A REPORT FROM

The State Hygienic Laboratory

MEDICAL LABORATORIES BUILDING

THE UNIVERSITY OF IOWA

IOWA CITY, IOWA 52242

Water Quality Survey
of
Muchakinock Creek

#79-6

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

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25 October 1978

ABSTRACT

On August 1, 1978, a water quality survey of Muchakinock Creek was performed by University Hygienic Laboratory personnel. The purpose of the study was to obtain background data on a watershed that has been extensively mined for coal and to assess the impact of the Oskaloosa Waste Water Treatment Plant discharge on the receiving stream. Results indicate the Oskaloosa discharge had minimal affect on Muchakinock Creek at the existing stream flows. General stream water quality was typified by moderately high specific conductance and total residue, low organic nitrogen and carbon levels, low alkalinity and pH. The high soil iron and sulfur content affects ground water quality which may affect stream water quality during periods of ground water recharge to the stream.

INTRODUCTION

Muchakinock Creek, located in Mahaska County, is a creek with a small drainage area (78.8 square miles) which merges with the Des Moines River near Eddyville, Iowa (Figure 1). The creek has a silty-sand bottom and for the most of its reach is narrow and shallow except during periods of heavy surface runoff. The majority of the Muchakinock watershed is agricultural with pasture, hay ground and some row crop production. Because this area was mined extensively for coal in the early 1900's numerous abandoned coal mines and their debris piles are scattered throughout the watershed.

A previous water quality survey (University Hygienic Laboratory Report #78-14) of Muchakinock Creek was conducted during a rainfall runoff event. Results of that survey indicated the surface runoff from the coal mine areas was highly acid. This acid runoff contained increased levels of trace metals and reduced stream pH.

The purpose of this survey was to develop a data base during low flow conditions and to assess the effect of point source discharges on the receiving stream. According to the Iowa Department of Environmental Quality Basin Plan, the only continuous point source waste discharge to Muchakinock Creek is from the Oskaloosa Southwest Wastewater Treatment Plant via Little Muchakinock Creek. Oskaloosa is currently in step 1 of the construction grant program.

Muchakinock Creek is classified a class B fresh warmwater stream from its mouth to near Leighton, Iowa, with the appropriate standards applying to that reach.

