jefferson, had water quality approaching expected ranges, specific conductance 860 micromhos, fecal coliform 10 per 100 ml, ammonia nitrogen 0.68 mg/L, filtrable phosphate 0.04 mg/L and a BOD of less than 1 mg/L. The dissolved oxygen was somewhat depressed at station 7 (5.1 mg/L) with 35% dissolved oxygen saturation.

Table 2

Selected Chemical and Bacteriological Data
from the Raccoon River

24 January 1977

(All values in mg/L unless designated otherwise)

Station	Specific Conductance*	Fecal Coliforms per 100 ml	Organic	Nitrogen Ammonia	Nitrate	Filtrable Phosphate	Dissolved Oxygen	BOD	Chloride
1									
2									
3	UNABLE TO COLLECT SAMPLE - NO FLOWING WATER								
4									
5	650	11,000	3.5	2.1	6.4	0.87	9.1	7	11
6	1600	<10	4.2	2.2	1.2	0.22	11.7	4	32
7	860	10	3.2	0.68	2.2	0.04	5.1	<1	11
Jefferson									
7A	940	230,000	3.0	4.8	1.5	1.2	2.6	12	26
8	1000	3,300	3.3	4.1	0.6	0.70	1.2	4	29
8A	1000	40	1.4	2.3	1.2	0.29	1.5	2	24
9	1100	30	1.6	2.2	1	0.17	2.4	1	29
Oscar Mayer									
9A	1500	5,300	1.6	31	0.6	2.3	0.0	17	52
Perry									
10	1600	280,000	26	23	<0.1	5.0	0.0	28	32
12	1100	120,000	3.0	15	<0.1	1.9	0.0	8	35
13	1300	21,000	2.0	14	<0.1	1.4	2.3	5	54
14	1400	1,500	2.0	12	0.2	1.2	0.0	2	82
South Raccoon River	560	830	1.8	0.56	2.1	0.09	8.7	<1	13
Raccoon River	650	1,000	2.6	1.9	1.9	0.18	7.0	<1	23

*Micromhos

Downstream of Jefferson (station 7A) parameters indicative of organic waste discharges increased. Fecal coliforms rose to 230,000 organisms per 100 ml, ammonia nitrogen 4.8 mg/L, filtrable phosphate 1.2 mg/L and BOD to 12 mg/L. Dissolved oxygen decreased to 2.6 mg/L (17% dissolved oxygen saturation). The decline in water quality at station 7A is a direct result of the Jefferson municipal wastewater treament discharge to the North Raccoon River.

Water quality at the next three stations (stations 8, 8A and 9) showed a gradual improvement as the stream attempted to assimilate the waste introduced at Jefferson. Waste assimilation during the winter is slowed because of the effect colder temperatures have on chemical and biological reactions. By station 9, ammonia nitrogen was 2.2 mg/L, filtrable phosphate 0.17 mg/L and BOD 1 mg/L. Dissolved oxygen had increased from 1.2 mg/L to 2.4 mg/L.

It is almost possible to suggest that water quality in the river at station 9 was starting to return to pre-Jefferson quality. But before that could happen, the Oscar Mayer plant at Perry had a waste discharge to the river. Below the Oscar Mayer discharge (station 9A) ammonia-nitrogen increased to 31 mg/L, filtrable phosphate to 2.3 mg/L, BOD to 17 mg/L and dissolved oxygen was non-existent (0.0 mg/L). To further complicate matters, Perry's municipal wastewater treatment plant discharges to the river between station 9A and 10, so at station 10, we see the in tandem effects of the Oscar Mayer and Perry discharges on stream quality. Specific conductance increased to 1600 micromhos, fecal coliforms 280,000 per 100 ml, ammonia nitrogen 23 mg/L, filtrable phosphate 5.0 mg/L, BOD of 28 mg/L and no dissolved oxygen.

The remaining reach of the North Raccoon River (stations 12-14) reflects its reaction to and its attempts to recover from the waste input at Perry. Most of the parameters decline very slowly and at station 14, ammonia-N (12 mg/L) and filtrable phosphate (1.2 mg/L) were still elevated while there was no (0.0 mg/L) dissolved oxygen.

