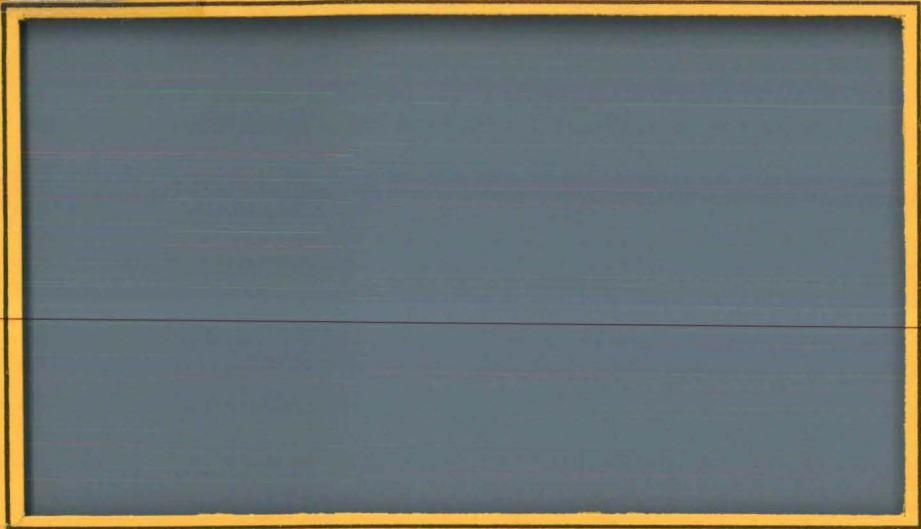


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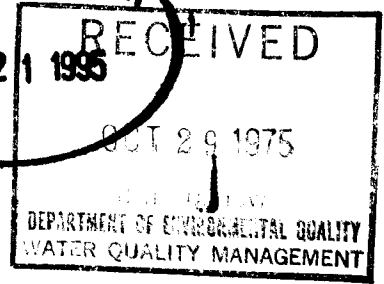
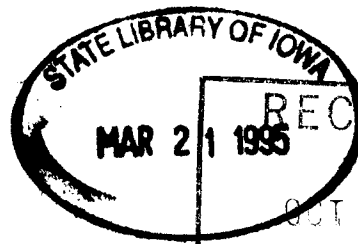
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Water Quality Survey
of
Beaver Creek
#76 - 7

Submitted to the Department of Environmental Quality
and the Iowa Water Quality Commission by the State
Hygienic Laboratory on October 22, 1975

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INTRODUCTION

The Beaver Creek (Fig.1) watershed covers an area of 391 square miles and is located in Butler, Grundy, Franklin, Hardin and Blackhawk counties. Beaver Creek is a tributary to and joins the Cedar River just above Cedar Falls, Iowa. The stream is a typical small, low-flow creek with a sandy, pebble-type bottom draining primarily a rural environment. Several small towns, Ackley - pop.1,794, Wellsburg - pop. 754, Aplington - pop. 936, Parkersburg - pop.1,631 and New Hartford - pop.690, have wastewater treatment plants that discharge into Beaver Creek, or one of its small tributaries.

Beaver Creek and its tributaries are classified from the mouth to County Road T-25 (Fig.1) as Class A fresh warm water streams.

Provisional flow data obtained from the U.S.Geological Survey for the sampling dates indicated a flow at the New Hartford Gauging Station of 29 CFS. The seven day ten year low flow for that gauging station is 3.9 CFS. Samples from Beaver Creek for water quality were collected September 22 and 23 in conjunction with surveys of three wastewater treatment plants (Ackley, Aplington and Wellsburg) by the Department of Environmental Quality staff.

RESULTS AND DISCUSSION

Water samples were analyzed for general water chemistry and bacteriological parameters. Ranges of a few of these parameters are listed below; a complete list of all data is attached to this report.