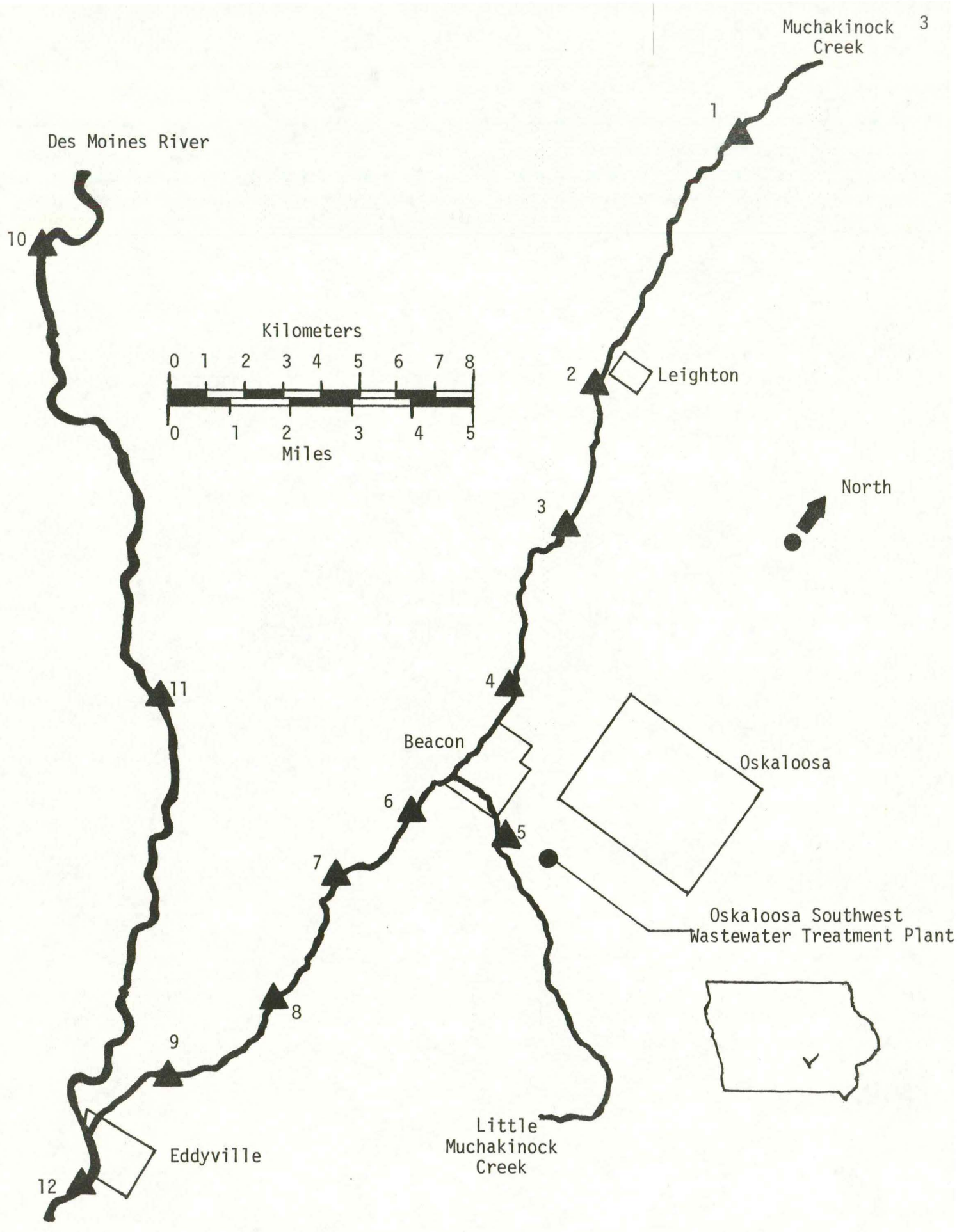

Figure 1. Muchakinock Creek Sampling Locations

TABLE 1

MUCHAKINOCK CREEK SAMPLING STATIONS

1 August 1978

Station	Location
1. Muchakinock Creek	Mahaska County Road Bridge, T76N, R17W, Section 17/20
2. Muchakinock Creek	Mahaska Co. Rd. Bridge, T75N, R17W, Sec. 1/2
3. Muchakinock Creek	Mahaska Co. Rd. Bridge, T75N, R16W, Sec. 7
4. Muchakinock Creek	Mahaska Co. Hwy 92 Bridge, T75N, R16W, Sec. 22
Oskaloosa WWTP	SW plant - final effluent
5. Little Muchakinock Creek	Mahaska Co. Rd. Bridge, T75N, R16W, Sec. 26
6. Muchakinock Creek	Mahaska Co. Rd. Bridge, T75N, R16W, Sec. 34
7. Muchakinock Creek	Mahaska Co. Rd. Bridge, T74N, R16W, Sec. 2
8. Muchakinock Creek	Mahaska Co. Rd. Bridge, T74N, R16W, Sec. 13/24
9. Muchakinock Creek	Mahaska Co. Hwy 137 Bridge, T74N, R16W, Sec.25/30
10. Des Moines River	Mahaska Co. Hwy 92 Bridge, T75N, R17W, Sec. 19
11. Des Moines River	Mahaska Co. Rd. T39 Bridge, T74N, R17W, Sec. 5/6
12. Des Moines River	Wapello Co. Hwy 137 Bridge, T73N, R15W, Sec. 6

On August 1, 1978, University Hygienic Laboratory personnel surveyed Muchakinock Creek. The survey included collection of water samples, stream flow measurements, and a 24 hour dissolved oxygen profile. Sampling locations are listed in Table 1.

Stream flow measurements conducted at station 9 gave a discharge of 16 CFS for August 1. A nearby U.S. Geological Survey gage recorded a mean daily discharge of 15 CFS. For comparative purposes, the runoff survey conducted July 16, 1977 had a mean daily discharge of 93 CFS at the gaging station. For the period of record (gage has only been in operation three years) the mean monthly discharges for July and August are listed below.

	1975	1976	1977	August 1, 1978
July	4.76	17.0	4.65	
August	6.75	3.83	9.57	16.0

As can been seen from the table, stream flow was above average on August 1 as compared to previous years.

