A REPORT FROM

The State Hygienic Laboratory

MEDICAL LABORATORIES BUILDING

THE UNIVERSITY OF IOWA
IOWA CITY, IOWA 52242

WINTER WATER QUALITY SURVEY OF THE EAST FORK WAPSIPINICON RIVER

#78 - 53

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

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ABSTRACT

Water quality of the East Fork Wapsipinicon River was surveyed during winter ice cover conditions. Purpose of the study was to assess the impact of point source waste discharges on water quality. Results of the survey indicate above average water quality on the upper reach (headwaters to Fredericksburg). The point source waste discharges from the Fredericksburg municipal wastewater treatment plant and Meinerz Creamery caused a decline in water quality downstream from Fredericksburg. Dissolved oxygen levels were reduced and the Iowa dissolved oxygen standard may have been violated on the lower reach (Fredericksburg to Tripoli). Compared to previous reports, water quality of the lower reach has not improved.

INTRODUCTION

The East Fork Wapsipinicon River originates in north central Iowa (Howard County) and flows southerly through Chickasaw County joining the Wapsipinicon River in Bremer County. Drainage area for the East Fork Wapsipinicon is relatively small (148 square miles) and consists mostly of agricultural land.

Previous water quality reports (State Health Department 1962 and State Hygienic Laboratory Report #78-2) conducted on the East Fork Wapsipinicon River have indicated poor water quality below Fredericksburg. The primary purpose of this survey was to assess the impact of the Fredericksburg municipal wastewater treatment plant discharge and the Meinerz Creamery discharge on the East Fork Wapsipinicon River.

The East Fork Wapsipinicon River is designated as a class "B" warm water stream from its mouth to above New Hampton in Chickasaw County with the appropriate stream standards applying to that reach.

Water samples were collected on February 7, 1978, preserved and sent to the State Hygienic Laboratory-Des Moines Branch for analysis. Field conditions during the sampling were harsh, air temperature ranged from -15^{o} to -10^{o}C with heavy snow and ice cover. Figure 1 is a map of the sampling area with sampling stations indicated. A complete list of the sampling station locations may be found in Table 1.

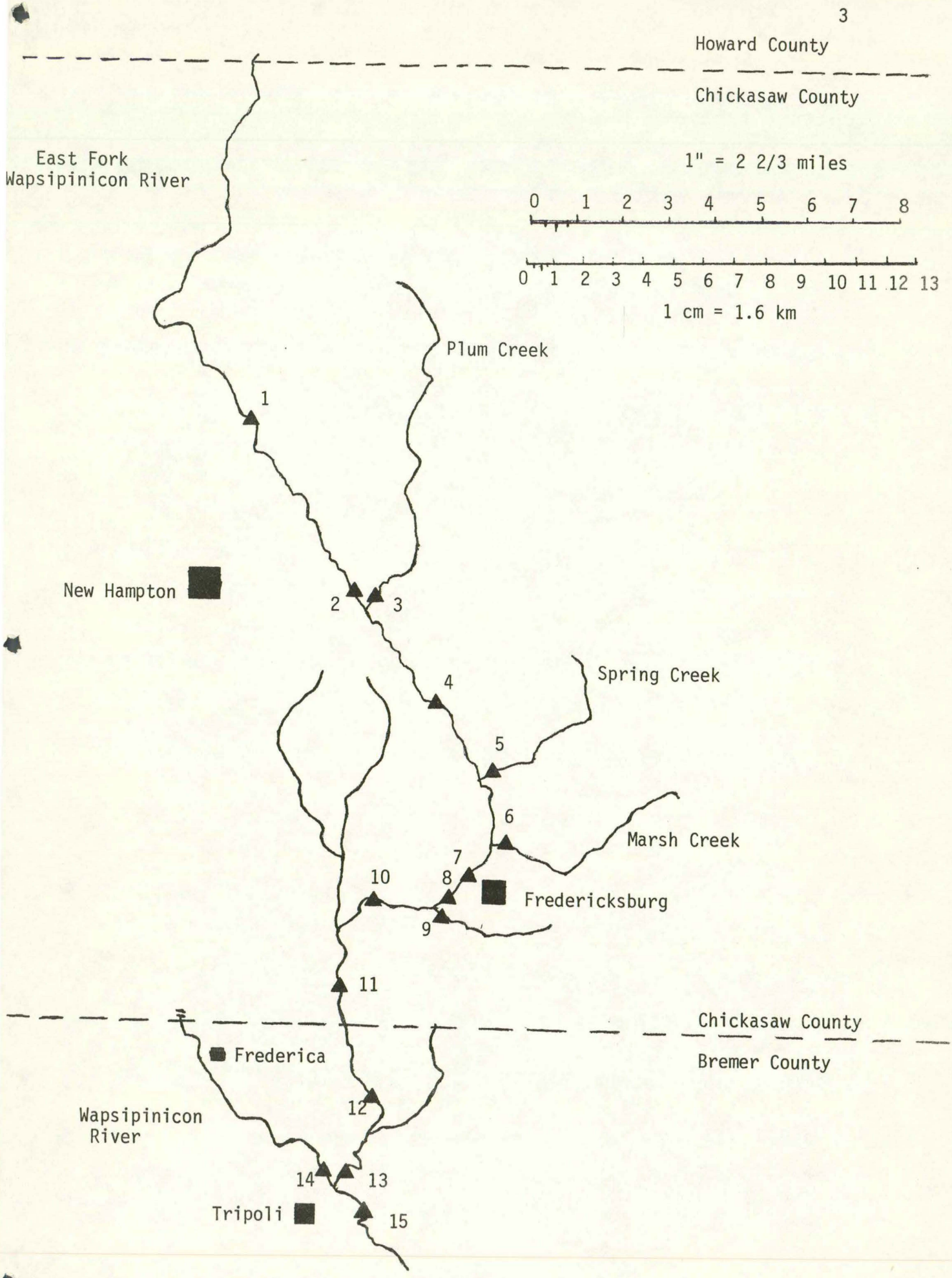
Howard County
Chickasaw County
East Fork
Wapsipinicon River
1" = 2 2/3 miles
0 1 2 3 4 5 6 7 8
0 1 2 3 4 5 6 7 8 9 10 11 12 13
1 cm = 1.6 km
Plum Creek
1
New Hampton
2
3
4
Spring Creek
5
6
Marsh Creek
7
10
8
Fredericksburg
9
11
Chickasaw County
Bremer County
Frederica
12
Wapsipinicon
River
14
13
Tripoli
15

