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WASTE LOAD ALLOCATION STUDY

POINT SOURCE WASTEWATER DISCHARGES

PART III

POINT SOURCE WASTEWATER DISCHARGES

General

Point source wastewater discharges consist of effluents from municiptal, industrial, and semi-public wastewater treatment facilities. Wastewater discharges identified in the Iowa Department of Environmental Quality (IDEQ) files, discharging to the surface waters of the Upper Des Moines River Basin have been inventoried and are compiled in the attached tables. Tabulations include location and identification of dischargers, quantity and quality of wastewater discharged, and operational data and descriptions of treatment facilities.

Owners and locations of individual wastewater discharges are listed in Table III-1. An identification system has been established with municipal wastewater discharge reference numbers preceded by "M", industrial discharges by "I", and semi-public discharges by "S". Stream mile locations are identified for each discharge with reference to mile zero at the mouth of each major stream or tributary. Minor tributaries are indicated in parentheses along with the stream mile of the confluence with the major tributary.

Table III-2 identifies characteristics of each point source wastewater discharge. Beginning with the upstream end of the West Fork Des Moines River, discharges are listed in order proceeding downstream to the confluence with East Fork Des Moines River. The tabulation then picks up at the upstream end of the East Fork Des Moines River and continues downstream. For each tributary, the point source furthest upstream is identified and the tabulation continues downstream to the main channel. The location of each point source is shown on Figure III-1.

Available wastewater quantity and quality information is tabulated in Table III-2. Flow rate, BOD_5, suspended solids, ammonia nitrogen, total phosphorus, total dissolved solids, temperature, and other miscella-

Municipal

Municipal sewage flow and quality data for 37 municipalities were extracted from IDEQ records and files. Average sewage flow values contained in reports submitted by treatment plant operators have been extracted by IDEQ and were published in "Wastewater Treatment Plant Flow Data - 1970, 1971, and 1972." Flow values shown in Table III-2 are the averages obtained for the last full year of record; in most instances 1972.

Most quality data was collected from IDEQ's "Effluent Quality Analysis Program (EQAP)." This data was supplemented by review of reports supplied by treatment facility operators. Data reported through EQAP are results of tests conducted by the Iowa State Hygienic Laboratory (ISHL) on wastewater samples supplied by the individual dischargers. In most instances, no more than 4 BOD_5 values, 2 ammonia nitrogen values, and 2 total phosphorus values are reported each year. Because of large seasonal variations in BOD_5 and ammonia nitrogen removal, both summer and winter values have been tabulated for these two constituents.

BOD_5 analysis results from the ISHL (reported in EQAP) are reported between 25 mg/l and 150 mg/l. For some communities, a large percentage of the values reported are 25 or "25-" mg/l. Since some of these values should probably be less than 25 mg/l, lower average summer BOD_5 values would result. The adequacy of this reporting procedure should be reviewed since some dischargers are, or soon will be, required to provide BOD_5 removals to less than 25 mg/l. In some instances, due to the sparsity and scatter of the data, engineering judgment was applied to arrive at representative values rather than taking strict averages of the available data.

Industrial

Information for 25 industries discharging wastewater to streams within the study area was obtained. U. S. Corps of Engineers discharge permit

Although these sources provide the best available discharge information, caution must be exercised in data interpretation. Information tabulated in Table III-2 has been submitted by the individual industries with very little verification. Also, some U. S. Corps of Engineers permit applications are not administratively complete.

Semi-Public

Information identifying semi-public treatment facilities was obtained from IDEQ files. Only eight semi-public facilities could be identified in the study area. Description of semi-public facility discharges is difficult due to the minimal surveillance provided. Quantity and quality relationships are practically non-existent and in most cases, design information is all that is available. Therefore, values in Table III-2 are based upon design characteristics and may not reflect actual operating conditions.

Existing Wastewater Treatment Facilities

Inventory information for existing wastewater treatment facilities from IDEQ files and records is compiled in Table III-3. The order of presentation in Table III-3 is identical to that utilized in Table III-2. Facilities are listed beginning with upstream reaches and continuing downstream.

Table III-3 contains existing design average day capacity, present average day flow, BOD_5 and suspended solids influent and effluent values, type of treatment processes, and comments. Influent values are only available for the larger treatment facilities. Specific processes identify primary treatment, secondary treatment, and solids dewatering operations. The treatment abbreviations are those presently used by IDEQ; a list is included at the end of the table. The "Comments" column includes information obtained by IDEQ personnel on existing operation, age of existing facilities, specific IDEQ permit requirements, IDEQ orders for additional treatment, and delineation of proposed facilities.

