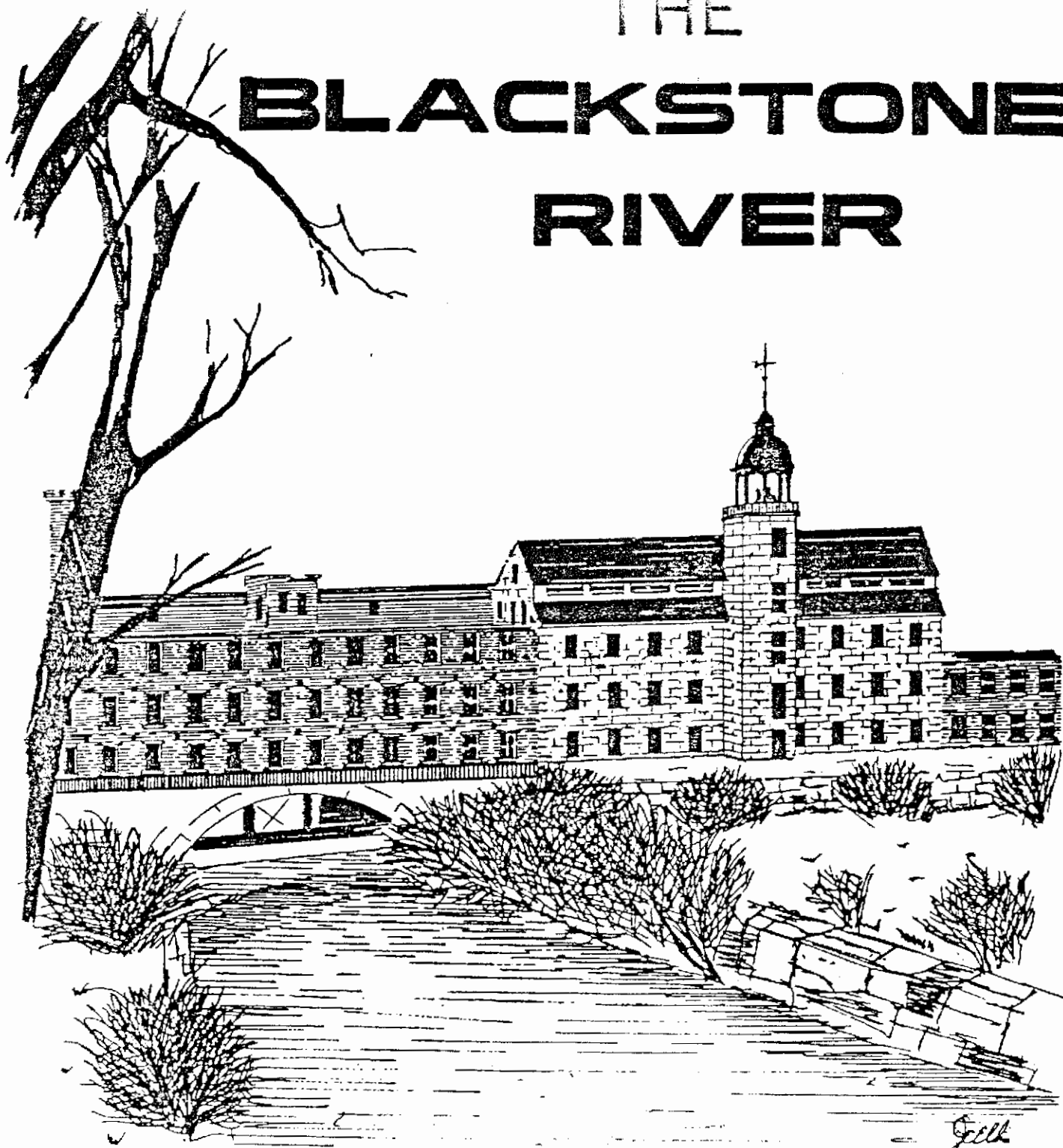


51-B-5

# THE BLACKSTONE RIVER



**PART B - WASTEWATER DISCHARGE DATA 1979-1980**  
massachusetts department of environmental quality engineering  
DIVISION OF WATER POLLUTION CONTROL  
thomas a. mcMahon, director

BLACKSTONE RIVER BASIN  
1979 - 1980  
WASTEWATER DISCHARGE SURVEY DATA

PREPARED BY  
TECHNICAL SERVICES BRANCH  
MASSACHUSETTS DIVISION OF WATER POLLUTION CONTROL

WESTBOROUGH, MASSACHUSETTS

AUGUST 1981

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## FOREWORD

The following report presents the results of the Wastewater Discharge Surveys conducted on the Blackstone River by the Massachusetts Division of Water Pollution Control (MDWPC) during the years 1979-1980. These surveys were part of the state-wide discharge monitoring program which has been established in conjunction with the National Pollutant Discharge Elimination System (NPDES). These surveys are also a continuation of a previously established on-going program of water quality and discharge monitoring by the Division's Technical Services Branch.