TABLE 1

East Wapsipinicon River Basin
Sampling Locations
7 February 1978

STATION		LOCATION
1	East Wapsipinicon River	Chickasaw Co. Rd. B-33, T96N, R13W, Section 23
2	East Wapsipinicon River	Chickasaw Co. Hwy 24, T95N, R12W, Section 9
3	Plum Creek	Chickasaw Co. Rd., T95N, R12W, Section 10
4	East Wapsipinicon River	Chickasaw Co. Rd. B-54, T95N, R12W, Section 25/36
5	Spring Creek	Chickasaw Co. Rd. V-48, T94N, R11W, Section 6
6	Marsh Creek	Within town, behind Farmer's Coop Creamery, 600' upstream from railroad bridge
7	East Wapsipinicon River	Chickasaw Co. Hwy 18, T94N, R12W, Section 12/13
	Chickasaw County	Fredericksburg Sewage Treatment Plant, Final effluent
8	East Wapsipinicon River	T94N, R12W, Section 14, 50' upstream from Meinerz effluent confluence
	Chickasaw County	Meinerz Creamery, Final effluent
9	Chickasaw County	Meinerz Creamery, T94N, R12W, Section 14, approximately 30' from confluence with East Wapsipinicon River
10	East Wapsipinicon River	Chickasaw Co. Rd., T94N, R12W, Section 16/21
11	East Wapsipinicon River	Chickasaw Co. Rd., T94N, R12W, Section 34
12	East Wapsipinicon River	Bremer Co. Rd. C-18, T93N, R12W, Section 11/14
13	East Wapsipinicon River	Bremer Co. Hwy 93, T93N, R12W, Section 23/26
14	Wapsipinicon River	Bremer Co. Hwy 93 T93N, R12W, Section 27
15	Wapsipinicon River	Bremer Co. Rd. C-33, T92N, R11W, Section 18/19

Stream flow measurements were made at stations 7 and 15 on the East Fork Wapsipinicon River and are listed below:

	Feb. 7, 1978	7 day Q_2	Drainage Area
East Fork Wapsipinicon near Fredericksburg	13 cfs	3.6 cfs	83.5 sq. mi.
East Fork Wapsipinicon near Tripoli	23 cfs	7.4 cfs	148 sq. mi.

Stream discharge during the survey was three to four times greater than the calculated 7 day 2 year low flow.