RESULTS AND DISCUSSION

This survey was conducted during a non-runoff period and values would be expected to reflect background conditions. In reviewing several chemical parameters a noticeable trend or pattern developed. Data from stream stations 1, 2 and 3 were quite consistent for most of the parameters (Table 2). Station 4 had significant changes in water quality as compared to the first three stations. Specific conductance, filtrable residue (TDS), and chemical oxygen demand increased while pH, alkalinity and dissolved oxygen declined.

TABLE 2

Selected Chemical Data
Muchakinock Creek
1 August 1978

Station	Specific Conductance*	pH	Filtrable Residue	Total Alkalinity	Dissolved Oxygen	TOC	Nitrogen Series Organic	Ammonia	Nitrate
1	660	8.3	486	180	11.4	8	0.60	0.13	17
2	560	8.3	408	169	9.6	8	0.64	0.13	13
3	630	8.2	458	161	10.6	9	0.50	0.11	13
4	820	7.7	616	141	8.2	7	0.39	0.13	12
Oskaloosa WWTP	1100	7.7	798	278	2.1	16	7.0	6.0	9.4
5[1]	940	7.9	702	230	7.9	12	2.4	1.9	5.2
6	920	7.9	694	161	8.4	9	0.64	0.19	8.0
7	930	7.7	718	152	7.1	9	0.59	0.15	7.6
8	1000	7.8	820	156	7.4	8	0.75	0.24	7.6
9	1100	7.65	868	140	7.8	8	0.48	0.21	7.3
10[2]	670	8.25	488	223	8.5	10	0.70	0.10	8.7
11[2]	670	8.2	476	221	8.1	10	0.76	0.08	8.6
12[2]	650	8.2	474	214	8.3	11	0.65	0.06	8.2

*Micromhos

[1]Little Muchakinock Creek

[2]Des Moines River Stations

Station 5, located on Little Muchakinock Creek, reflected water quality affected by a point source discharge, i.e., the Oskaloosa Southwest Wastewater Treatment Plant discharges into Little Muchakinock Creek. Increases in organic nitrogen, ammonia nitrogen, and total organic carbon (TOC) along with a decline in dissolved oxygen were apparent at station 5. The Oskaloosa Southwest Wastewater Treatment Plant effluent had relatively low BOD (5 mg/L), TOC (16 mg/L) and ammonia nitrogen (6.0 mg/L) indicative of above average waste treatment. From stations 6 through 9 the specific conductance and filtrable residue gradually increased while the pH and total alkalinity decreased. Dissolved oxygen was lowest at these three stations. Water chemistry data for the three Des Moines River stations (stations 10, 11 and 12) were all very similar and within expected ranges.

A noticeable change in water quality occurred between stations 3 and 4 and continued downstream. In reviewing the data it appears the change in water quality could be due to acid drainage, i.e., pH declined, dissolved solids and conductance increased (usually associated with acid drainage) and the alkalinity decreased (a buffering response to an increase in acid). No direct discharge was observed during the survey leaving the cause for the variation in water quality speculative. Ground water containing reduced iron and sulfur compounds may be seeping into the stream creating the changes.

A similar, but much more dramatic trend was observed from the runoff study of July, 1977. During that survey water quality at station 4 had a pH of 3.6, specific conductance of 2100 micromhos and 0.0 mg/L alkalinity. The

significant changes in water quality at station 4 as well as the subtle changes in water quality at stations 6 - 9 may be attributed to the soil types and possibly to past mining activities within the watershed.

During the August 1, 1978 survey water samples for trace metals analyses were collected at five stations on Muchakinock Creek and two on the Des Moines River. Barium was the only trace metal detected. The values were not significantly different than those associated with normal background.

During the Muchakinock Creek Survey a twenty-four dissolved oxygen study was conducted at ten stations. The purpose of the study was to observe fluctuations in dissolved oxygen from both natural and point source waste related discharge conditions. Data for the study are summarized in Table 3. Dissolved oxygen values for stations 2 and 3 have similar ranges and mean values that probably best reflect the expected twenty-four hour dissolved oxygen cycle. Station 4 exhibited a significant difference in DO as compared to stations 2 and 3.

There appears to be a significant increase in COD between stations 3 and 4 which may in part be responsible for the decline in dissolved oxygen. As to the source of the increased COD, one can only speculate to an input of oxidizable inorganic substances, most probably reduced sulfur and iron compounds.