The wastewater discharges were sampled for various periods of time ranging from three 24-hour composite samples to a grab sample. The sampling period was determined according to regulations established by the NPDES permits. Composite samples were taken by automatic samplers and were composited according to flow where flow records were available. If no flow records were available, the composite was made of equal amounts for that time period.

The samples were analyzed at the Lawrence Experiment Station of the Department of Environmental Quality Engineering. All analyses were performed according to procedures of the current APHA's Standard Methods for the Examination of Water and Wastewater. Data were compiled and placed in tabular form by personnel of the Massachusetts Division of Water Pollution Control.



LOCATION OF  
MAJOR WASTEWATER DISCHARGES

WASTEWATER DISCHARGES

NUMBER

1	Worcester Spinning and Finishing Company
2	New England Plating Company, Inc.
3	Upper Blackstone Water Pollution Abatement District WWTP
4	New England High Carbon Wire Company
5	Millbury Sewage Treatment Plant
6	Wyman Gordon Company
7	Grafton Sewage Treatment Plant
8	Polyfoam Inc.
9	Northbridge Sewage Treatment Plant
10	Stanley Woolen Company
11	Douglas Sewage Treatment Plant
12	Hayward Schuster Woolen Mills
13	Whitin Machine, ATF Davidson
14	Emil Bernat Yarns
15	Upton Sewage Treatment Plant
16	Uxbridge Sewage Treatment Plant
17	Blackstone Potato Chip Company
18	Hopedale Sewage Treatment Plant

WORCESTER SPINNING AND FINISHING COMPANY

LOCATION: Chapel Street, Leicester  
RECEIVING WATER: Kettle Brook  
CAPACITY: 0.15 MGD  
TREATMENT PROCESS: Flow Equalization, pH Adjustment, Extended  
Aeration, Settling, Chlorination

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/23-24/79	EFFLUENT 4/25-26/79	EFFLUENT 10/2-3/79	EFFLUENT 10/3/79
TYPE OF SAMPLE:	24-Hr. Comp.	24-Hr. Comp.	7 -Hr. Comp.	GRAB
<u>PARAMETER</u>				
COD	552	579	360	444
BOD <sub>5</sub>	18	150	0	0
pH (Standard Units)	8.0	7.9	8.2	8.2
Total Alkalinity	200	213	182	256
Suspended Solids	6.5	12	6.0	6.0
Total Solids	3,900	4,076	3,006	3,716
Turbidity (NTU)	2	--	1.1	1.1
Total Kjeldahl-Nitrogen	14	13	5.0	6.9
Ammonia-Nitrogen	4.8	5.5	0.80	0.70
Nitrate-Nitrogen	0.6	0.3	2.6	1.3
Ortho-Phosphorus	--	--	--	--
Total Phosphorus	15	14	5.6	9.6
Chloride	2,000	2,000	--	--
Flow (MGD)	0.098	--	0.098	0.098

WORCESTER SPINNING AND FINISHING COMPANY

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 6/9-10/80	EFFLUENT 6/10-11/80	EFFLUENT 8/4-5/80	EFFLUENT 8/5-6/80	EFFLUENT 8/6-7/80	EFFLUENT 10/15-16/80
TYPE OF SAMPLE:	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>						
COD	191	750	457	609	702	649
BOD <sub>5</sub>	4.8	7.0	3.9	6.0	6.0	4.0
pH (Standard Units)	7.9	7.8	7.4	7.5	7.5	7.6
Total Alkalinity	155	146	100	89	82	223
Suspended Solids	14	11	7.0	21	7.0	9.5
Total Solids	2,206	5,264	3,000	4,942	5,756	482
Turbidity (NTU)	2.4	0.4	0.5	0.2	0.2	0.7
Total Kjeldahl-Nitrogen	4.9	6.5	3.1	13	13	2.4
Ammonia-Nitrogen	0.30	0.30	1.2	1.0	1.1	0.5
Nitrate-Nitrogen	2.4	0.5	0.5	1.0	0.6	--
Ortho-Phosphorus	10.4	10.4	10.0	12.0	14.0	6.6
Total Phosphorus	11.5	11.1	10.0	13.0	17.0	6.9
Settleable Solids (ml/l)	--	--	0.2	0.1	0.2	0.0
Total Chromium	--	--	0.04	--	0.0	--
BOD <sub>2</sub>	--	--	2.1	--	--	--
BOD <sub>7</sub>	--	--	5.1	--	--	--
BOD <sub>14</sub>	--	--	6.3	--	--	--
Chloride	--	--	1,500	2,700	--	85
Total Volatile Solids	--	--	--	--	--	188
Hardness	--	--	--	--	--	67
Flow (MGD)	0.072	0.072	0.058	0.058	0.071	0.568



NEW ENGLAND PLATING COMPANY, INC.