Station 15 was located on the South Raccoon River just upstream from its juncture with the North Raccoon River. Water quality at station 15 was more what would be expected to occur under heavy winter ice cover not affected by point source discharges. Specific conductance was 560 micromhos, ammonia-nitrogen 0.56 mg/L, filtrable phosphate 0.09 mg/L, a BOD of less than 1 mg/L and a dissolved oxygen of 8.7 mg/L which represents good water quality considering the harsh environmental conditions.

Station 16 represents the Raccoon River after the confluence of the North and South Raccoon Rivers. The lower chemical values observed in the South Raccoon help to dilute the higher values found in the North Raccoon. The end result was an improvement in water quality at station 16, to the point that no water quality standards were violated and there was adequate dissolved oxygen (7.0 mg/L) in the river.

Previous surveys have indicated several point source discharge problems on the North Raccoon River. Most notable have been Storm Lake and Hygrade Food Products at Storm Lake. Unfortunately, no assessment of their effect on water quality could be made during this survey due to the zero stream flow.

Figures 2 and 3 are graphs representing ammonia-N and dissolved oxygen on the North Raccoon River at different flows. The three years selected represent flows varying by a magnitude of 10 to demonstrate the effect of dilution on water quality. The ammonia

Figure 2
North Raccoon River Ammonia-Nitrogen

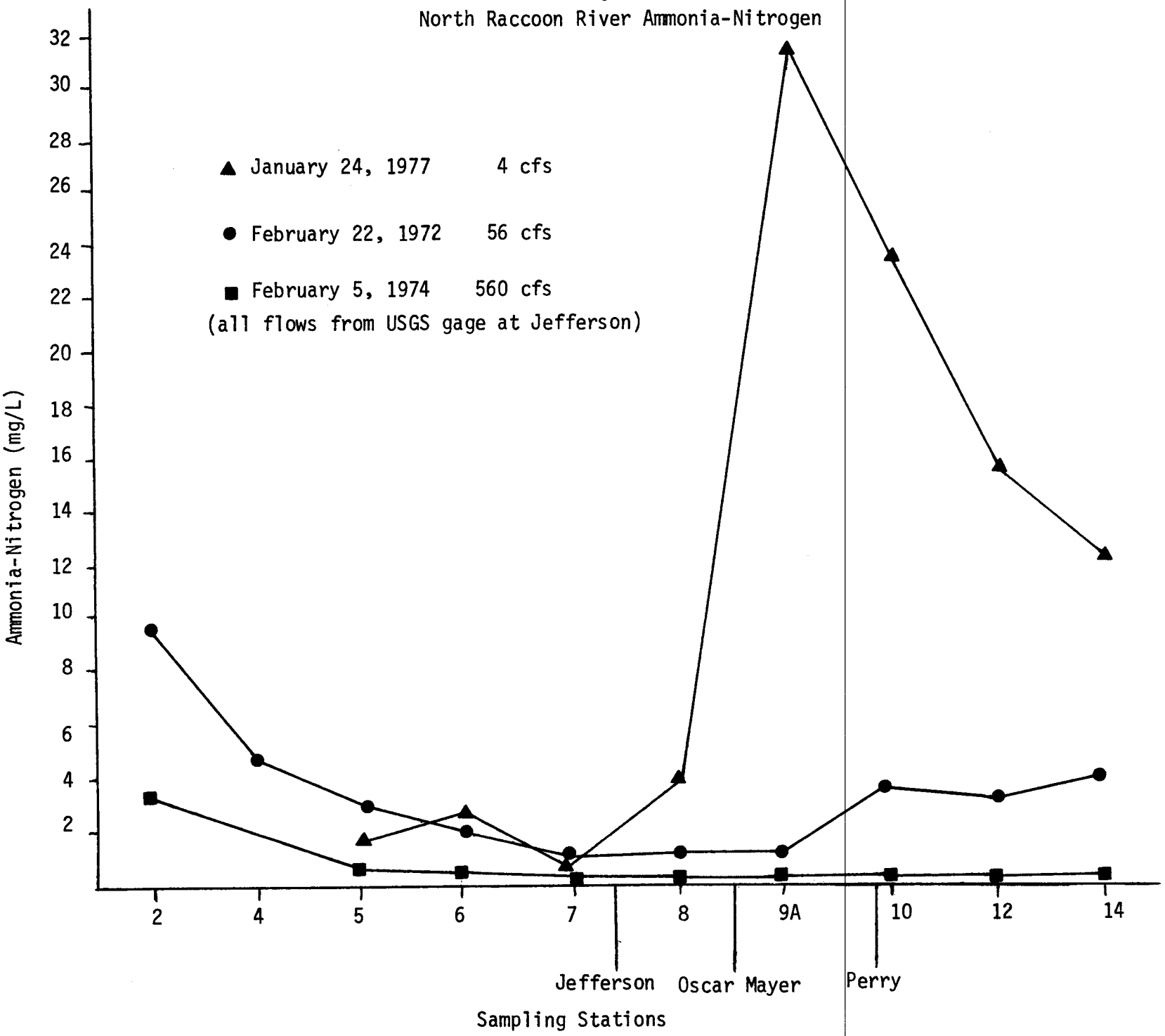
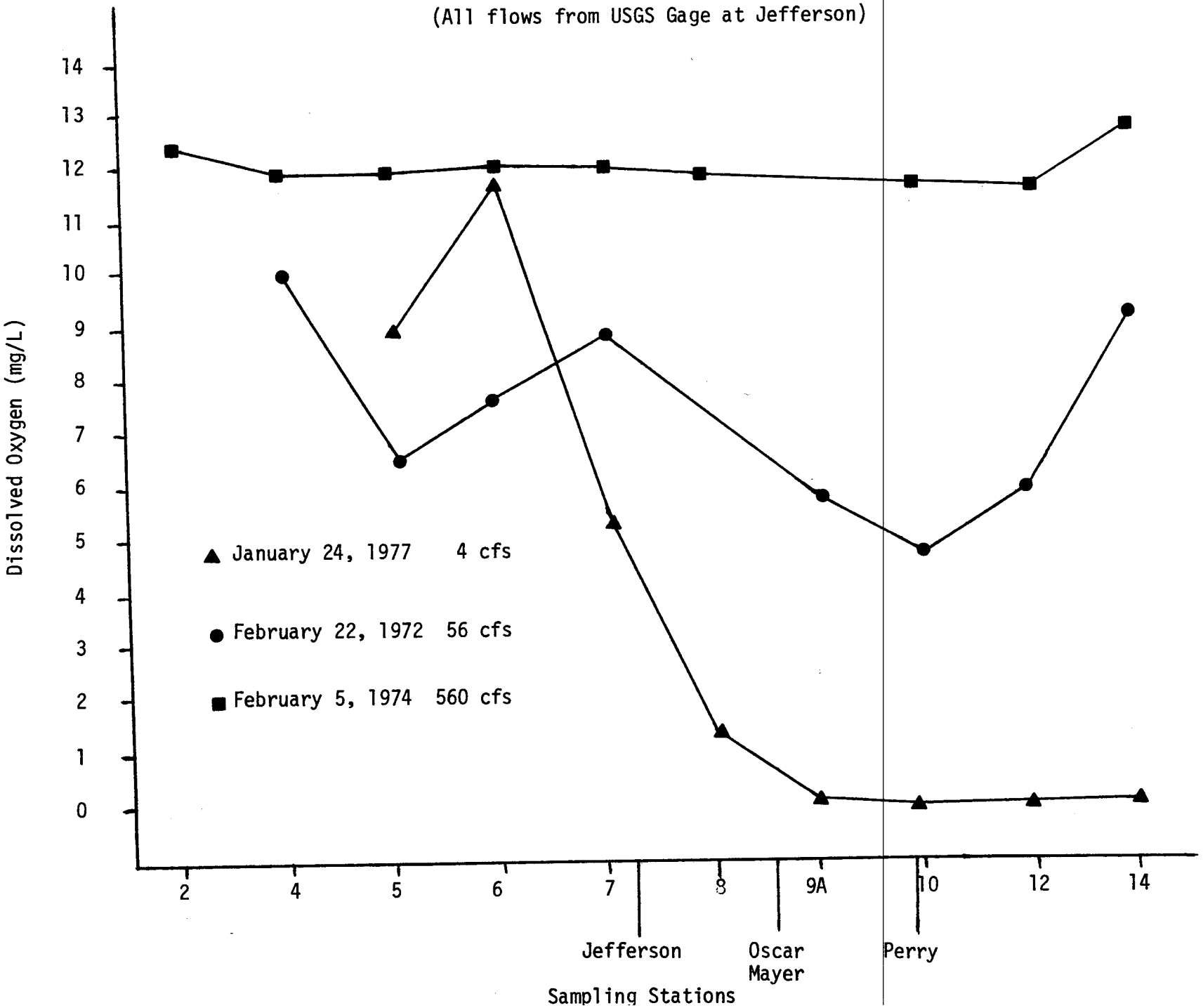