Station 5, located downstream from the Oskaloosa SW Wastewater Treatment Plant, had a slightly lower range and mean dissolved oxygen compared to station 4. The lowest range of values and the lowest mean value occurred

TABLE 3

24 HOUR DISSOLVED OXYGEN VALUES (mg/L)

1 and 2 August 1978

Station	TIME 1200	1600	2000	2400	0400	0800	Range of Value, by Stations	Mean
2	10.6	9.6	7.4	7.0	7.1	7.5	7.0 - 10.6	8.2
3	10.6	10.6	7.7	6.7	7.0	7.6	6.7 - 10.6	8.4
4	8.1	8.2	7.4	7.0	6.7	7.0	6.7 - 8.2	7.4
5	8.3	7.9	6.7	6.3	6.2	6.4	6.2 - 8.3	7.0
6	8.3	8.4	6.8	6.8	6.5	6.4	6.4 - 8.4	7.2
7	7.6	7.1	6.5	6.5	6.5	6.3	6.3 - 7.6	6.7
8	7.8	7.4	8.6	7.0	7.0	6.8	7.0 - 8.6	7.4
9	7.9	7.8	7.2	7.1	7.0	7.0	7.0 - 7.9	7.3
11	8.2	8.3	7.7	7.4	7.6	7.9	7.4 - 8.3	7.8
12	8.2	8.1	7.7	7.5	7.4	7.5	7.4 - 8.2	7.7
Range of values by time	7.6-10.6	7.1-10.6	6.5-7.7	6.3-7.5	6.2-7.6	6.3-7.9		
Mean*	8.6	8.4	7.3	6.8	6.7	6.9		

*Calculated using only the eight Muchakinock Stations

at station 7. The DO sag occurring at station 7 was probably due to the combination of the effect of lower water quality from station 4 and the inability of Little Muchakinock Creek to assimilate the load. The two Des Moines River station values were quite consistent with less than 1 mg/L fluctuation in a twenty-four hour period. As has been demonstrated in previous reports (University Hygienic Laboratory Reports #78-15 and 78-24), the lowest dissolved oxygen values were observed in the early morning and the highest occurred during mid-afternoon.

SUMMARY AND CONCLUSIONS

Results of a water quality survey of Muchakinock Creek conducted August 1, 1978, indicate the Oskaloosa Southwest Wastewater Treatment Plant discharge had minimal impact on stream quality at the existing stream flows. A change in water quality was observed at station 4 and may have been caused by groundwater recharge into Muchakinock Creek containing sulfur and iron compounds in a reduced state. A previous survey conducted during a rainfall runoff event demonstrated a similar pattern at station 4 though to a greater extent. In general, overall stream quality was good with no violations of the Iowa Water Quality Standards.

Jack O. Kennedy

Jack O Kennedy
Limnologist

APPENDIX

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town	Muchakinock Creek	Leighton	Muchakinock Creek
Source	Mahaska Co. Rd. Bridge	Muchakinock Creek	Mahaska Co. Rd. Bridge
Specific Location	T76N, R17W, Sec. 17 and 20	Mahaska Co. Rd. Bridge T75N, R17W Sec. 2/1	T75N, R16W Sec. 7
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	839	840	841
	FIELD DATA		
Collection Time	1640	1655	1710
pH			
Temperature	28°C	25°C	27°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	5,200	8,600	2000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	660	560	630
MBAS (as LAS)			
pH (units)	8.3	8.3	8.2
Alkalinity: P	none	none	none
T	190	169	161
NITROGEN: Organic N	0.60	0.64	0.50
Ammonia N	0.13	0.13	0.11
Nitrite N			
Nitrate N	17	73	13
Nitrate as NO_3			
RESIDUE: Total	508	426	478
Fixed	272	254	308
Volatile	236	172	170
Filtrable Residue T	486	408	458
F	256	246	294
V	226	162	164
Nonfiltrable Residue T	22	18	20
F	16	10	14
V	6	8	6
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.18	0.13	0.12
Total P	0.19	0.18	0.13
Dissolved Oxygen	11.4	9.6	10.6
BOD	2	2	1
COD	15	20	12
Grease or Oil			
Turbidity (JTU)	4.6	5.3	6.7
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	28	23	23
Sulfate (SO_4^{--})			
:al organic carbon	8	8	9
orophyll a	5 µg/l	5 µg/l	6 µg/l

REMARKS:

COLLECTOR REPORT TO: Limnology Division, Hygienic Lab, Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
DIRECTOR