LOCATION: Garden Street, Worcester  
RECEIVING WATER: Mill Brook  
CAPACITY: 0.150 MGD  
TREATMENT PROCESS: Neutralization, Chemical Addition,  
Settling  
SLUDGE DISPOSAL: Centrifuge, Pumped

RESULTS OF LABORATORY ANALYSES (mg/l)

	EFFLUENT 4/23-24/79 <u>8-Hr. Comp.</u>	EFFLUENT 10/2/79 <u>GRAB</u>
DATE OF COLLECTION:		
TYPE OF SAMPLE:		
<u>PARAMETER</u>		
pH (Standard Units)	--	9.4
Suspended Solids	15	--
Total Solids	--	3,534
Cadmium	0.07	--
Chromium	0.65	0.08
Chromium +6	0.0000	--
Copper	0.25	7.5
Amenable Cyanide	2.6	--
Cyanide	2.6	--
Iron	18	0.13
Lead	0.20	--
Nickel	0.60	0.35
Tin	<0.10	5.0
Zinc	2.0	1.3
Flow(MGD)	0.127	0.113

UPPER BLACKSTONE WATER POLLUTION ABATEMENT DISTRICT

WASTEWATER TREATMENT PLANT

LOCATION: Route 20, Millbury  
RECEIVING WATER: Blackstone River  
CAPACITY: 56.0 MGD  
TREATMENT PROCESS: Bar Rack, Aerated Grit Chamber, Primary  
Settling, Aeration Tanks, Secondary  
Settling, Chlorination  
SLUDGE DISPOSAL: Sludge Conditioning Tanks, Vacuum Filter,  
Incineration, Ashes Buried at Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	INFLUENT 4/23-24/79	INFLUENT 10/1-2/79	EFFLUENT 10/1-2/79
TYPE OF SAMPLE:	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>			
COD	405	300	54
BOD <sub>5</sub>	114	70	2
pH (Standard Units)	6.1	6.9	7.6
Total Alkalinity	34	78	70
Suspended Solids	240	264	14
Settleable Solids (ml/l)	10	6.0	0.0
Total Solids	566	456	262
Turbidity (NTU)	95	--	--
Total Kjeldahl-Nitrogen	19	20	8.6
Ammonia-Nitrogen	10	7.9	7.4
Nitrate-Nitrogen	0.6	1.0	2.6
Total Phosphorus	4.6	5.3	2.3
Total Coliform/100ml	80	--	2,200
Fecal Coliform/100ml	20	--	<5
Flow (MGD)	36.72	35.20	35.20

UPPER BLACKSTONE WATER POLLUTION ABATEMENT DISTRICT

WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSES (mg/l)

	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT
DATE OF COLLECTION:	10/2-3/79	10/3-4/79	6/9-10/80	6/10-11/80	8/4-5/80	8/5-6/80	10/15-16/80
TYPE OF SAMPLE:	24-Hr. Comp.	24-Hr. Comp.	24-Hr. Comp.	24-Hr. Comp.	24-Hr. Comp.	24-Hr. Comp.	24-Hr. Comp.
<u>PARAMETER</u>							
COD	54	48	91	67	59	39	90
BOD <sub>5</sub>	2	4	3.3	3.3	6.9	4.5	8.7
pH (Standard Units)	7.7	7.6	7.4	7.7	7.3	7.5	7.6
Total Alkalinity	76	62	30	60	20	28	94
Suspended Solids	3.5	5.0	9.0	6.5	8.5	3.5	7.0
Settleable Solids (ml/l)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Solids	262	250	322	282	308	298	312
Total Volatile Solids	--	--	--	--	--	74	74
Turbidity (NTU)	5.2	5.9	4.1	3.7	3.3	3.1	2.7
Hardness	--	--	--	--	--	54	54
Total Kjeldahl-Nitrogen	9.1	7.4	9.3	10	3.6	5.2	13
Ammonia-Nitrogen	7.8	5.6	9.1	9.2	1.7	3.0	12
Nitrate-Nitrogen	1.5	1.2	0.6	0.4	8.0	6.9	1.0
Total Phosphorus	2.0	1.0	1.7	1.7	1.9	1.4	2.2
Ortho-Phosphorus	--	--	1.7	0.85	1.4	0.86	1.7
Chloride	--	--	--	--	--	79	79
Total Coliform/100ml	--	--	--	100	400	--	--
Fecal Coliform/100ml	--	--	--	5	20	--	--
Flow (MGD)	35.2	41.2	31.8	29.2	30.0	29.0	26.2
BOD <sub>1</sub>	--	--	--	--	3.0	--	--
BOD <sub>7</sub>	--	--	--	--	7.8	--	--
BOD <sub>14</sub>	--	--	--	--	21	--	--

UPPER BLACKSTONE WATER POLLUTION ABATEMENT DISTRICT

WASTEWATER TREATMENT PLANT

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION: TYPE OF SAMPLE:	<u>INFLUENT</u> <u>4/24/79</u> <u>GRAB</u>	<u>INFLUENT</u> <u>10/2/79</u> <u>GRAB</u>	<u>EFFLUENT</u> <u>10/2/79</u> <u>GRAB</u>	<u>INFLUENT</u> <u>8/5/80</u> <u>GRAB</u>
<u>PARAMETER</u>				
Aluminum	1.0	0.64	0.00	--
Cadmium	---	0.00	0.00	--
Chromium <sup>+6</sup>	0.000	0.00	0.00	--
Chromium	0.30	0.18	0.18	0.02
Copper	0.30	0.50	0.04	0.08
Iron	18	4.1	0.10	--
Lead	0.20	0.16	--	0.00
Nickel	0.35	0.00	0.10	0.10
Tin	<0.10	<0.5	<0.5	0.01
Zinc	0.65	0.50	0.18	0.60