A total of 37 municipal, 6 industrial, and 8 semi-public treatment facilities have been identified in the study area. In addition, 8 small communities presently without municipal collection or treatment systems are included in Table III-3. These communities are in various stages of development of municipal treatment facilities.

Summary

Distribution of hydraulic and organic loads upon the streams in the Upper Des Moines River Basin from the three point wastewater discharge classifications is summarized in Table III-4.

TABLE III-4

POINT SOURCE

WASTEWATER DISCHARGE SUMMARY

	Municipal	Industrial	Semi-Public
Flow, mgd	13.575	12.128	0.359
%	52	47	1
BOD_5, lb/day	5,130	939	74
%	84	15	1
Ammonia-N, lb/day	908	788	10
%	53	46	1
Phosphorus-P, lb/day	2,494	197	45
%	91	7	2

The relatively low percentage of BOD_5 discharged by industries compared to flow is due to the following:

1. Several quarries discharge large volumes of water, but add little BOD_5 to the stream.
2. Several industrial discharges consist only of cooling water; therefore, negligable amounts of BOD_5 are discharged.

Table III-5 summarizes the classifications of municipal treatment facilities and populations served. The smaller communities are typically served by waste stabilization pond systems, while most larger cities

TABLE III-5

WASTEWATER TREATMENT FACILITIES

PROCESS SUMMARY

Type of Plant	Communities Served	Population Served
Trickling Filter	17	93,267
Waste Stabilization Pond	18	10,944
Imhoff Tank	1	1,103
Extended Aeration	1	710

None of the communities in the study area presently operate advanced waste treatment facilities. However, IDEQ is currently reviewing plans for two new high-level treatment facilities. The city of Estherville has submitted plans for polishing ponds and dual media filters following secondary activated sludge treatment. The city of Emmetsburg has also prepared preliminary plans for a treatment facility capable of reducing BOD_5 to 10 mg/l and ammonia nitrogen to 2 mg/l.

TABLE III-1

POINT SOURCE

WASTEWATER DISCHARGE POINTS

Discharger	Reference Number	Stream* Mile	Discharge To	Page Reference Quantity	Page Reference Treatment
Municipal					
Algona	M-1	42	East Fork Des Moines River	III-12	III-21
Armstrong	M-2	90	East Fork Des Moines River	III-11	III-21
Badger	M-3	320	Des Moines River (Badger Creek)	III-13	III-22
Bancroft	M-4	64	East Fork Des Moines River (Mud Creek)	III-11	III-21
Bode	M-5		Trulner Creek	III-12	III-21
Boone	M-6	246	Des Moines River (Honey Creek)	III-19	III-25
Boxholme	M-7				III-25
Britt	M-8		East Branch Boone River	III-17	III-23
Burt	M-9	61	East Fork Des Moines River	III-12	III-21
Clare	M-10				III-22
Clarion	M-11		Eagle Creek	III-18	III-24
Corwith	M-12	89	Boone River	III-17	III-23
Dakota City	M-13	5	East Fork Des Moines River	III-12	III-21
Dayton	M-14	274	Des Moines River (Skillet Creek)	III-19	III-24
Duncombe	M-15		Brushy Creek	III-17	III-23
Eagle Grove	M-16	47	Boone River (Drainage Ditch 94)	III-18	III-23
Emmetsburg	M-17	48	West Fork Des Moines River	III-10	III-20
Estherville	M-18	79	West Fork Des Moines River	III-10	III-20
Fort Dodge	M-19	311	Des Moines River	III-14	III-22
Gilmore City	M-20		Lizard Creek	III-13	III-22
Goldfield	M-21	61	Boone River	III-17	III-23
Graettinger	M-22	64	West Fork Des Moines River	III-10	III-20
Humboldt	M-23	4	West Fork Des Moines River	III-11	III-20
Kanawha	M-24		Otter Creek	III-17	III-23

TABLE III-1 (Continued)