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town	Muchakinock Creek	Beacon	Muchakinock Creek
Source	Mahaska Hwy 92 Bridge	Little Muchakinock Cr.	Mahaska Co. Rd. Bridge
Specific Location	T75N, R16W, Sec. 22	Mahaska Co. Rd. Bridge T75N, R16W, Sec. 26	T75N, R16W, Sec. 34
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	842	843	844
FIELD DATA			
Collection Time	1750	1800	1810
pH			
Temperature	25°C	24°C	24°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	2,100	320	1200
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	820	940	920
MBAS (as LAS)			
pH (units)	7.7	7.9	7.9
Alkalinity: P	none	none	none
T	141	230	161
NITROGEN: Organic N	0.39	2.4	0.64
Ammonia N	0.13	1.9	0.19
Nitrite N			
Nitrate N	12	5.2	8.0
Nitrate as NO_3			
RESIDUE: Total	650	734	722
Fixed	472	530	566
Volatile	178	204	156
Filtrable Residue T	616	702	694
F	444	504	548
V	172	198	146
Nonfiltrable Residue T	34	32	28
F	28	26	18
V	6	6	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.03	3.5	0.48
Total P	0.05	3.6	0.53
Dissolved Oxygen	8.2	7.9	8.4
BOD	2	4	2
COD	38	29	24
Grease or Oil			
Turbidity (JTU)	14	13	11
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	20	57	26
Sulfate (SO_4^{--})			
tal organic carbon	7	12	9
lorophyll a	3 µg/l	8 µg/l	7 µg/l

REMARKS:

COLLECTOR REPORT TO: Limnology Division, Hygienic Lab, Des Moines Branch

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DIRECTOR

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town	Muchakinock Creek	Muchakinock Creek.	Muchakinock Creek
Source	Mahaska Co. Rd. Bridge	Mahaska Co. Rd. Bridge	Mahaska Co. Hwy 137 Bridge
Specific Location	T74N, R16W, Sec. 2	T74N, R16W, Sec. 13/24	T74N, R16W, Sec. 25/30
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	845	846	847
FIELD DATA			
Collection Time	1825	1840	1850
pH			
Temperature	23° C	23°C	23°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	1000	440	630
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	930	1000	1100
MBAS (as LAS)			
pH (units)	7.7	7.8	7.65
Alkalinity: P	none	none	none
T	152	156	140
NITROGEN: Organic N	0.59	0.75	0.48
Ammonia N	0.15	0.24	0.21
Nitrite N			
Nitrate N	7.6	7.6	7.3
Nitrate as NO_3			
RESIDUE: Total	762	842	902
Fixed	568	652	698
Volatile	194	190	204
Filtrable Residue T	718	820	868
F	534	638	674
V	184	182	194
Nonfiltrable Residue T	44	22	34
F	34	14	24
V	10	8	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.35	0.12	0.06
Total P	0.40	0.16	0.09
Dissolved Oxygen	7.1	7.4	7.8
BOD	2	2	2
COD	17	17	21
Grease or Oil			
Turbidity (JTU)	17	10	18
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	26	23	22
Sulfate (SO_4^{--})			
tal organic carbon	9	8	8
lorophyll a	2 µg/l	<1 µg/l	4 µg/l

REMARKS:

COLLECTOR REPORT TO: Limnology Division, Hygienic Lab, Des Moines Branch

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DIRECTOR

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town	Tracy	Des Moines River	Eddyville
Source	Des Moines River	Mahaska Co. Rd. T39	Des Moines River
Specific Location	Mahaska Co. (old) Hwy 92 Bridge T75N, R17W, Sec. 19	bridge T73N, R15W, Sec. 615	Wapello Co. Hwy 137 Bridge T73N, R15W, Sec. 6
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	848	849	850
FIELD DATA			
Collection Time	1615	1945	1910
pH			
Temperature	26°C	26°C	25°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	20	10	60
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	670	670	650
MBAS (as LAS)			
pH (units)	8.25	8.2	8.2
Alkalinity: P	none	none	none
T	223	221	214
NITROGEN: Organic N	0.70	0.76	0.65
Ammonia N	0.10	0.08	0.06
Nitrite N			
Nitrate N	8.7	8.6	8.2
Nitrate as NO_3			
RESIDUE: Total	528	522	536
Fixed	332	320	320
Volatile	196	202	216
Filtrable Residue T	488	476	474
F	304	284	270
V	184	192	204
Nonfiltrable Residue T	40	46	62
F	28	36	50
V	12	10	12
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.22	0.20	0.20
Total P	0.24	0.25	0.24
Dissolved Oxygen		8.1	8.3
BOD	2	2	2
COD	20	28	21
Grease or Oil			
Turbidity (JTU)	24	26	28
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	24	25	24
Sulfate (SO_4^-)			
otal organic carbon	10	10	11
lorophyll a	7 µg/l	8 µg/l	9 µg/l