NEW ENGLAND HIGH CARBON WIRE COMPANY

LOCATION: Riverlin Street, Millbury  
 RECEIVING WATER: Blackstone River  
 CAPACITY: 0.060 MGD  
 TREATMENT PROCESS: pH Adjustment, Lagoon  
 SLUDGE DISPOSAL: Drying Lagoon, Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/23/79	EFFLUENT 10/2/79	EFFLUENT 6/9/80	EFFLUENT 6/10/80	EFFLUENT 8/6/80
TYPE OF SAMPLE:	<u>GRAB</u>	<u>GRAB</u>	<u>GRAB</u>	<u>GRAB</u>	<u>GRAB</u>
<u>PARAMETER</u>					
COD	--	--	--	--	359
BOD <sub>5</sub>	--	--	--	--	41
pH (Standard Units)	7.6	8.6	7.6	7.0	3.9
Acidity	--	--	--	--	7.0
Suspended Solids	61	17	14	30	--
Total Phosphorus	--	--	--	--	1.5
Oil & Grease*	--	--	1.4	1.3	0.1
Chromium	--	0.01	--	--	0.00
Copper	0.55	0.04	0.09	0.08	0.05
Iron	20	5.3	1.6	14	250
Lead	0.70	0.07	0.10	0.15	--
Manganese	3.5	1.0	0.37	3.3	--
Nickel	0.25	0.07	0.05	0.09	0.00
Tin	--	--	--	--	0.08
Zinc	0.50	0.08	0.10	0.11	0.10
Flow (MGD)	0.02	0.03	0.007	0.007	--

\*Effluent grab sample of Oil & Grease was taken 8/5/80 = 2.0

MILLBURY SEWAGE TREATMENT PLANT

LOCATION: Providence Street, Millbury

RECEIVING WATER: Blackstone River

CAPACITY 2.0 MGD

TREATMENT PROCESS: Comminutor, Grit Chamber, Primary Settling,  
Roughing Filter, Settling, Trickling Filter,  
Secondary Settling, Chlorination

SLUDGE DISPOSAL: Anaerobic Digester, Drying Beds, Landfill

MILLBURY SEWAGE TREATMENT PLANT  
RESULTS OF LABORATORY ANALYSES (mg/1)

	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT
DATE OF COLLECTION:	4/23-24/79	10/2-3/79	6/9-10/80	6/10-11/80	8/4-5/80	8/5-6/80	10/15-16/80
TYPE OF SAMPLE:	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>							
COD	230	444	163	153	173	218	215
BOD <sub>5</sub>	27	13	20	9.0	23	19	19
pH (Standard Units)	7.1	7.5	7.1	7.3	7.1	7.2	7.5
Total Alkalinity	50	64	44	27	35	39	66
Hardness	--	--	--	--	--	--	47
Suspended Solids	22	15	32	26	14.5	17	24
Settleable Solids (ml/1)	0.1	0.0	0.4	0.2	0.0	0.5	0.0
Total Solids	646	922	578	562	666	872	840
Total Volatile Solids	--	--	--	--	--	--	184
Turbidity (NTU)	21	12	6.7	9.5	9.8	3.8	5.8
Total Kjeldahl-Nitrogen	20	32	9.8	8.7	16.0	37	40
Ammonia-Nitrogen	17	25	6.7	5.2	11.7	23	36
Nitrate-Nitrogen	8.0	14	12	11.7	16.0	17	11
Total Phosphorus	4.5	4.0	4.6	4.5	5.0	5.3	4.5
Ortho-Phosphorus	--	--	4.5	4.3	4.9	4.1	4.5
Chloride	--	--	--	58	1.0	--	225
Total Coliform/100ml	93,000	400	24,000	14,000	--	240,000	--
Fecal Coliform/100ml	24,000	<5	4,300	200	--	240,000	--
Flow (MGD)	0.697	0.742	0.450	0.450	0.581	0.581	0.498
BOD <sub>1</sub>	--	--	--	--	6.0	--	--
BOD <sub>7</sub>	--	--	--	--	46	--	--
BOD <sub>14</sub>	--	--	--	--	76	--	--

WYMAN GORDON COMPANY, MILLBURY PLANT

LOCATION: Grafton  
RECEIVING WATER: Quinsigamond River  
CAPACITY: 0.150 MGD (Discharges 001A, 001)  
TREATMENT PROCESS: Lagoon

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT	EFFLUENT
TYPE OF SAMPLE:	4/24/79	10/2/79
<u>PARAMETER</u>	<u>GRAB</u>	<u>GRAB</u>
pH (Standard Units)	7.1	6.8
Total Alkalinity	34	32
Total Kjeldahl-Nitrogen	4.3	3.5
Total Phosphorus	0.95	0.20
Oil and Grease	3.4	1.2
Aluminum	0.18	0.64
Chromium	0.00	0.00
Chromium +6	0.000	--
Copper	0.02	0.02
Iron	0.35	0.65
Lead	0.03	0.00
Nickel	0.03	0.05
Cadmium	--	0.00
Zinc	--	0.35
Flow (MGD)	*Meter Broken	*