POINT SOURCE

WASTEWATER DISCHARGE POINTS

Discharger	Reference Number	Stream* Mile	Discharge To	Page Reference Quantity	Page Reference Treatment
Municipal (cont.)					
Lehigh	M-25	292	Des Moines River (Crooked Creek)	III-17	III-23
Livermore	M-26	20	East Fork Des Moines River	III-12	III-21
Luverne	M-27				III-23
Madrid	M-28		Big Creek	III-19	III-25
Mallard	M-29				III-20
Otho	M-30	302	Des Moines River	III-16	III-22
Pilot Mound	M-31				III-25
Pocahontas	M-32		Lizard Creek	III-13	III-22
Renwick	M-33	67	Boone River (Joint Drainage Ditch 3, 47)	III-17	III-23
Ringstead	M-34		Black Cat Creek	III-12	III-21
Rolf	M-35	21	West Fork Des Moines River (Pilot Creek)	III-11	III-20
Stratford	M-36	281	Des Moines River	III-19	III-24
Swea City	M-37		Mud Creek	III-11	III-21
Thor	M-38				III-23
Titonka	M-39		Buffalo Creek	III-12	III-21
Vincent	M-40		Brushy Creek	III-17	III-23
Wallingford	M-41				III-20
Webster City	M-42	24	Boone River	III-19	III-24
West Bend	M-43	27	West Fork Des Moines River (Prairie Creek)	III-11	III-20
Whittemore	M-44		Lotts Creek	III-12	III-21
Woolstock	M-45				III-24
Industrial					
American Can Co.	I-1	311	Des Moines River	III-14	
Boone Valley Coop.	I-2	47	Boone River (Drainage Ditch 94)	III-17	
Cooperative Farm Chemicals Assn.	I-3	301	Des Moines River	III-16	III-22

TABLE III-1 (Continued)

POINT SOURCE

WASTEWATER DISCHARGE POINTS

Discharger	Reference Number	Stream* Mile	Discharge To	Page Reference Quantity	Page Reference Treatment
Industrial (cont.)					
Corn Belt Power Coop:	I-4	328	Des Moines River	III-12	
Culligan Water Conditioning, Inc.	I-5	310	Des Moines River	III-14	
Dickey Clay Mfg.	I-6	292	Des Moines River (Crooked Creek)	III-17	
Emmetsburg Rendering Works	I-7	48	West Fork Des Moines River	III-11	
Farmegg Production, Inc.	I-8	322	Des Moines River (Bass Creek)	III-13	III-22
Farmland Industries	I-9	302	Des Moines River (Holiday Creek)	III-16	III-22
Fort Dodge Creamery	I-10	311	Des Moines River	III-14	
Franklin Mfg.	I-11	24	Boone River	III-18	
Hallett Construction Co.	I-12		Lizard Creek	III-13	
Hormel and Co.	I-13	312	Des Moines River	III-14	
Iowa Beef Processors	I-14	309	Des Moines River	III-15	III-22
Iowa Industrial Hydraulics, Inc.	I-15		Lizard Creek	III-13	
Iowa Public Service Co.	I-16	47	Boone River (Drainage Ditch 94)	III-17	
Land O'Lakes, Inc.	I-17	310	Des Moines River	III-14	
Morrell and Co.	I-18	79	West Fork Des Moines River	III-10	III-20
National Gypsum Co.	I-19	307	Des Moines River (Gypsum Creek)	III-16	
Northern Natural Gas Co.	I-20		Soldier Creek	III-14	
P and M Stone Co., Inc.	I-21	17	West Fork Des Moines River	III-11	
United States Gypsum Co.	I-22	308	Des Moines River	III-15	

TABLE III-1 (Continued)

POINT SOURCE

WASTEWATER DISCHARGE POINTS

Discharger	Reference Number	Stream* Mile	Discharge To	Page Reference Quantity	Page Reference Treatment
Industrial (cont.)					
Wadco Foods, Inc.	I-23	79	West Fork Des Moines River	III-10	
Webster Processing Co.	I-24	307	Des Moines River	III-15	III-22
Welp and McCarter	I-25		Lizard Creek	III-13	
Semi-Public					
Boone County Home	S-1	261	Des Moines River (Poor Farm Creek)	III-19	III-24
Burr Oak Manor	S-2		East Fork Des Moines River	III-12	III-21
Camp Laurie	S-3		Des Moines River	III-19	III-24
Episcopal Center and Conference Camp	S-4	261	Des Moines River (Poor Farm Creek)	III-19	III-24
Oak Lake Development	S-5	52	East Fork Des Moines River	III-12	III-21
Savage Sanitary Sewer District - Fort Dodge	S-6	308	Des Moines River	III-15	III-22
Sentral Community School District	S-7		Black Cat Creek	III-12	III-21
Woodward State Institution	S-8	231	Des Moines River (Preston Branch)	III-19	III-25

* Main Stem Des Moines River: 0 mile at confluence with Mississippi River.

West Fork Des Moines River: 0 mile at confluence with East Fork Des Moines River.

East Fork Des Moines River: 0 mile at confluence with West Fork Des Moines River.

Boone River: 0 mile at confluence with Des Moines River.