RESULTS AND DISCUSSION

Selected chemical and bacteriolocial data for the East Fork Wapsipinicon river have been tabulated and will be found in Table 2. For discussion purposes the East Fork Wapsipinicon may be divided into two segments, the reach above Fredericksburg and the reach in and below Fredericksburg. Sampling stations 1 through 7, located upstream from Fredericksburg, had above average water quality for winter conditions. The organic nitrogen and ammonia nitrogen values were low as was the total organic carbon and total phosphate. Dissolved oxygen values were adequate, approaching the 90% saturation level. Fecal coliform levels were in expected ranges for winter ice cover conditions.

Between stations 7 and 8, the Fredericksburg wastewater treatment plant discharges to the river. Indicator parameters of organic wastes (ammonia nitrogen, organic nitrogen, phosphate and chloride) increased slightly at station 8 in response to the municipal waste discharge from Fredericksburg. Located between stations 8 and 10 was a small stream that transports the waste discharge from Meinerz Creamery. Station 9, located on the small stream just before it joined with the East Fork Wapsipinicon, exhibited very poor water quality as indicated by elevated levels of organic nitrogen and ammonia nitrogen, total organic carbon, total

TABLE 2

Selected Chemical and Bacteriological Data
from the East Wapsipinicon River

February 7, 1978

Station	Nitrogen Organic	Nitrogen Ammonia	Dissolved Oxygen	Total Organic Carbon	Total Phosphate	Chloride	Fecal Coliforms (organisms/100 ml)
1	0.01	0.20	11.8	8.8	0.08	13	40
2	0.02	0.17	11.6	7.9	0.09	14	20
3 Plum Creek	0.14	0.12	12.8	6.3	0.09	14	10
4	0.02	0.20	11.5	7.6	0.08	14	80
5 Spring Creek	0.03	0.12	13.1	7.2	0.11	14	10
6 Marsh Creek	0.14	0.25	12.7	9.8	0.14	22	890
7	0.05	0.21	11.3	8.3	0.10	16	140
Fredericksburg WWTP	13	10	3.2	88.0	14	50	880,000
8	0.58	0.55	9.9	9.8	0.61	18	1,300
Meinerz Creamery	17	10	0.0	146.1	31	1100	1,900
9	13	7.5	5.1	112.0	25	870	380
10	0.55	0.91	6.0	14.6	1.3	52	5,100
11	0.93	0.87	4.2	9.6	1.0	46	1,900
12	0.43	0.71	4.1	9.1	0.80	44	340
13	0.38	0.68	4.0	10.5	0.75	44	210
14	0.11	0.80	6.5	5.2	0.26	19	20
15	0.50	0.75	6.4	10.6	0.29	28	40

phosphate and chloride. The impact of this tributary stream on the river can be measured by comparing chemical values from station 8 to station 10. Increases in all organic waste indicator parameters except organic nitrogen and a significant decline in dissolved oxygen occurred at station 10, compared to station 8. The remaining stations on the East Fork Wapsipinicon River (11-13) demonstrated a gradual decline in the organic waste parameters indicating a corresponding gradual return to baseline water quality. The dissolved oxygen values at stations 11, 12 and 13 were low (4.2, 4.1, 4.0 mg/l respectively) and were probably in violation of the Iowa Water Quality Standard for dissolved oxygen. The low dissolved oxygen values at stations 11, 12 and 13 are a result of the high oxygen demanding wastes being discharged by Fredericksburg and Meinerz Creamery, depleting the stream dissolved oxygen.

Fredricksburg is in Step I of the construction grants program and is completing their inflow and infiltration report. Meinerz Creamery, according to the IDEQ staff is under executive order to meet their effluent limitations. Effluent sampling is being conducted by both IDEQ and EPA.

Water samples for trace metals analysis were collected at stations 1, 10 and 13. The only reportable trace metal was a copper value of 0.06 mg/l at station 13, which was in violation of the Iowa Standard of 0.02 mg/l. The elevated copper value cannot be attributed to any point source at this time and may be a background level for that area.

Stream samples were collected at station 7 and 15 for analysis of ortho-nitroaniline (ONA), an organic compound that has been found in sections of the Cedar River. Results of the analysis show no detectable ONA (less than 10 parts per trillion) in either of the samples.