Figure 3

North Raccoon River Dissolved Oxygen

(All flows from USGS Gage at Jefferson)



nitrogen curve for January 1977 shows an increase below Perry, which has been observed before but not to such a great extent. Figure 3 demonstrates the effects of low flow and organic waste on dissolved oxygen. Again the three different stream discharges have had different effects on dissolved oxygen content.

In an effort to provide information on background phenol values, samples for phenol analysis were collected at four stations on the North Raccoon River. Results of these samples are listed below:

Station	Phenol Value
5	13 µg/L
7A	13 µg/L
9	2 µg/L
10	33 µg/L

Samples collected at stations 5 and 7A were the first stations downstream of a municipal waste discharge and most probably each value reflects the phenol input from those discharges. Station 9 was located upstream from Perry and indicates background concentrations of phenol. Downstream from Perry (station 10) the phenol value increased to 33 µg/L, a significant rise compared to station 9. A follow-up survey to determine the relative phenol input from Oscar Mayer and the Perry municipal plant was conducted by DEQ staff approximately one month after this survey. Analysis of the final effluent for phenol resulted in values of 15 µg/L for the Perry municipal effluent and 26 µg/L for the Oscar Mayer effluent. The additive effect of the two discharges plus the low flow created the high river phenol concentration.

Sources of phenols in domestic and packinghouse wastes vary considerably. Some phenols may be formed by the breakdown of human and other organic wastes. They are also used in dyes,

for disinfection, livestock dips and in many other ways. More work needs to be done in determining phenolic waste concentrations from various organic waste point source discharges and to assess their impact, if any, on the receiving stream.

CONCLUSIONS

Water quality of the North Raccoon River during January 1977 was very poor. The upper reaches (Storm Lake area) were frozen solid which made it impossible to collect samples. The point source discharges from Sac City, Jefferson, Oscar Mayer and Perry greatly deteriorated water quality. Ammonia-nitrogen, phosphates and BOD increased downstream from each discharge with the greatest increase coming below Perry. From Jefferson to its juncture with the South Raccoon, dissolved oxygen was almost non-existent. The low flow and relatively close proximity of the waste discharges made it impossible for the river to assimilate the heavy organic waste load under winter conditions, causing the entire reach to be affected. Although the ammonia-nitrogen and dissolved oxygen values were such that they would normally violate the Iowa Water Quality Standards because of the low streamflows the Iowa Water Quality Standards will probably not be applicable (current flow data is provisional and may or may not change).

Jack O. Kennedy
Limnologist

APPENDIX

LIMNOLOGY SURVEY

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Sac City	Sac City	Sac City
Source	WWTP	North Raccoon River	North Raccoon River
Specific Location	Final effluent	Co. Rd. D-42	Sac Co.Rd. D-42, T88N, R36W, Sec. 36
Date Collected	25 January 1977	25 January 1977	24 January 1977
Date Received	25 January 1977	25 January 1977	25 January 1977
Lab Number	2893	2894	2895
		FIELD DATA	
Collection Time	11:00	11:30	5:45
pH			
Temperature		0°C	0°C
Dissolved Oxygen			
		BACTERIOLOGICAL EXAMINATION	
Fecal Coliform/100 ml	1,700,000 (<24 hrs.)	11,000 (<24 hrs.)	7,200 (>24 hrs.)
		CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
Conductance (micromhos)	1100	650	630
MBAS (as LAS)			
pH (units)	7.3	7.35	7.4
Alkalinity: P	none	none	none
T	212	270	260
NITROGEN: Organic N	16	3.5	3.5
Ammonia N	36	2.1	1.8
Nitrite N			
Nitrate N	2.8	6.4	7.4
Nitrate as NO_3			
RESIDUE: Total	636	678	708
Fixed	458	540	576
Volatile	178	138	132
Filtrable Residue T	528	372	342
F	446	292	268
V	82	80	74
Nonfiltrable Residue T	68	256	304
F	8	226	272
V	60	30	32
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	12	0.87	0.63
Total P	14	1.0	0.70
Dissolved Oxygen		9.1	8.7
BOD	70	7	4
COD	210	31	27
Grease or Oil			
Turbidity (JTU)	46	62	60
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	68	11	9.0
Sulfate (SO_4^{--})			
Total Organic Carbon		17.1	14.9
Chlorophyll a		12 µg/L	15 µg/L
Phenol		13 µg/L	
REMARKS:		Complete ice cover.	Complete ice cover.