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
nes River (Cont.)																
2,100	3.5			508	0.8	180	0.3					2268	3.8	195	175	pH = 6.0 units COD = 4420 TS = 1684 TVS = 1432 Oil = 14 F Coli = 559 x 10^9/100 ml T Coli = 757 x 10^6/100 ml
13,000	16			1176	1.5	1060	1.3					508	0.6			COD = 24,800 TS = 2776 TVS = 2068 Oil = 1070 F Coli = 600/100 ml T Coli < 1/100 ml
30	19	40	26			4	3	13	8	20	13					
30	8	45	12			6	2	15	4	15	4					
nes River				160	6725									56	33	TS = 696 pH = 6.8 units Alk as $CaCO_3$ = 320
20	114	30	171			10	57	5	28	20	114					
nes River																
25	19	40	30			1	1	12	9	4	3					
30	12	60	24			4	2	20	8	15[b]	6					
50	41	100	83			10	8	22	18	20	17					

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

ge	BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
Moines River																	
57	25	33	60	79			1	1	14	18	6	8					
c																	
56	25	12	40	19			4	2	16	7	16	7					
Moines River																	
05[b]	25[b]	1					6[b]	0.3			15[b]	1					
eek																	
43	25[b]	9	25	9			2[b]	1	8	3	10[b]	4					
06[b]	25	1					6	0.3			15	1					
Moines River																	
52	25	115	50	230			5[b]	23	15	69	25[b]	115					
11[b]	25[b]	2					6	0.6			15[b]	1					
33	25	7	35	10			4	1	15	4	10	3					
51	25	31	115	145			2	3	10	13	18	23					
Creek																	
7	30	4	50	7			2	0.3	12	2	8	1					
Moines River																	
4	25	9	45	17			12	4	2	1	18	7					
er																	
4	< 1	< 0.3			31	9	< .2	< 0.1			0.1	< 0.1	2179	618	85	76	pH = 6.95 units COD = 40 Kjel-N = 0.43 Alk as $CaCO_3$ = 16 TS = 2209 TVS = 322 Cr = 9.96 Cu = 0.02 Fe = 0.10 NO_3-N = 5.8

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

rage low (gd)	BOD_5 Summer (mg/l)	(lb/day)	BOD_5 Winter (mg/l)	(lb/day)	Suspended Solids (mg/l)	(lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	(lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	(lb/day)	Phosphorus (Total P) (mg/l)	(lb/day)	Total Dissolved Solids (mg/l)	(lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
iver (Cont.)																	
.0066[b]																	
ek																	
.032[b]	30	8	36	10			2	0.5	12	3	10	3					
eek																	
.003	0	0			57	1	17.6	1			< .01	--	2515	63	68		pH = 6.74 units COD = 41.2 CN = 0.024 Cl = 280 Al = 0.51 Cd = 0.038 Cr = 0.058 Cu = 0.031 Hg < 0.05 Ni = 0.071, Ag = 0.051 NO_3-N = 35
.236	30	59	45	89			1	2	7	14	18	35					
.500					5	63							84	1051	76		pH = 7.8 units Alk as $CaCO_3$ = 61
.087	25	18	36	26			3	2	12	9	11	8					
.123					0								640	657	54	52	pH = 8.2 units TS = 640
.05					14	6							566	236	68	70	pH = 8.5 units TS = 580
.210					42	74							469	821			pH = 8.2 units TS = 511

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
nt.)																
														65	40	pH = 8.0 units
< 5	< 7													120		pH = 2 units Oil = 10
														80	80	
														75		pH = 6.9 units
35	983	45	1264			7	197	31	871	26	730					
< 5	< 1			44	2	< 0.1	--			0.15	0.01	9188	460	62	62	pH = 7.2 units COD < 10 Cl = 5050, NO_3-N = 1.6
125	21			3804	635	2.2	0.4			< 0.001	--	938	156	63		Kjel-N < 0.1 pH = 8.0 units COD = 181, NO_3-N < 1
3	14			2	9	1.4	6			< 0.001	--	482	2219	91		Kjel-N = 4.7 pH = 7.9 units COD = 16
2	0.1			62	2	1.9	0.06			< 0.001	--	2597	87	76		TOC = 33, NO_3-N < 1 Kjel-N = 4.0 pH = 8.1 units COD = 38 TOC = 26, NO_3-N < 1 Kjel-N = 6.8