SUMMARY AND CONCLUSIONS

Results of a winter stream quality survey of the East Fork Wapsipinicon River indicate above average water quality upstream from Fredericksburg, Iowa. The point source waste discharges from the Fredricksburg municipal wastewater treatment plant and Meinerz Creamery had a significant impact on stream water quality. Violation of the Iowa water quality standard for dissolved oxygen may have occurred at three sampling stations downstream from Fredericksburg. Compared to previous reports, water quality downstream from Fredericksburg has not improved and may be classified as below average.

Jack O. Kennedy
Limnologist

WATER QUALITY REPORT

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

Town		New Hampton	New Hampton
Source	E. Wapsipinicon River	E. Wapsipinicon River	Plum Creek
Specific Location	Chickasaw Co.Rd. B-33 T96N, R13W, Sec. 23	Chickasaw Co. Hwy 24, T95N, R12W, Sec. 9	Chickasaw Co. Rd., T95N, R12W, Sec. 10
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3753	3754	3755
	FIELD DATA		
Collection Time	0950	1015	1040
pH			
Temperature	Air-15.0°C, Water 0°C	Air-11°C, Water 0°C	Air-11°C, Water 0°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	40	20	10
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	410	380	430
MBAS (as LAS)			
pH (units)	7.6	7.45	7.7
Alkalinity: P	none	none	none
T	129	117	145
NITROGEN: Organic N	0.01	0.02	0.14
Ammonia N	0.20	0.17	0.12
Nitrite N			
Nitrate N	3.6	3.7	5.3
Nitrate as NO_3			
RESIDUE: Total	253	250	266
Fixed	214	205	218
Volatile	39	45	48
Filtrable Residue T	253	243	265
F	214	203	218
V	39	40	47
Nonfiltrable Residue T	0	7	1
F	0	2	0
V	0	5	1
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.04	0.03	0.03
Total P	0.08	0.09	0.09
Dissolved Oxygen	11.8	11.6	12.8
BOD	2	2	2
COD	6	7	5
Grease or Oil			
Turbidity (JTU)	1.7	4.5	2.1
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	13	14	14
Sulfate (SO_4^{--})			
Total Organic Carbon	8.8	7.9	6.3
REMARKS:	100% ice cover	100% ice cover	100% ice cover

COLLECTOR: Kennedy/Meierhoff/Prill
REPORT TO: Limnology Division
SHL
Des Moines Ia

WJ Hausler, Jr., PhD
Director

WATER QUALITY REPORT

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

Town		Fredericksburg	Fredericksburg
Source	E. Wapsipinicon River	Spring Creek	Marsh Creek
Specific Location	Chickasaw Co.Rd. B-54, T95N,R12W, Sec. 25/36	Chickasaw Co.Rd. V-48, T94N,R11W, Sec. 6	Within town, behind Farmer's Co-op Creamery, 600'up-stream from railroad bridge
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3756	3757	3758
		FIELD DATA	
Collection Time	1110	1130	1150
pH			
Temperature	Air-10°C, Water 0°C	Air-10°C, Water 0°C	Air-10°C, Water 0°C
Dissolved Oxygen			
		BACTERIOLOGICAL EXAMINATION	
Fecal Coliform/100 ml	80	10	890
		CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
Conductance (micromhos)	410	460	520
MBAS (as LAS)			
pH (units)	7.5	7.8	7.7
Alkalinity: P	none	none	none
T	128	142	147
NITROGEN: Organic N	0.02	0.03	0.14
Ammonia N	0.20	0.12	0.25
Nitrite N			
Nitrate N	4.9	7.2	7.0
Nitrate as NO_3			
RESIDUE: Total	252	280	323
Fixed	204	221	264
Volatile	48	59	59
Filtrable Residue T	251	275	322
F	204	221	264
V	47	54	58
Nonfiltrable Residue T	1	5	1
F	0	0	0
V	1	5	1
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.02	0.04	0.06
Total P	0.08	0.11	0.14
Dissolved Oxygen	11.5	13.1	12.7
BOD	1	2	2
COD	6	5	7
Grease or Oil			
Turbidity (JTU)	2.9	3.8	2.5
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	14	14	22
Sulfate (SO_4^-)			
al Organic Carbon	7.6	7.2	9.8
REMARKS:	100% ice cover	100% ice cover	Open water

COLLECTOR: Kennedy/Meierhoff/Prill
REPORT TO: Limnology Division
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WATER QUALITY REPORT