GRAFTON SEWAGE TREATMENT PLANT

LOCATION: Off Ferry Street, South Grafton

RECEIVING WATER: Blackstone River

CAPACITY: 3.88 MGD

TREATMENT PROCESS: Primary Settling, Aeration, Secondary clarifiers, Chlorination, Sludge thickening

SLUDGE DISPOSAL: Vacuum filter, Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 10/2-3/79*	EFFLUENT 6/9-10/80	EFFLUENT 6/10-11/80	EFFLUENT 8/5-6/80	EFFLUENT 10/15-16/80
TYPE OF SAMPLE:	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>					
COD	54	--	--	38	53
BOD <sub>5</sub>	17	4.8	3.0	7.8	9.6
pH (Standard Units)	7.8	7.1	7.1	7.6	5.4
Total Alkalinity	123	21	19	26	4.0
Hardness	--	--	--	--	67
Suspended Solids	6.0	7.0	6.0	13.5	6.0
Settleable Solids (ml/l)	0.0	0.0	0.0	0.0	0.0
Total Solids	--	382	382	550	482
Total Volatile Solids	--	--	--	--	188
Total Kjeldahl- Nitrogen	14	1.9	2.7	2.7	2.4
Ammonia-Nitrogen	14	0.10	1.0	0.04	0.50
Nitrate-Nitrogen	4.4	18	17	2.3	150+
Total Phosphorus	4.6	3.9	4.7	5.8	6.9
Ortho-Phosphorus	--	3.9	4.6	5.3	6.6
Turbidity (NTU)	2.8	1.8	2.1	0.7	0.7
Chloride	--	--	--	--	85
Total Coliform/100ml	25,000	800	35,000	10,000	--
Fecal Coliform/100ml	4,000	30	11,000	400	--
Flow (MGD)	0.25	0.48	0.45	0.38	0.36

\*Plant starting up

+Too high

POLYFOAM INC.

LOCATION: Providence Road, Northbridge  
RECEIVING WATER: Old Raceway to Blackstone River  
CAPACITY: 0.05 MGD  
TREATMENT PROCESS: None

RESULTS OF LABORATORY ANALYSIS (mg/l)

DATE OF COLLECTION: 10/16/80  
TYPE OF SAMPLE GRAB

<u>PARAMETER</u>	
COD	10.6
BOD <sub>5</sub>	2.4
pH (Standard Units)	6.6
Total Alkalinity	15
Suspended Solids	0.5
Settleable Solids (ml/l)	0.0
Total Solids	170
Total Volatile Solids	40
Turbidity (NTU)	0.3
Hardness	34
Total Kjeldahl-Nitrogen	1.7
Ammonia-Nitrogen	0.16
Nitrate-Nitrogen	1.3
Total Phosphorus	0.30
Ortho-Phosphorus Chloride	0.30 52

<u>DATE</u>	<u>OIL &amp; GREASE (mg/l)</u>	<u>FLOW(MGD)</u>
4/23/79	1.3	0.0036
10/2/79	0.5	0.0036
8/5/80	1.4	--
8/6/80	0.00	--

NORTHBRIDGE SEWAGE TREATMENT PLANT

LOCATION: Providence Road, Northbridge

RECEIVING WATER: Blackstone River

CAPACITY: 1.8 MGD

TREATMENT PROCESS: Comminutor, Primary Settling Tanks,  
Trickling Filters, Secondary Settling  
Tanks, Sand Filters, Chlorination

SLUDGE DISPOSAL: Sludge Thickening Tanks, Vacuum Filter,  
Landfill

NORTHBRIDGE SEWAGE TREATMENT PLANT  
RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/24/79	EFFLUENT 10/3-4/79	EFFLUENT 10/4/79	EFFLUENT 6/9-10/80	EFFLUENT 6/11/80	EFFLUENT 8/5-6/80	EFFLUENT 10/15-16/80
TYPE OF SAMPLE:	<u>GRAB</u>	<u>24-Hr. Comp.</u>	<u>GRAB</u>	<u>24-Hr. Comp.</u>	<u>GRAB</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>							
COD	41	36	30	--	--	27	60
BOD <sub>5</sub>	16	7	7	4.5	1.8	2.1	5.4
pH (Standard Units)	6.4	6.4	6.2	7.0	7.0	6.9	7.1
Total Alkalinity	38	22	21	30	35	28	63
Suspended Solids	8.0	1.0	0.5	0.5	5.0	8.5	21*
Settleable Solids (ml/l)	0.1	0.0	0.0	0.0	0.1	0.1	0.6
Total Solids	130	220	194	170	178	214	244
Total Volatile Solids	--	--	--	--	--	--	74
Total Kjeldahl-Nitrogen	8.0	4.6	4.8	6.1	6.6	5.8	12
Ammonia-Nitrogen	6.1	3.1	3.0	6.0	6.2	5.4	9.3
Nitrate-Nitrogen	2.3	11	11	10	7.6	9.1	5.2
Total Phosphorus	3.4	3.8	3.5	3.6	2.9	4.9	6.0
Ortho-Phosphorus	--	--	--	3.6	2.8	4.3	5.5
Turbidity (NTU)	3.0	1.9	1.3	1.2	1.3	1.1	2.1
Chloride	--	--	--	--	54	--	45
Hardness	--	--	--	--	--	--	18
Total Coliform/100ml	2,260	--	--	--	10	50	--
Fecal Coliform/100ml	170	--	--	--	<5	<5	--
Flow (MGD)	--	--	--	1.36	1.23	1.20	0.698