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
Cont.)																
30	250			120	1001	50	417			9	75	1250	10,425	75	40	pH = 8.0 units COD = 200 TOC = 130 TVS = 110 TS = 1300, NO_3-N = 2 NO_2-N = 8 Org-N = 5 Kjel-N = 60 Ortho-P = 9 Oil = 10 SO_4 = 150 Cl = 360 Ca = 100 Fe = 0.2 Mg = 0.05 Na = 230 F Strep = 10/100 ml F Coli = 10/100 ml T Coli = 10/100 ml
25[b]	10					6[b]	3			15[b]	6					
7.2	3			6	2					0.08	0.03	2778	996	60	40	pH = 7.9 units COD = 27, NO_3-N = 0.4 NO_2 = 0.2
3.0	5			5	8					0.08	0.1	2709	4067	60	40	pH = 7.9 units COD = 18 NO_3-N = 0.7

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

rage ow gd)	BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
ver (Cont.)																	
k																	
.00288	30	1			15	0.4	0.56	0.01			0.24	0.01	1381	33			COD = 42, NO_3-N = 2.00 Kjel-N = 12.26
.0685	1	0.6			17	10	0.22	0.1			0.20	0.1	2575	1471			COD = 12, NO_3-N = 6.90 Kjel-N = 5.6
.00216	10	0.2			28	0.5	0.22	--			0.38	0.01	1051	19			COD = 23, NO_3-N = 1.40 Kjel-N 3.08
.00432	10	0.4			28	1.0	0.22	0.01			0.38	0.01	1051	38			COD = 23, NO_3-N = 1.40 Kjel-N = 3.08
ver																	
.057	25	12	41	19			2	1	8	4	8	4					
k								100		100							
ver																	
84	6	42			0		20	140			0.09	0.6	3000	21017	75	40	COD = 32, NO_3-N = ? Org-N = 3 Kjel-N = 22 Na = 450 Oil = 1 SO_4 = 2260 Cl = 320 Ca = 260 Al = 0.6 Mg = 0.07 Cr = 0.05 Cu = 0.05 Fe = 4.6 Pb = 0.01

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

ge	BOD_5 Summer (mg/l)	(lb/day)	BOD_5 Winter (mg/l)	(lb/day)	Suspended Solids (mg/l)	(lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	(lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	(lb/day)	Phosphorus (Total P) (mg/l)	(lb/day)	Total Dissolved Solids (mg/l)	(lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
r (Cont.)																	Mn = 0.29 Ni = 0.02 Zn = 0.16 F Coli = 76/100 ml T Coli = 7800/100 ml
47	25	10	40	16													
54					9	4					0.05	0.02	1619	729	65	57	pH = 7.9 units, NO_3-N = 0.12
2[b]	25[b]	5[b]															
22	25	5	35	6			2	0.4	8	1	10	2					
23	28	5	40	8			2	0.4	12	2	6	1					
Boone River																	
42	27	54	50	101			2	4	14	28	10	20					
age Ditch 3, 47																	
40	25	8	35	12			1	0.3	12	4	15	5					
83	31	21	46	32			1	0.7	14	10	10	7					
24	31	6	80	16			1	0.2	17	2	25	5					
tch 94																	
20																	
16	3	0.4			4	0.5	1.1	0.2			0.5	0.07	495	66	84	71	pH = 7.6 units COD = 4 Kjel-N = 1.54 Ortho-P = 1.6 TS = 499 NO_3-N = 0.07

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

BOD_5 Summer (mg/l)	BOD_5 Summer (lb/day)	BOD_5 Winter (mg/l)	BOD_5 Winter (lb/day)	Suspended Solids (mg/l)	Suspended Solids (lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	Ammonia Nitrogen (N) Summer (lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	Ammonia Nitrogen (N) Winter (lb/day)	Phosphorus (Total P) (mg/l)	Phosphorus (Total P) (lb/day)	Total Dissolved Solids (mg/l)	Total Dissolved Solids (lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
94 (Cont.)																TVS = 0.2 Alk as $CaCO_3$ = 280 SO_4 = 166 Cl = 4 Zn = 0.06 Phenols = 0.009 Ca = 179 Algal Inhibitor = 0.08
45	245	75	408			4	22	14	76	11	60					
35	76	70	152			4	9	16	35	9	20					
20	77			36	138	0.77	3			3.02	12	710	2724	73	73	pH = 9.5 units Kjel-N = 1.13 Ortho-P = 3 TS = 734 TVS = 65 COD = 40 Alk as $CaCO_3$ = 102 SO_4 = 310 Cl = 56 Flouride = 0.92 Ca = 22.9 Cr = 0.86 Fe = 0.5 Pb < 0.1 Mg = 16.3 Mn = 0.03 Cu < 0.01 NO_3-N = 0.61