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The University of Iowa
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Town	Fredericksburg	Fredericksburg	Fredericksburg
Source	E. Wapsipinicon River	Fredericksburg STP	E. Wapsipinicon River
Specific Location	Chickasaw Co. Hwy 18, T94N, R12W, Sec. 12/13	Final effluent	T94N,R12W, Sec. 14, 50' upstream from Meinerz effluent confluence
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3759	3760	3761
		FIELD DATA	
Collection Time	1240	1:20	1430
pH			
Temperature	Air-10°C, Water 0°C	Air-11°C, Water 7°C	Water 0°C
Dissolved Oxygen			
		BACTERIOLOGICAL EXAMINATION	
Fecal Coliform/100 ml	140	880,000	1,300
		CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
Conductance (micromhos)	420	960	450
MBAS (as LAS)			
pH (units)	7.4	7.5	7.35
Alkalinity: P	none	none	none
T	131	364	138
NITROGEN: Organic N	0.05	13	0.58
Ammonia N	0.21	10	0.55
Nitrite N			
Nitrate N	5.4	<0.1	5.1
Nitrate as NO_3			
RESIDUE: Total	261	758	276
Fixed	213	600	229
Volatile	48	158	47
Filtrable Residue T	260	694	273
F	213	600	229
V	47	94	44
Nonfiltrable Residue T	1	64	3
F	0	0	0
V	1	64	3
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.01	12	0.49
Total P	0.10	14	0.61
Dissolved Oxygen	11.3	3.2	9.9
BOD	2	100	5
COD	10	250	8
Grease or Oil			
Turbidity (JTU)	3.0	29	3.3
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	16	50	18
Sulfate (SO_4^{--})			
al Organic Carbon	8.3	88.0	9.8
REMARKS:	100% ice cover		100% ice cover

COLLECTOR
REPORT TO

Kennedy/Meierhoff/Prill
Limnology Division
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Des Moines, Ia.

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WATER QUALITY REPORT

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

Town	Fredericksburg	Fredericksburg	Fredericksburg
Source	Meinerz Creamery	Meinerz Creamery	E. Wapsipinicon River
Specific Location	Final effluent	T94N,R12W, Sec. 14, about 30' from confluence w/E. Wapsipinicon	Chickasaw Co.Rd., T94N, R12W, Sec. 16/21
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3762	3763	3764
		FIELD DATA	
Collection Time	1:15	1445	1530
pH			
Temperature	Air-11°C, Water 0°C	Air-11°C, Water 0°C	Air-11°C, Water 0°C
Dissolved Oxygen			
		BACTERIOLOGICAL EXAMINATION	
Fecal Coliform/100 ml	1,900	380	5,100
		CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
Conductance (micromhos)	4700	3800	590
MBAS (as LAS)			
pH (units)	7.6	7.5	7.4
Alkalinity: P	none	none	none
T	668	535	155
NITROGEN: Organic N	17	13	0.55
Ammonia N	10	7.5	0.91
Nitrite N			
Nitrate N	0.1	0.5	4.7
Nitrate as NO_3			
RESIDUE: Total	2870	2220	292
Fixed	2620	2000	225
Volatile	250	220	67
Filtrable Residue T	2820	2200	290
F	2620	2000	225
V	200	200	65
Nonfiltrable Residue T	48	24	2
F	0	0	0
V	48	24	2
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	28	20	1.1
Total P	31	25	1.3
Dissolved Oxygen	0.0	5.1	6.0
BOD	130	80	6
COD	448	36	24
Grease or Oil			
Turbidity (JTU)	35	24	4.2
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	1100	870	52
Sulfate (SO_4^{--})			
otal Organic Carbon	146.1	112.0	14.6
REMARKS:		100% ice cover	100% ice cover

COLLECTOR REPORT TO: Kennedy/Meierhoff/Prill
Limnology Division
SHL
Des Moines, Ia.