\*Appears too high

STANLEY WOOLEN COMPANY

LOCATION: Route 16, Uxbridge  
RECEIVING WATER: Blackstone River  
CAPACITY: 0.30 MGD  
TREATMENT PROCESS: Screens, Lagoon  
SLUDGE DISPOSAL: Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/24/79	EFFLUENT 10/2/79
TYPE OF SAMPLE:	<u>GRAB</u>	<u>GRAB</u>
<u>PARAMETER</u>		
COD	506	288
BOD <sub>5</sub>	162	57
pH (Standard Units)	4.5	7.1
Total Alkalinity	0.0	43
Suspended Solids	51	32
Settleable Solids (ml/l)	0.1	0.0
Total Solids	434	286
Total Kjeldahl-Nitrogen	15	5.6
Ammonia-Nitrogen	5.2	0.33
Nitrate Nitrogen	1.0	1.0
Total Phosphorus	1.9	1.5
Ortho-Phosphorus	--	--
Turbidity (NTU)	110	42
Total Coliform/100ml	2,400	--
Fecal Coliform/100ml	36	--
Flow (MGD)	*	*

\*No meter

DOUGLAS SEWAGE TREATMENT PLANT

LOCATION: Charles & North Streets, Douglas  
RECEIVING WATER: Mumford River  
CAPACITY: 0.7 MGD  
TREATMENT PROCESS: Comminutor, Aeration, Settling,  
Chlorination  
SLUDGE DISPOSAL: Drying Beds, Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

	<u>EFFLUENT</u> 4/24-25/79 <u>24-Hr. Comp.</u>	<u>EFFLUENT</u> 10/3-4/79 <u>24-Hr. Comp.</u>
DATE OF COLLECTION:		
TYPE OF SAMPLE:		
<u>PARAMETER</u>		
COD	83	48
BOD <sub>5</sub>	15	12
pH (Standard Units)	7.2	7.4
Total Alkalinity	83	82
Suspended Solids	8.5	7.5
Settleable Solids (ml/l)	0.0	0.5
Total Solids	336	300
Total Kjeldahl-Nitrogen	9.8	6.9
Ammonia-Nitrogen	3.3	5.5
Nitrate-Nitrogen	0.3	1.9
Total Phosphorus	8.2	6.2
Turbidity (NTU)	6.2	1.7
Total Coliform/100ml	4,900	500
Fecal Coliform/100ml	40	<5
Flow (MGD)	0.039	0.714

HAYWARD SCHUSTER WOOLEN MILLS

LOCATION: Gilboa Street, Douglas  
RECEIVING WATER: Gilboa Brook to Mumford River  
CAPACITY: 1.25 MGD  
TREATMENT PROCESS: Chemical Addition, Vibrating Screen,  
Aeration, Settling  
SLUDGE DISPOSAL: Drying Beds, Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

	<u>EFFLUENT</u> 4/24-25/79 24-Hr. Comp.	<u>EFFLUENT</u> 4/25-26/79 24-Hr. Comp.	<u>EFFLUENT</u> 10/3-4/79 24-Hr. Comp.
<u>PARAMETER</u>			
COD	267	199	162
BOD <sub>5</sub>	25	19	10
pH (Standard Units)	7.5	7.7	7.0
Total Alkalinity	155	177	126
Suspended Solids	45	30	36
Total Solids	1,000	1,156	856
Total Kjeldahl-Nitrogen	19	14	15
Ammonia-Nitrogen	16	14	12
Nitrate-Nitrogen	0.4	0.3	0.7
Total Phosphorus	1.7	0.90	1.4
Turbidity (NTU)	40	--	22
Phenol	0.04	0.05	--
Chromium	0.20	0.15	--
Settleable Solids (ml/l)	--	--	2.0
Flow (MGD)	1.0	1.0	1.0

WHITIN MACHINE CO, ATF DAVIDSON

LOCATION: Northbridge  
RECEIVING WATER: Mumford River  
CAPACITY: 0.025 MGD  
TREATMENT PROCESS: pH Adjustment, Chemical Addition, Settling  
SLUDGE DISPOSAL: Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/23/79	EFFLUENT 10/3/79
TYPE OF SAMPLE:	<u>GRAB</u>	<u>GRAB</u>
<u>PARAMETER</u>		
pH (Standard Units)	8.2	8.3
Oil and Grease	1.5	--
Cyanide	0.02	1.9
Cadmium	0.00	0.00
Chromium	0.00	0.01
Chromium +6	0.000	0.000
Copper	0.08	0.11
Nickel	1.4	10
Zinc	0.06	0.04
Iron	--	1.3
Amenable Cyanide	--	1.9
Total Coliform/100ml	--	200
Fecal Coliform/100ml	--	<5
Flow (MGD)	0.020	0.015