TABLE III-2 (Continued)
POINT SOURCE
WASTEWATER DISCHARGE QUANTITIES

BOD_5 Summer (mg/l)	(BOD_5 Summer lb/day)	BOD_5 Winter (mg/l)	(BOD_5 Winter lb/day)	Suspended Solids (mg/l)	(Suspended Solids lb/day)	Ammonia Nitrogen (N) Summer (mg/l)	(Ammonia Nitrogen (N) Summer lb/day)	Ammonia Nitrogen (N) Winter (mg/l)	(Ammonia Nitrogen (N) Winter lb/day)	Phosphorus (Total P) (mg/l)	(Phosphorus (Total P) lb/day)	Total Dissolved Solids (mg/l)	(Total Dissolved Solids lb/day)	Temperature Summer (°F)	Temperature Winter (°F)	Other (mg/l unless noted otherwise)
t.)																
25	330	40	528			6	79	16	211	25	330					
25	9	25	9			8	3	19	7	19	7					
25	12	60	28			4	2	14	7	18	9					
25[b]	2					6[b]	0.5			15[b]	1					
25[b]	15					6[b]	4			15[b]	9					
25[b]	1					6[b]	0.4			15[b]	1					
40	664	70	1162			4	66	16	266	18	299					
25[b]	42					6[b]	10			15[b]	25					
25	41	40	66			8	13	21	35	23	38					
	6,143						1,706				2,736					

oor or no data available.

TABLE III-3
WASTEWATER TREATMENT FACILITIES

Existing Design Average Day Capacity (mgd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
2.92	2.025	1128	135	1147	145	(Sf Oa Ka) Gm Sm Cm	Fo Cm Ftr Cm	Dfh Ls Xl	Plans and specifications for new treatment facility are presently being reviewed by IDEQ. Proposed treatment processes include primary clarification, high rate trickling filters, activated sludge aeration, flow equalization and polishing ponds, dual media filters, and chlorination.
	0.37		150		230		Lo		
									No existing municipal treatment facility. Presently preparing preliminary report.
0.246	0.185		35				Lo		Plant put into operation during 1968.
0.266	0.222		40			Ga Sch Cm	Ftr Cp	Ga Sch Cm	Existing plant is heavily overloaded during periods of wet weather. City is in the process of designing new treatment facility. Consent order issued by IDEQ requires final plans and specifications to be prepared by 1/1/74 with contract awarded by 6/1/74. Plant to be designed for effluent BOD_5 and ammonia concentrations of 10 mg/l and 2 mg/l, respectively.
0.111	0.077		35			Cl	Ftr Cp	Bo	Existing treatment facility was constructed during the 1940's and is in rather poor condition.
0.054									No existing municipal treatment facility. Waste stabilization pond has been designed to replace private septic tanks. Construction permit was issued by IDEQ in September, 1973.
0.085	0.032		40				Lo		Waste stabilization pond was put into operation during May, 1970; replaced Imhoff tank and sand filters.
0.926	0.683	219	19	676	70	Sh Gw Cm	Ftr Cm	Dfr Bo Xl	

TABLE III-3 (Continued)
WASTEWATER TREATMENT FACILITIES

Existing Design Average Day Capacity (mgd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
0.175	0.089		30				Lo		Plant placed in operation during 1966.
0.063	0.047		45				Lo		Plant placed in operation during 1969.
	0.099		90			Ci	Fs	Bo	Presently designing new waste stabilization pond to replace existing plant.
0.073	0.157		45				Lo		Plant placed in operation during 1964.
0.115	0.056		35			Cp Ftoc	Lo		
5)									Construction of a one-acre waste stabilization pond to treat the flow from 100 people was approved by the Iowa National Resources Council on June 5, 1973.
0.077	0.043		25				Lo		Plant placed in operation during 1969.
(S-7)0.006						Cm	Ft		Constructed in 1957.
0.655	0.552		40			Sg Gm (Km Cm)	Ftr Cm	Dfh Bo	Plant constructed during 1954.
0.015							As	HA	
0.110	0.033		30				Lo		Plant placed in operation during 1968.
0.147	0.151		75			Sh Gh Cm	Ftr Cp	Dfh Bo	Plant constructed in 1960.
0.050	0.017		45				Lo		Plant placed in operation during 1968.
0.10	0.044		45			Sh Ci	Ftr Cp	Bo	Plant constructed in 1958.