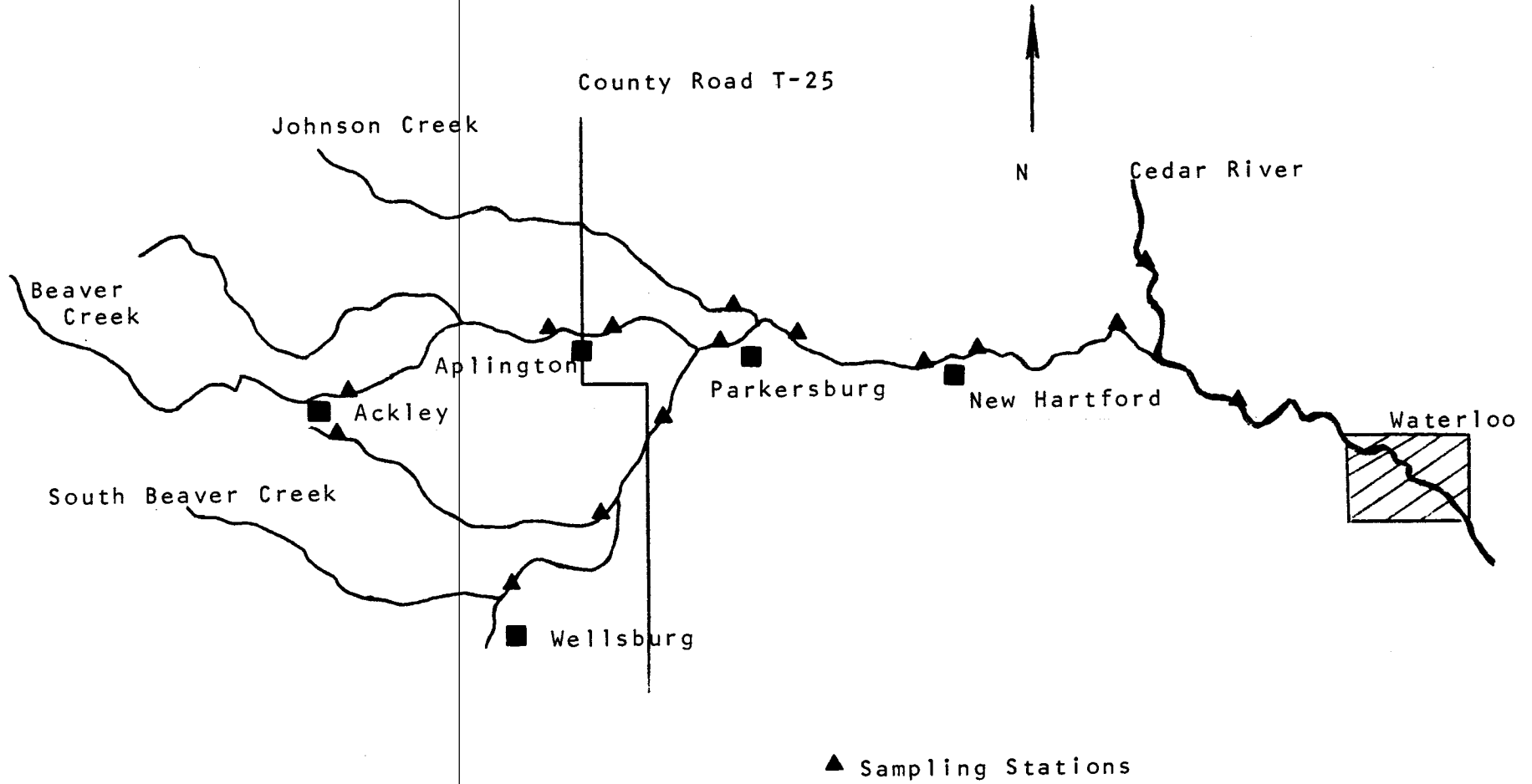


Fig. 1 Map of Beaver Creek showing Sampling Locations

TABLE 1
 SAMPLING LOCATIONS-BEAVER CREEK SURVEY

Station 1 - County Road Bridge	T-90N	R-14W	Sec 31
Station 2 - County Road Bridge	T-89N	R-18W	Sec 7
Station 3 - County Road Bridge	T-88N	R-18W	Sec 3 and 4
Station 4 - County Road Bridge	T-89N	R-17W	Sec 28 and 29
Station 5 - County Road Bridge	T-89N	R-17W	Sec 15 and 22
Station 6 - County Road Bridge	T-90N	R-17W	Sec 20
Station 7 - County Road Bridge	T-90N	R-17W	Sec 21 and 22
Station 8 - County Road Bridge	T-90N	R-16W	Sec 18 and 19
Station 9 - County Road Bridge	T-90N	R-17W	Sec 25
Station10 - County Road Bridge	T-90N	R-16W	Sec 27 and 28
Station11 - County Road Bridge	T90N	R-15W	Sec 29 and 30
Station12 - County Road Bridge	T-90N	R-15W	Sec 36
Station13 - County Road Bridge	T-90N	R-14W	Sec 30
Station14 - Cedar River County Road Bridge	T-90N	R-14W	Sec 16
Station15 - Cedar River Hwy 218 Bridge at Cedar Falls			

BEAVER CREEK*

Fecal Coliform/100ml	10	1200
Specific Conductance	394	622
pH	8.1	8.6
Total Solids	299	454mg/l
Total Phosphate	0.05	0.33mg/l
BOD	1	3mg/l
Chloride	16	39mg/l
D.O.	11.4	16.1mg/l
D.O. Saturation	110	170%

*not including the sample below Ackley

Basically the chemical and bacteriological data indicate good water quality. The dissolved oxygen concentrations were high and saturation was greater than 100% for the entire stream. Other chemical parameters were within expected ranges at most of the sampling stations.