COLLECTOR REPORT TO: Kennedy & Miller
Limnology Division
SHL
Des Moines, Ia

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

FEB 22 1977

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Lake City	Jefferson	Jefferson
Source	North Raccoon River	North Raccoon River	WWTP
Specific Location	Calhoun Co. Hwy 175, R34W, T86N, Sec. 17	Green Co. Rd. E-53, R31W, T83N, Sec. 11	Final effluent
Date Collected	24 January 1977	24 January 1977	25 January 1977
Date Received	25 January 1977	25 January 1977	25 January 1977
Lab Number	2896	2897	2898
	FIELD DATA		
Collection Time	5:15	4:15	1:00
pH			
Temperature	0°C	0°C	
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	<10 (>24 hrs.)	10 (>24 hrs.)	1,200,000 (<24 hrs.)
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	1600	860	1400
MBAS (as LAS)			
pH (units)	7.6	7.25	7.45
Alkalinity: P	none	none	none
T	696	390	233
NITROGEN: Organic N	4.2	3.2	8.7
Ammonia N	2.2	0.68	34
Nitrite N			
Nitrate N	1.2	2.2	1.5
Nitrate as NO_3			
RESIDUE: Total	1150	526	1180
Fixed	892	405	986
Volatile	258	121	194
Filtrable Residue T	1090	493	1040
F	914	408	988
V	176	85	52
Nonfiltrable Residue T	5	0	62
F	0	0	6
V	5	0	56
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.22	0.04	8.0
Total P	0.24	0.08	9.6
Dissolved Oxygen	11.7	5.1	
BOD	4	<1	50
COD	14	12	170
Grease or Oil			
Turbidity (JTU)	3.3	1.8	31
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	32	11	260
Sulfate (SO_4^{--})			
Total Organic Carbon	11	9.2	
Chlorophyll a	<1 µg/L	2 µg/L	

REMARKS: Complete ice cover.

COLLECTOR REPORT TO: Kennedy & Miller
Limnology Division
SHL
Des Moines, Ia.

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Jefferson	Jefferson	Dawson
Source	North Raccoon River	North Raccoon River	North Raccoon River
Specific Location	Hwy 4 bridge south of Jefferson	Green Co.Rd., T82N, R30W, Sec. 1	Dallas Co. Rd., R29W, T81N, Sec. 3
Date Collected	25 January 1977	24 January 1977	24 January 1977
Date Received	25 January 1977	25 January 1977	25 January 1977
Lab Number	2899	2900	2901
	FIELD DATA		
Collection Time	1:00	3:30	2:45
pH			
Temperature	0°C	0°C	0°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	230,000 (<24 hrs.)	3,300 (>24 hrs.)	40 (>24 hrs.)
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	940	1000	1000
MBAS (as LAS)			
pH (units)	7.2	7.3	7.3
Alkalinity: P	none	none	none
T	376	442	448
NITROGEN: Organic N	3.0	3.3	1.4
Ammonia N	4.8	4.1	2.3
Nitrite N			
Nitrate N	1.5	0.6	1.2
Nitrate as NO_3			
RESIDUE: Total	595	656	645
Fixed	475	527	506
Volatile	120	129	139
Filtrable Residue T	548	618	602
F	499	538	530
V	49	80	72
Nonfiltrable Residue T	9	3	11
F	1	0	8
V	8	3	3
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	1.2	0.70	0.29
Total P	1.8	0.83	0.32
Dissolved Oxygen	2.6	1.2	1.5
BOD	12	4	2
COD	28	10	9
Grease or Oil			
Turbidity (JTU)	8.3	4.6	2.9
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	26	29	24
Sulfate (SO_4^{--})			
Total Organic Carbon	13.0	9.9	6.5
Phenol	13 µg/L		
Chlorophyll a	3 µg/L	3 µg/L	6 µg/L
REMARKS:	Complete ice cover. Gage reading 4.52	Complete ice cover.	Complete ice cover.
COLLECTOR	Kennedy & Miller		
REPORT TO	Limnology Division SHL Des Moines, Ia.		