TABLE III-3 (Continued)
WASTEWATER TREATMENT FACILITIES

sting sign erage ay ecity gd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
0.0066							Lo		Plant constructed in 1970.
0.045	0.032		35				Lo		Two-cell waste stabilization pond with first cell constructed in 1961 and second cell constructed in 1968.
0.156	0.236		40			Sch Cm	Ftr	Dfh Bo	Plant constructed in 1951. Preliminary report is being prepared for new facilities.
0.100	0.087		30				Lo		Plant placed in operation during 1959.
									No existing municipal treatment facilities. Community has attempted to obtain grant assistance for waste stabilization pond since 1967 with active interest in August, 1973.
5.30	3.367	420	38	375	34	Sm Gm Oa Ka Cm	Fto Cm Eg Ftr Cm	Dfhemt Ds Bo Ls	Last plant expansion was completed in 1965.
1.20	1.00		30		120	O Af	Ln Lo	T Xl	Plant placed in operation during 1970. Waste stabilization pond covers about 40 acres. No discharge allowed when river flow is less than 32 cfs.
0.05							La Lo		Plant constructed in 1970 to serve Webster County Home and new residential development.
0.05							Lo		Treatment facility was constructed during 1967-68. In 1971, waste stabilization pond was being re-designed as a complete retention facility with no discharge.
0.044	0.057		35				Lo		Plant placed in operation during 1968.
							Lo		Plant placed in operation during 1966.
	0.52		6		0		L		Package aeration plant is provided for sanitary flow. Chemical process water is also treated to reduce chromate and ammonia.

TABLE III-3 (Continued)

WASTEWATER TREATMENT FACILITIES

Existing Design Average Day Capacity (mgd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
0.150	0.047		35				Lo		
							Lo		Plant placed in operation during October, 1972.
0.034	0.022		30				Lo		Plant placed in operation during 1967.
0.091	0.023		35				Lo		Waste stabilization pond placed in operation during October, 1971; replaced Imhoff tank and sand filters.
0.18	0.242		40			Sc Cm	Ftr Cm	Dch Bo Xl	Existing plant was constructed in 1935 and is in poor condition. A site has been approved for a new waste stabilization pond designed to replace the existing facility.
									No existing municipal treatment facility. Preliminary plans have been prepared for three-cell waste stabilization pond.
0.096	0.040		30				Lo		Plant constructed in 1962.
0.087	0.083		40				Lo		Waste stabilization pond placed in operation in March, 1970; replaced Imhoff tank and sand filters.
0.219	0.024		50				Lo		Plant constructed in 1963.
									No existing municipal treatment facility. Plans and specifications prepared in 1973 for waste stabilization pond system.
0.504	0.652	106	52			Gm Sc Cm	Fth Cm	Dfht Dop Bo	Existing sewers have a large quantity of infiltration during periods of wet weather. Treatment plant is overloaded and raw sewage is by-passed frequently. City had preliminary report prepared which recommended construction of a large aerated lagoon and oxidation pond to treat all flow collected.

TABLE III-3 (Continued)

WASTEWATER TREATMENT FACILITIES

Existing Design Average Day Capacity (mgd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
0.145	0.261		60			Sh Cm	Ftr Cp	Dch Bo	Plant constructed in 1933-34. Presently making modifications to recirculate trickling filter effluent.
									No existing municipal treatment facility. Preliminary plans were made for sanitary sewers and waste stabilization pond system in 1967-68, and city made application for a loan from FHA. City is still served by individual septic tanks.
1.50	1.582	341	22	108	90	Sh Gw Cm	Ftr Cm	Dfh Bo Xl	Plant was built in 1939 and expanded in 1963. Preliminary report issued October 30, 1973, recommends adding another digestor, two more trickling filters and final clarifiers.
0.070	0.042		25			Sh Ae	Ae Lp		Treatment plant was constructed in 1965. Existing sewers have a large quantity of infiltration during periods of wet weather. A compliance order was issued by IDEQ to correct the infiltration problem. The compliance order requires: preliminary report by 6/1/74, final plans and specifications by 12/1/74, construction contract be awarded by 4/1/75, and project completed by 12/31/75.
0.084	0.057		40			Sh Ci	Ftr Cp	Bo	Plant was constructed in 1956 and is in poor condition. Compliance order issued by IDEQ requires in-plant and operation modifications to be completed by 6/1/74.
0.010									Permit issued to construct waste stabilization pond in September, 1969.
0.008							Lo		Plant constructed in 1967.
0.007									Permit issued 1/18/73 to construct waste stabilization pond to replace septic tank. No discharge allowed during summer low flow periods.