EMIL BERNAT YARNS

LOCATION: Route 16, Uxbridge  
RECEIVING WATER: Mumford River  
CAPACITY: 0.25 MGD  
TREATMENT PROCESS: Settling Tank  
SLUDGE DISPOSAL: Pumped

RESULTS OF LABORATORY ANALYSES (mg/l)

	EFFLUENT 4/23/79 <u>GRAB</u>	EFFLUENT 10/3-4/79 <u>24-Hr. Comp.</u>
<u>PARAMETER</u>		
COD	626	324
BOD <sub>5</sub>	198	38
pH (Standard Units)	5.5	7.4
Total Alkalinity	27	76
Suspended Solids	64	7.0
Total Solids	580	588
Turbidity (NTU)	60	16
Total Kjeldahl-Nitrogen	12	6.9
Ammonia-Nitrogen	0.66	1.2
Nitrate Nitrogen	0.2	1.1
Total Phosphorus	7.2	2.6
Flow (MGD)	0.323	0.162

UPTON SEWAGE TREATMENT PLANT

LOCATION: Maple Avenue, Upton  
RECEIVING WATER: West River  
CAPACITY: 0.15 MGD  
TREATMENT PROCESS: Comminutor, Aeration, Settling, Dosing  
Tank, Sand Filters, Chlorination  
SLUDGE DISPOSAL: Aeration, Drying Beds, Landfill

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/24/79	EFFLUENT 10/3-4/79
TYPE OF SAMPLE:	<u>GRAB</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>		
COD	28	18
BOD <sub>5</sub>	9.0	2.0
pH (Standard Units)	6.6	7.0
Total Alkalinity	42	33
Suspended Solids	4.0	2.0
Settleable Solids (ml/l)	0.0	0.0
Total Kjeldahl-Nitrogen	9.9	3.6
Ammonia-Nitrogen	5.9	0.60
Nitrate-Nitrogen	2.3	6.4
Total Phosphorus	3.4	2.6
Ortho-Phosphorus	--	--
Turbidity (NTU)	3.0	2.0
Total Solids	184	204
Total Coliform/100ml	<20	100
Fecal Coliform/100ml	<10	<5
Flow (MGD)	0.10	0.04*

\*Estimate

UXBRIDGE WASTEWATER TREATMENT FACILITY

LOCATION: Off Route 122, Uxbridge

RECEIVING WATER: Blackstone River

CAPACITY: 2.5 MGD

TREATMENT PROCESS: Primary Settling, Aeration, Clarifiers, Chlorination

SLUDGE DISPOSAL: Sludge Thickening, Vacuum Filter, Landfilled On-site

RESULTS OF LABORATORY ANALYSES (mg/l)

	EFFLUENT 6/9-10/80	EFFLUENT 6/10-11/80	EFFLUENT 10/15-16/80
	<u>24-Hr.Comp.</u>	<u>24-Hr.Comp.</u>	<u>24-Hr.Comp.</u>
<u>PARAMETER</u>			
COD	--	--	131
BOD <sub>5</sub>	25	24	11
pH (Standard Units)	7.7	7.4	7.0
Total Alkalinity	32	46	38
Hardness	--	--	25
Suspended Solids	34	2.6	15
Settleable Solids (ml/l)	0.0	0.1	0.1
Total Solids	426	460	460
Total Volatile Solids	5.1	--	124
Turbidity (NTU)	15	18	2.7
Kjeldahl-Nitrogen	16.9	12.1	7.2
Ammonia-Nitrogen	14.8	12.0	4.5
Nitrate-Nitrogen	0.6	0.1	11
Total Phosphorus	5.5	6.6	5.8
Ortho-Phosphorus	5.1	5.1	5.5
Chloride	--	48	--
Total Coliform/100ml	430,000	1,000	--
Fecal Coliform/100ml	43,000	<5	--
Flow (MGD)	0.30	0.24	0.29

BLACKSTONE POTATO CHIP COMPANY

LOCATION: Main Street, Blackstone  
RECEIVING WATER: Blackstone River  
CAPACITY: 10,000 GPD  
TREATMENT PROCESS: None. Will discharge to the Woonsocket, RI  
Sewage Treatment Plant

RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	EFFLUENT 4/23/79	EFFLUENT 10/3/79	EFFLUENT 6/9/80
TYPE OF SAMPLE:	<u>GRAB</u>	<u>GRAB</u>	<u>GRAB</u>
<u>PARAMETER</u>			
COD	442	504	640
BOD <sub>5</sub>	123	320	282
pH (Standard Units)	9.6	6.0	7.8
Total Alkalinity	60	48	56
Phenothalein Alkalinity	19	--	--
Suspended Solids	130	61	464
Total Solids	482	--	716
Total Kjeldahl-Nitrogen	6.0	5.2	19
Ammonia-Nitrogen	0.01	3.8	7.1
Nitrate-Nitrogen	0.1	2.2	0.0
Total Phosphorus	2.2	5.0	4.5
Ortho-Phosphorus	--	--	2.6
Oil and Grease	548	52	17
Turbidity (NTU)	--	78	21