WJ Hausler, Jr., PhD
Director

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WATER QUALITY REPORT

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

Town	Fredericksburg		
Source	E. Wapsipinicon River	East Wapsipinicon River	East Wapsipinicon River
Specific Location	Chickasaw Co.Rd., T94N,R12W, Sec. 16/21	Chickasaw Co.Rd., T94N,R12W, Sec. 34	Bremer Co.Rd. C-18, T93N, R12W, Sec. 11/14
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3765	3766	3767
	FIELD DATA		
Collection Time	1530	1600	1630
pH			
Temperature	Air-11°C, Water 0°C	Air-11°C, Water 0°C	Air-12°C, Water 0°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	4,200	1,900	340
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	560	570	540
MBAS (as LAS)			
pH (units)	7.3	7.25	7.3
Alkalinity: P	none	none	none
T	155	150	147
NITROGEN: Organic N	0.78	0.93	0.43
Ammonia N	0.90	0.87	0.71
Nitrite N			
Nitrate N	4.7	4.3	4.1
Nitrate as NO_3			
RESIDUE: Total	343	332	327
Fixed	292	287	278
Volatile	51	45	49
Filtrable Residue T	342	332	323
F	292	287	277
V	50	45	46
Nonfiltrable Residue T	1	0	4
F	0	0	1
V	1	0	3
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	1.1	0.83	0.70
Total P	1.2	1.0	0.80
Dissolved Oxygen	6.1	4.2	4.1
BOD	6	4	3
COD	18	18	16
Grease or Oil			
Turbidity (JTU)	4.1	3.5	4.2
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	51	46	44
Sulfate (SO_4^{--})			
tal Organic Carbon	13.3	9.6	9.1
REMARKS:	100% ice cover		100% ice cover

COLLECTOR: Kennedy/Meierhoff/Prill
REPORT TO: Limnology Division
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Des Moines, Ia

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WATER QUALITY REPORT

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

Town Source Specific Location	E. Wapsipinicon River Bremer Co. Hwy 93, T93N, R12W, Sec. 23/26	Wapsipinicon River Bremer Co. Hwy 93, T93N,R12W, Sec. 27	Wapsipinicon River BremerCo. Rd. C-33, T92N, R11W, Sec. 18/19
Date Collected Date Received Lab Number	7 February 1978 8 February 1978 3768	7 February 1978 8 February 1978 3769	7 February 1978 8 February 1978 3770
	FIELD DATA		
Collection Time pH Temperature Dissolved Oxygen	1700 Air-12°C, Water 0°C	1730 Air-12°C, Water 0°C	1745 Air-13°C, Water 0°C
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	210	20	40
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos) MBAS (as LAS)	550	450	480
pH (units) Alkalinity: P T	7.2 none 146	7.3 none 162	7.3 none 155
NITROGEN: Organic N Ammonia N Nitrite N Nitrate N	0.38 0.68 2.2	0.11 0.80 2.5	0.50 0.75 2.9
Nitrate as NO_3			
RESIDUE: Total Fixed Volatile	328 284 44	268 224 44	279 237 42
Filtrable Residue T F V	327 284 43	268 224 44	279 237 42
Nonfiltrable Residue T F V	1 0 1	0 0 0	0 0 0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P Total P	0.64 0.75	0.08 0.26	0.12 0.29
Dissolved Oxygen BOD COD	4.0 3 13	6.5 2 13	6.4 2 12
Grease or Oil Turbidity (JTU)	4.4	4.7	6.7
Total Hardness (as $CaCO_3$) Calcium (Ca^{++}) Magnesium (Mg^{++})			
Chloride (Cl^-) Sulfate (SO_4^{--}) Total Organic Carbon	44 10.5	19 5.2	28 10.6
REMARKS:	100% ice cover	100% ice cover	100% ice cover

COLLECTOR / REPORT TO: Kennedy/Meierhoff/Prill
Limnology Division
SHL
Des Moines, Ia.

WJ Hausler, Jr., PhD
Director

MAR 15 1978

WATER QUALITY REPORT
METALS

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
515:281-5371

Town		Fredericksburg	
Source	E. Wapsipinicon River	E. Wapsipinicon River	East Wapsipinicon River
Specific Location	Chickasaw Co. Rd. B33 T96N, R13W, Sec. 23	Chickasaw Co. Rd. T94N, R12W, Sec. 16/21	Bremer Co. Hwy 93, T93N, R12W, Sec. 23/26
Date Collected	7 February 1978	7 February 1978	7 February 1978
Date Received	8 February 1978	8 February 1978	8 February 1978
Lab Number	3753	3764	3768
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	<0.01	<0.01
Barium	<0.1	<0.1	<0.1
Cadmium	<0.01	<0.01	<0.01
Chromium, Total	<0.01	<0.01	<0.01
Chromium, Hexavalent			
Copper	<0.01	<0.01	0.06
Lead	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001
Nickel	<0.1	<0.1	<0.1
Selenium	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01
Zinc	<0.01	<0.01	0.01

REMARKS:

COLLECTOR REPORT TO

Kennedy/Meierhoff/Prill
Limnology Division
SHL
Des Moines, Ia.

Date Reported MAR 15 1978

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