The sample collected downstream of the Ackley wastewater treatment plant is one of the two exceptions to the expected ranges. Values for fecal coliform (69,000 organisms/100ml) specific conductance (1290 micromhos) total solids (897mg/l), total phosphate (5.5mg/l), BOD (7mg/l) and chloride (120mg/l) were all elevated compared to the other samples. These increases are usually related to an organic waste discharge which undoubtedly comes from the Ackley wastewater treatment plant. Ackley does not discharge directly to Beaver Creek but to a much smaller tributary, the middle fork of South Beaver Creek (Fig.1).

By the time the stream reaches the classified area, dilution Chemical and biological breakdown has reduced the values to acceptable levels.

Except for Johnson Creek, a small tributary, the nitrogen series was low and within the expected ranges. Below is a table comparing nitrogen values between Beaver Creek and Johnson Creek.

	BEAVER CREEK	JOHNSON CREEK
Organic N	0.32 - 1.5	1.1
Ammonia N	0.01 - 0.12	1.1
Nitrite N	0.019 - 0.15	0.98
Nitrate N	0.5 - 4.1	15

The nitrogen series is the only parameter elevated in the Johnson Creek sample. Other parameters give no indication of an organic or industrial waste. The high nitrite and nitrate indicate that quite possibly the original compound was mostly ammonia and has been biologically oxidized to the more stable forms. From all indications it appears ammonia has been discharged into Johnson Creek.

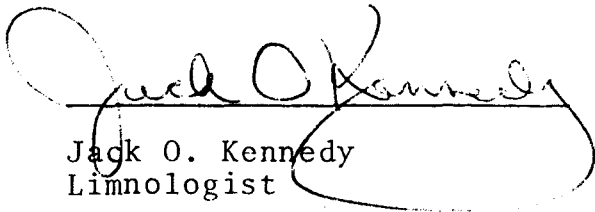
In an effort to determine if oxygen depletion was occurring in Beaver Creek during the night, dissolved oxygen samples were collected at approximately sunrise on September 23, 1975. These samples showed a decrease from daytime highs but were still high enough (9.5 - 9.7mg/l) to provide adequate dissolved oxygen for the aquatic life.

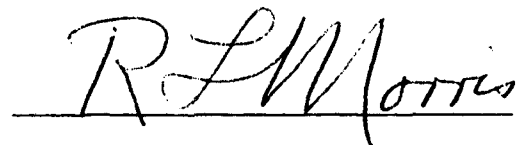
Samples for stream metals were also collected and analyzed. No reportable values were obtained for any of the eight metals.

CONCLUSIONS AND RECOMMENDATIONS

The chemical and bacteriological data indicate excellent water quality in Beaver Creek under the flow and weather conditions experienced during sampling. Deterioration in water quality was noted immediately downstream of Ackley's wastewater treatment plant and of Johnson Creek. Ackley's problem is not severe and is to be expected when discharging into a small stream.

It is recommended that additional sampling of Johnson Creek be performed to determine if the high ammonia encountered is the exception rather than the rule and to identify the source if possible.


Jack O. Kennedy
Limnologist


R.L. Morris, PhD
Associate Director and
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	Ackley	Ackley	Wellsburg
Source	Beaver Creek	Middle fork Beaver	South Beaver Creek
Specific Location	Co. Rd. Bridge T90N R 14 W Sec 31	Creek Co. Rd. Bridge T89N R18W Sec 7	Co. Rd. Bridge T88N R18W Sec 3 & 4
Date Collected	23 Sept. 1975	22 Sept. 1975	22 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1193	1194	1195
Collection Time	11:20 AM	FIELD DATA 11:30	12:00
pH			
Temperature	14.0C	15 ^o C	16.5 ^o C
Dissolved Oxygen			
Fecal Coliform/100 ml	540	BACTERIOLOGICAL EXAMINATION	
		69,000	1200
Conductance (micromhos)	609	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
MBAS (as LAS)		1290	504
pH (units)	8.1	7.7	8.5
Alkalinity: P	none	none	4.0
T	238	278	197
NITROGEN: Organic N	0.60	1.5	0.66
Ammonia N	0.06	0.05	0.01
Nitrite N	0.048	0.044	0.042
Nitrate N	4.1	1.3	2.8
Nitrate as NO ₃			
RESIDUE: Total	399	897	374
Fixed	226	655	213
Volatile	173	242	161
Filtrable Residue T	399	864	374
F	226	631	213
V	173	233	161
Nonfiltrable Residue T	0	33	0
F	0	24	0
V	0	9	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.04	5.2	0.21
Total P	0.09	5.5	0.33
Dissolved Oxygen	16.1	9.3	16.0
BOD	3	7	3
COD	14	52	20
Grease or Oil			
Turbidity (JTU)	10	33	26
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	30	120	16
Sulfate (SO ₄ ⁻)			