TABLE III-3 (Continued)
WESTEWATER TREATMENT FACILITIES

Existing Design Average Day Capacity (mgd)	Present Average Day Flow (mgd)	BOD_5 Influent Conc. (mg/l)	BOD_5 Effluent Conc. (mg/l)	Suspended Solids Influent Conc. (mg/l)	Suspended Solids Effluent Conc. (mg/l)	Type of Treatment: Primary	Type of Treatment: Secondary	Type of Treatment: Solids Treatment	Comments
									No existing municipal treatment system. Final plans and specifications received by IDEQ on 11/26/73 for waste stabilization pond.
									No existing municipal treatment system. Plans and specifications for waste stabilization pond have been approved by IDEQ and are waiting for EPA funding.
1.60	1.99	165	42	149	34	Sch Gam Ka Cm	Ftr C*	Ho Zil Vv Xp	Plant constructed in 1958.
0.213	0.20					Sm G Cm	Ft Cm E	D B	Plant constructed in 1941. Plans are being prepared for polishing pond to follow existing facilities.
0.305	0.198		35			Sh Ga (Cp Do)	Ftr Cm	Xl	Plant constructed in 1967.

ABBREVIATIONS

SEWAGE TREATMENT FACILITIES

A ----Aeration (in tanks or basins)
Aa----Activated sludge, diffused air aeration
Ac----Contact stabilization
Ad----Aerobic digestion
Ae----Extended aeration
Af----Air flotation
Am----Activated sludge, mechanical aeration
Ao----Oxidation ditch
Ap----Aeration, plain, without sludge return

B ----Sludge beds
Bo----Open
Bc----Glass covered

C ----Settling tanks
Ci----Two-story (Imhoff)
Cm----Mechanically equipped
Cp----Plain, hopper bottom or intermittently drained for cleaning
Cs----Septic tank
Ct----Multiple tray, mechanically equipped
CmDm--Two-story "Clarigester"
CpDo--Two-story "Spiragester"

D ----Digesters, separate sludge
Dc----With cover (fixed if not otherwise specified)
D(cg)-Gasometer in fixed cover
De----Gas used in engines (heat usually recovered)
Df----With floating cover
Dg----With gasometer cover
Dh----Gas used in heating
Dm----Mixing
Do----Open top
Dp----Unheated
Dr----Heated

E ----Chlorination
Ec----With contact tank
Eg----By chlorine gas
Eh----By hypochlorite

F ----Filters
Fc----Covered filter
Fo----Roughing filter
Fr----Rapid sand or other sand straining
Fs----Intermittent sand
Ft----Trickling (no further details)
Fth---High capacity
Ft2H--High capacity, two-stage
Ftn---Fixed nozzle, standard capacity
Ftr---Rotary distributor, standard capacity
Ftt---Traveling distributor, standard capacity

G ----Grit chambers
Ga----Aerated grit removal
Gh----Without continuous removal mechanism
Gm----With continuous removal mechanism
Gp----Grit pocket at screen chamber
Gw----Separate grit washing device

H ----Sludge storage tanks (not second-stage digestion units)
Ha----Aerated
Hc----Covered
Hm----With stirring or concentrating mechanism
Ho----Open

I ----Sewage application to land
If----Ridge and furrow irrigation

ABBREVIATIONS

SEWAGE TREATMENT FACILITIES

K ----Chemical treatment-flocculation. Chemical treatment-type units or equipment not necessarily complete or operated as chemical treatment.
Ka----Flocculation tank, air agitation
Kc----Chemicals used
Km----Flocculation tank, mechanical agitation
Kx----No chemicals used

L ----Lagoons
La----Aerated lagoon
Le----Evaporation lagoon
Ln----Anaerobic lagoon
Lo----Waste stabilization lagoon
Lp----Polishing lagoon
Ls----Sludge lagoon - not for treatment of sewage

O ----Grease removal or skimming tanks - not incidental to settling tanks
Oa----Aerated tank (diffused air)
Om----Mechanically equipped tank
Ov----Vacuum type

S ----Screens
Sc----Comminutor (screenings ground in sewage stream)
Sf----Fine screen (less than 1/8" opening)
Sg----Screenings ground in separate grinder and returned to sewage flow
Sh----Bar rack, hand cleaned 1/2" - 2" openings
Si----Intermediate screen 1/8" - 1/2" openings
Sm----Bar rack mechanically cleaned 1/2" - 2" openings
Sr----Coarse rack (openings over 2")
St----Garbage ground at plant and returned to sewage flow

V ----Mechanical sludge dewatering
Vc----Sludge centrifuge
Vp----Pressure filter
Vv----Rotary vacuum filter
Vo----Other

X ----Sludge drying or incineration
Xd----Used for fertilizer
Xf----Sludge burned for fuel
Xl----Disposal to land
Xn----Incinerated
Xp----Used for fill

Z ----Sludge conditioning
Za----Chemicals used, alum
Zc----Chemical used (unidentified)
Zi----Chemicals used, iron salts
Zl----Chemicals used, lime
Zp----Polyelectrolytes used
Zx----No chemicals used
Zy----Elutriation