REMARKS:

COLLECTOR REPORT TO: Limnology Division
Hygienic Lab
Des Moines Branch

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town	Oskaloosa		
Source	WWTP(SW Plant)		
Specific Location	final effluent		
Date Collected	8/2/78		
Date Received	8/2/78		
Lab Number	851		
		FIELD DATA	
Collection Time	1140		
pH			
Temperature	22°C		
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	53,000		
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	1100		
MBAS (as LAS)			
pH (units)	7.7		
Alkalinity: P	none		
T	278		
NITROGEN: Organic N	7.0		
Ammonia N	6.0		
Nitrite N			
Nitrate N	9.4		
Nitrate as NO_3			
RESIDUE: Total	810		
Fixed	582		
Volatile	228		
Filtrable Residue T	798		
F	582		
V	216		
Nonfiltrable Residue T	12		
F	0		
V	12		
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	6.6		
Total P	6.7		
Dissolved Oxygen	2.1		
BOD	5		
COD	38		
Grease or Oil			
Turbidity (JTU)	1.7		
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	77		
Sulfate (SO_4^{--})			
tal organic carbon	16		

REMARKS:

COLLECTOR REPORT TO: Limnology Division, Hygienic Lab, Des Moines Branch

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

WATER QUALITY REPORT
METALS

Town	Muchakinock Creek	Muchakinock Creek	Beacon
Source	Mahaska Co. Rd. Bridge	Mahaska Hwy 92 Bridge	Little Muchakinock Creek
Specific Location	T76N, R17W, Sec. 17/20	T75N, R16W, Sec. 22	Mahaska Co.Rd. Bridge T75N, R16W, Sec. 26
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	839	842	843
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	<0.01	<0.01
Barium	0.2	0.2	0.1
Cadmium	<0.01	<0.01	<0.01
Chromium, Total	<0.01	<0.01	<0.01
Chromium, Hexavalent			
Copper	<0.01	<0.01	<0.01
Lead	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001
Nickel	<0.1	<0.1	<0.01
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

Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported SEP 26 1978

W.J. Hausler Jr., Ph.D.
Director

WATER QUALITY REPORT
METALS

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

Town	Muchakinock Creek	Muchakinock Creek	Tracy
Source	Mahaska Co. Rd. Bridge	Mahaska Co. Hwy 137	Des Moines River
Specific Location	T74N, R16W Sec. 2	Bridge T74N, R16W, Sec. 25/30	Mahaska Co. (old) Hwy 92 Bridge, T75N, R17W Sec. 19
Date Collected	8/1/78	8/1/78	8/1/78
Date Received	8/2/78	8/2/78	8/2/78
Lab Number	845	847	848
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	<0.01	0.01
Barium	0.1	0.2	0.2
Cadmium	<0.01	<0.01	<0.01
Chromium, Total	<0.01	<0.01	<0.01
Chromium, Hexavalent			
Copper	<0.01	<0.01	<0.01
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:

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Des Moines Branch

Date Reported SEP 26 1978

W.J. Hausler Jr., Ph.D.
Director

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

WATER QUALITY REPORT
METALS

Town	Eddyville	Oskaloosa	
Source	Des Moines River	WWTP (SW Plant)	
Specific Location	Wapello Co. Hwy 137 Br. T73N, R15W, Sec. 6	final effluent	
Date Collected	8/1/78	8/2/78	
Date Received	8/2/78	8/2/78	
Lab Number	850	851	
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	0.01	<0.01	
Barium	0.2	<0.1	
Cadmium	<0.01	<0.01	
Chromium, Total	<0.01	<0.01	
Chromium, Hexavalent			
Copper	<0.01	<0.01	
Lead	<0.01	<0.01	
Mercury	<0.001	<0.01	
Nickel	<0.1	0.2	
Selenium	<0.01	<0.01	
Silver	<0.01	<0.01	
Zinc	<0.01	<0.01	

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

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