REMARKS:

COLLECTOR
REPORT TO

Kennedy & Cramer
Limnology
State Hygienic Laboratory
Des Moines, Ia.

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

OCT 8 1975

mk

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	Middle Fork Beaver Creek County Road Bridge T89N R17W Sec 28&29	South Beaver Creek County Road Bridge D 17 T89N R17W Sec 15 & 22	Aplington Beaver Creek County Road Bridge T-25 T90N R17W Sec 20
Date Collected	22 Sept. 1975	22 Sept. 1975	22 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1196	1197	1198
Collection Time	12:15	FIELD DATA 12:30	2:35
pH			
Temperature	16.5 ⁰ C	10 ⁰ C	15 ⁰ C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	720	640	140
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	622	549	561
MBAS (as LAS)			
pH (units)	8.35	8.1	8.3
Alkalinity: P	2.0	none	none
T	184	199	229
NITROGEN: Organic N	0.35	0.52	0.49
Ammonia N	0.01	0.01	0.01
Nitrite N	0.038	0.031	0.022
Nitrate N	2.6	2.3	2.1
Nitrate as NO ₃			
RESIDUE: Total	454	366	378
Fixed	290	225	251
Volatile	164	141	127
Filtrable Residue T	433	366	378
F	269	225	251
V	164	141	127
Nonfiltrable Residue T	21	0	0
F	21	0	0
V	0	0	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.03	0.05	0.03
Total P	0.11	0.09	0.08
Dissolved Oxygen	12.4	11.8	12.9
BOD	2	2	2
COD	22	16	16
Grease or Oil			
Turbidity (JTU)	28	18	18
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	39	21	18
Sulfate (SO ₄ ⁻)			

REMARKS:

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REPORT TO Limnology Division
State Hygienic Laboratory
Des Moines, Ia.

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

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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	Aplington	Parkersburg	Parkersburg
Source	Beaver Creek	Johnson Creek	South Beaver Creek
Specific Location	County Road Bridge T90N R17W Sec21&22	County Road Bridge T90N R16W Sec 18 and 19	Hwy 20 Bridge T90N R17W Sec 25
Date Collected	22 Sept. 1975	22 Sept. 1975	22 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1199	1200	1201
Collection Time	2:45	FIELD DATA 3:00	3:30
pH			
Temperature	15°C	19.0°C	17.0°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	550	230	170
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	572	424	506
MBAS (as LAS)			
pH (units)	8.3	8.55	8.4
Alkalinity: P	none	5.0	2.0
T	233	167	193
NITROGEN: Organic N	0.88	1.1	0.84
Ammonia N	0.05	1.1	0.12
Nitrite N	0.14	0.98	0.15
Nitrate N	3.7	15	2.0
Nitrate as NO ₃			
RESIDUE: Total	378	299	327
Fixed	189	193	217
Volatile	189	106	110
Filtrable Residue T	352	299	327
F	178	193	217
V	174	106	110
Nonfiltrable Residue T	26	0	0
F	11	0	0
V	15	0	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.08	0.04	0.04
Total P	0.11	0.07	0.05
Dissolved Oxygen	12.3	15.3	15.6
BOD	2	2	2
			16
COD	16	16	
Grease or Oil			
Turbidity (JTU)	18	7	7
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	19	12	18
Sulfate (SO ₄ ⁻)			