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

FEB 22 1977

LIMNOLOGY SURVEY
WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Perry	Perry	Perry
Source	North Raccoon River	North Raccoon River	North Raccoon River
Specific Location	Co.Rd. bridge west of Perry, Sec. 5 & 8	Hwy 141 bridge W of Perry, 100 yd. downstream Oscar Mayer dis.	Dallas Co. Rd. P-58, R28W, T81N, Sec. 34
Date Collected	24 January 1977	24 January 1977	24 January 1977
Date Received	25 January 1977	25 January 1977	25 January 1977
Lab Number	2902	2903	2904
	FIELD DATA		
Collection Time	1:45	1:15	12:15
pH			
Temperature	0°C	0°C	0°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	30 (>24 hrs.)	5,300 (>24 hrs.)	280,000 (>24 hrs.)
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	1100	1500	1600
MBAS (as LAS)			
pH (units)	7.25	7.25	7.35
Alkalinity: P	none	none	none
T	480	624	674
NITROGEN: Organic N	1.6	1.6	26
Ammonia N	2.2	31	23
Nitrite N			
Nitrate N	1.0	0.6	<0.1
Nitrate as NO_3			
RESIDUE: Total	693	831	852
Fixed	511	702	703
Volatile	182	129	149
Filtrable Residue T	667	785	809
F	549	675	679
V	118	110	130
Nonfiltrable Residue T	1	13	16
F	0	4	4
V	1	9	12
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.17	2.3	5.0
Total P	0.19	2.3	5.2
Dissolved Oxygen	2.4	0.0	0.0
BOD	1	17	28
COD	7	42	79
Grease or Oil			
Turbidity (JTU)	3.0	32	35
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	29	52	32
Sulfate (SO_4^{--})			
tal Organic Carbon	8.4	19.7	29.8
enol	2 µg/L		33 µg/L
lorophyll a	4 µg/L	4 µg/L	3 µg/L

REMARKS: Complete ice cover. 95% ice cover. 95% ice cover. Ice layer with running water between layer.

COLLECTOR: Kennedy & Miller
REPORT TO: Limnology Division SHL

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

LIMNOLOGY SURVEY
WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Dallas Center	Adel	Van Meter
Source	North Raccoon River	North Raccoon River	North Raccoon River
Specific Location	Dallas Co. Hwy 44, T79N, R27W, Sec. 6	¼ mi. below Hwy 169 above Adel dam, T79N, R27W, Sec. 29	I-80 br., R27W, T78N, Sec. 21 & 16, Madison Co.
Date Collected	24 January 1977	24 January 1977	24 January 1977
Date Received	25 January 1977	25 January 1977	25 January 1977
Lab Number	2905	2906	2907
	FIELD DATA		
Collection Time	11:45	11:00	10:30
pH			
Temperature	0°C	0°C	0°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	120,000 (>24 hrs.)	21,000 (>24 hrs.)	1,500 (>24 hrs.)
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	1100	1300	1400
MBAS (as LAS)			
pH (units)	7.3	7.35	7.4
Alkalinity: P	none	none	none
T	482	540	512
NITROGEN: Organic N	3.0	2.0	2.0
Ammonia N	15	14	12
Nitrite N			
Nitrate N	<0.1	<0.1	0.2
Nitrate as NO_3			
RESIDUE: Total	662	774	790
Fixed	540	636	669
Volatile	122	138	121
Filtrable Residue T	614	728	754
F	534	626	656
V	80	102	98
Nonfiltrable Residue T	7	3	3
F	0	0	1
V	7	3	2
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	1.9	1.4	1.2
Total P	1.9	1.4	1.2
Dissolved Oxygen	0.0	2.3	0.0
BOD	8	5	2
COD	28	19	12
Grease or Oil			
Turbidity (JTU)	9.0	5.5	4.9
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	35	54	82
Sulfate (SO_4^{--})			
otal Organic Carbon	14.2	9.8	10.5
hlorophyll a	2 µg/L	4 µg/L	9 µg/L
REMARKS:	Complete ice cover.	Complete ice cover.	Complete ice cover.
COLLECTOR	Kennedy & Miller		
REPORT TO	Limnology Division SHL		

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town	Van Meter	Van Meter	
Source	South Raccoon River	Raccoon River	
Specific Location	I-80 bridge		
Date Collected	24 January 1977	24 January 1977	
Date Received	25 January 1977	25 January 1977	
Lab Number	2908	2909	
	FIELD DATA		
Collection Time	10:45	9:45	
pH			
Temperature	0°C	0°C	
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	830 (>24 hrs.)	1000 (>24 hrs.)	
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	560	650	
MBAS (as LAS)			
pH (units)	7.35	7.4	
Alkalinity: P	none	none	
T	228	261	
NITROGEN: Organic N	1.8	2.6	
Ammonia N	0.56	1.9	
Nitrite N			
Nitrate N	2.1	1.9	
Nitrate as NO_3			
RESIDUE: Total	349	413	
Fixed	267	317	
Volatile	82	96	
Filtrable Residue T	322	379	
F	259	304	
V	63	75	
Nonfiltrable Residue T	6	8	
F	4	7	
V	2	1	
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.09	0.18	
Total P	0.13	0.20	
Dissolved Oxygen	8.7	7.0	
BOD	<1	<1	
COD	12	7	
Grease or Oil			
Turbidity (JTU)	4.5	4.8	
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	13	23	
Sulfate (SO_4^{--})			
tal Organic Carbon	5.2	6.8	
lorophyll a	6 µg/L	4 µg/L	

REMARKS: Complete ice cover. Complete ice cover. Gage 309

COLLECTOR REPORT TO: Kennedy & Miller, Limnology Division, SHL

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

[illegible] SURVEY

METALS ANALYSIS

TOWN:	Sac City	Sac City	Jefferson	Perry
SOURCE:	WWTP	North Raccoon River	North Raccoon River	North Raccoon River
SPECIFIC LOCATION:	Final effluent	Co. Rd. D-42	Hwy 4 bridge south of Jefferson	Co. Rd. bridge west of Perry, Sec. 5 & 8
DATE COLLECTED:	25 January 1977	25 January 1977	25 January 1977	24 January 1977
DATE RECEIVED:	25 January 1977	25 January 1977	25 January 1977	25 January 1977
COLLECTED BY:	Kennedy & Miller			
REPORT TO:	Limnology Division SHL Des Moines, Iowa			
LAB NUMBER	2893	2894	2899	2902
ALUMINUM				
ANTIMONY				
ARSENIC	<0.01	<0.01	<0.01	<0.01
BARIUM	<0.1	0.1	0.1	0.2
CADMIUM	<0.01	<0.01	<0.01	<0.01
CHROMIUM, TOTAL	0.10	<0.01	<0.01	<0.01
CHROMIUM, HEXAVALENT				
COPPER	0.02	<0.01	<0.01	<0.01
IRON				
LEAD	0.35	<0.01	<0.01	<0.01
MAGNESIUM				
MANGANESE				
MERCURY	<0.001	<0.001	<0.001	<0.001
NICKEL	<0.1	<0.1	<0.1	<0.1
SILVER	<0.01	<0.01	<0.01	<0.01
TIN				
ZINC	0.71	0.03	0.03	0.02
Selenium	<0.01	<0.01	<0.01	<0.01

DETERMINATIONS REPORTED AS MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE STATED.

FEB 22 1977

LIMNOLOGY SURVEY METALS ANALYSIS

TOWN:	Perry
SOURCE:	North Raccoon River
SPECIFIC LOCATION:	Dallas Co.Rd. P-58, R28W, T81N, Sec. 34
DATE COLLECTED:	24 January 1977
DATE RECEIVED:	25 January 1977
COLLECTED BY:	Kennedy & Miller
REPORT TO:	Limnology Division SHL Des Moines, Iowa
LAB NUMBER	2904
ALUMINUM	
ANTIMONY	
ARSENIC	<0.01
BARIUM	0.2
CADMIUM	<0.01
CHROMIUM, TOTAL	<0.01
CHROMIUM, HEXAVALENT	
COPPER	<0.01
IRON	
LEAD	<0.01
MAGNESIUM	
MANGANESE	
MERCURY	<0.001
NICKEL	<0.1
SILVER	<0.01
TIN	
ZINC	0.02
*Selenium	<0.01

DETERMINATIONS REPORTED AS MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE STATED.

FEB 22 1977