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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	Sinclair	New Hartford	New Hartford
Source	Beaver Creek	Beaver Creek	Beaver Creek
Specific Location	County Road Bridge T90N R16W Sec 27 and 28	County Road Bridge T90N R15W Sec 29 and 30	County Road T90N R15W Sec 36
Date Collected	22 Sept. 1975	22 Sept. 1975	22 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1202	1203	1204
Collection Time	4:00	FIELD DATA 4:35	4:50
pH			
Temperature	15.0°C	14.0°C	15.0°C
Dissolved Oxygen			
Fecal Coliform/100 ml	110	BACTERIOLOGICAL EXAMINATION	
		130	10
Conductance (micromhos)	529	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
MBAS (as LAS)		531	504
pH (units)	8.25	8.25	8.3
Alkalinity: P	None	none	none
T	212	206	206
NITROGEN: Organic N	0.74	0.52	0.56
Ammonia N	0.02	<0.01	<0.01
Nitrite N	0.11	0.065	0.019
Nitrate N	2.3	2.3	1.1
Nitrate as NO ₃			
RESIDUE: Total	333	335	300
Fixed	225	216	184
Volatile	108	119	116
Filtrable Residue T	333	329	286
F	225	210	170
V	108	119	116
Nonfiltrable Residue T	0	6	14
F	0	6	14
V	0	0	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.05	0.05	0.05
Total P	0.09	0.08	0.06
Dissolved Oxygen	11.8	11.4	12.3
BOD	2	2	1
COD	14	12	12
Grease or Oil			
Turbidity (JTU)	8	7	4
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	18	18	16
Sulfate (SO ₄ ⁻)			
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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		Janesville	Cedar Falls
Source		Cedar River	Cedar River
Specific Location	Beaver Creek County Road Bridge T90N R14W Sec 30	County Road Bridge C-57 T90N R14W Sec 16	Hwy 218 Bridge in Cedar Falls
Date Collected	22 Sept. 1975	22 Sept. 1975	22 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1205	1206	1207
Collection Time	5:00	5:30	6:00
pH		FIELD DATA	
Temperature	16.0°C	15.0°C	13.0°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	70	70	270
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	492	394	437
MBAS (as LAS)			
pH (units)	8.3	8.6	8.45
Alkalinity: P	none	3.0	3.0
T	201	142	165
NITROGEN: Organic N	0.32	2.1	1.9
Ammonia N	<0.01	<0.01	<0.01
Nitrite N	0.020	0.018	0.036
Nitrate N	0.7	0.5	3.5
Nitrate as NO ₃			
RESIDUE: Total	287	273	296
Fixed	173	145	188
Volatile	114	128	108
Filtrable Residue T	287	267	284
F	173	139	176
V	114	128	108
Nonfiltrable Residue T	0	6	12
F	0	6	12
V	0	0	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.05	0.02	0.02
Total P	0.06	0.16	0.18
Dissolved Oxygen	12.2	19.3	17.7
BOD	1	13	10
COD	10	46	36
Grease or Oil			
Turbidity (JTU)	4	23	22
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	15	15	17
Sulfate (SO ₄ ⁻)			

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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	Aplington	Sinclair	New Hartford
Source	Beaver Creek	Beaver Creek	Beaver Creek
Specific Location	County Road Bridge T90N R17W Sec 21 and 22	County Road Bridge T90N R15W Sec 29 and 30	County Road Bridge T90N R15W Sec 29&30
Date Collected	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Date Received	23 Sept. 1975	23 Sept. 1975	23 Sept. 1975
Lab Number	1208	1209	1210
Collection Time	6:30	FIELD DATA 6:50 A.M.	7:00 am
pH			
Temperature	10°C	10.0°C	10.0°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml			
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)			
MBAS (as LAS)			
pH (units)			
Alkalinity: P			
T			
NITROGEN: Organic N			
Ammonia N			
Nitrite N			
Nitrate N			
Nitrate as NO ₃			
RESIDUE: Total			
Fixed			
Volatile			
Filtrable Residue T			
F			
V			
Nonfiltrable Residue T			
F			
V			
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P			
Total P			
Dissolved Oxygen	9.5	9.7	9.5
BOD			
COD			
Grease or Oil			
Turbidity (JTU)			
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)			
Sulfate (SO ₄ ⁻)			

REMARKS:

COLLECTOR Cramer
REPORT TO Limnology Division
State Hygienic Laboratory
Des Moines, Ia.

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

OCT 8 1975 mk

METALS ANALYSIS

TOWN:
SOURCE:
SPECIFIC LOCATION:

Ackley
Beaver Creek
Co. Rd. bridge T90N
R14W, Sec. 31

Beaver Creek
Co. Rd. bridge T90N
R14W, Sec. 30

DATE COLLECTED:
DATE RECEIVED:
COLLECTED BY:
REPORT TO:

23 September 1975
23 September 1975
Kennedy & Cramer
Limnology Division
State Hygienic Laboratory
Des Moines, Iowa

22 September 1975
23 September 1975

LAB NUMBER

1193

1205

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ARSENIC
BARIUM
CADMIUM
CHROMIUM, TOTAL
CHROMIUM, HEXAVALENT
COPPER
IRON
LEAD
MAGNESIUM
MANGANESE
MERCURY
NICKEL
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