HOPEDALE SEWAGE TREATMENT PLANT

LOCATION: Route 16, Hopedale  
RECEIVING WATER: Mill River  
CAPACITY: 0.30 MGD  
TREATMENT PROCESS: Comminutor, Imhoff Tank, Trickling Filter  
Settling Tank, Chlorination

HOPEDALE SEWAGE TREATMENT PLANT  
RESULTS OF LABORATORY ANALYSES (mg/l)

DATE OF COLLECTION:	INFLUENT 4/23-24/79	EFFLUENT 4/23-24/79	EFFLUENT 4/24/79	INFLUENT 10/1-2/79	EFFLUENT 10/1-2/79	EFFLUENT 10/2-3/79	EFFLUENT 10/3-4/79
TYPE OF SAMPLE:	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>GRAB</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>	<u>24-Hr. Comp.</u>
<u>PARAMETER</u>							
COD	221	147	37	372	324	120	114
BOD <sub>5</sub>	114	54	17	120	15	24	20
pH (Standard Units)	7.3	7.7	6.9	7.2	7.3	7.6	7.6
Total Alkalinity	123	104	116	151	103	100	96
Suspended Solids	47	38	6.0	89	29	22	24
Settleable Solids (ml/l)	2.0	1.3	0.1	6.5	1.0	0.8	1.0
Total Solids	338	330	284	442	330	302	292
Turbidity (NTU)	37	25	17	28	6.4	17	15
Total Kjeldahl-Nitrogen	19	18	15	34	22	20	18
Ammonia-Nitrogen	19	17	15	23	18	18	13
Nitrate-Nitrogen	0.4	1.9	0.7	0.8	5.5	5.1	3.7
Total Phosphorus	5.4	6.8	4.7	10	9.3	6.8	5.6
Total Coliform/100ml	--	--	24,000	--	5,600	--	--
Fecal Coliform/100ml	--	--	230	--	400	--	--
Flow (MGD)	--	--	0.300	--	0.300	--	0.400*

\*Estimate

## GLOSSARY

Acidity - The quantitative capacity of aqueous solutions to react with hydroxyl ions. It is measured by titration with a standard solution of a base to a specified end point. Usually expressed as milligrams per liter of calcium carbonate.

Alkalinity - The capacity of water to neutralize acids, a property imparted by the water's content of carbonates, bicarbonates, hydroxides, and occasionally borates, silicates, and phosphates. It is expressed in milligrams per liter of equivalent calcium carbonate.

Anaerobic Waste Treatment - Waste stabilization brought about through the action of microorganisms in the absence of air or elemental oxygen. Usually refers to waste treatment by methane fermentation.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen used in the biochemical oxidation of organic matter in a specified time, at a specified temperature, and under specified conditions.

Biological Wastewater Treatment - Forms of wastewater treatment in which bacterial or biochemical action is intensified to stabilize, oxidize, and nitrify the unstable organic matter present. Intermittent sand filters, contact beds, trickling filters, and activated sludge processes are examples.

Chemical Oxygen Demand (COD) - A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater. It is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test. It does not differentiate between stable and unstable organic matter and thus does not necessarily correlate with biochemical oxygen demand.

Chlorination - The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results.

Clarification - Any process or combination of processes, the primary purpose of which is to reduce the concentration of suspended matter in a liquid.

Coliform - Bacteria found in abundance in the intestinal tract of warm-blooded animals. They are not harmful in themselves, but their presence indicates that pathogenic bacteria may be present. Since they can be detected by relatively simple test procedures, coliforms are used to indicate the extent of bacterial pollution from sewage. Bacterial tests usually measure the fecal and total coliforms. Fecal coliform make up about 90 percent of the coliforms discharged in fecal matter. Non-fecal coliforms may originate in soil, grain, or decaying vegetation.

Comminution - The process of cutting and screening solids contained in the wastewater flow before it enters the flow pumps or other units in the treatment plant.

Composite Wastewater Sample - A combination of individual samples of water or wastewater taken at selected intervals, generally hourly, for some specified period, to minimize the effect of the variability of the individual sample. Individual samples may have equal volume or be proportioned to the flow at the time of sampling.

Data - Records of observations and measurements of physical facts, occurrences, and conditions, reduced to written, graphical, or tabular form.

Fats (wastes) - Triglyceride esters of fatty acids; erroneously used as synonymous with grease.

Flocculation - In water and wastewater treatment, the agglomeration of colloidal and finely divided suspended matter after coagulation by gentle stirring by either mechanical or hydraulic means. In biological wastewater treatment where coagulation is not used, agglomeration may be accomplished biologically.

Grab Sample - A single sample of wastewater taken at neither set time nor flow.

Grease - In wastewater, a group of substances including fats, waxes, free fatty acids, calcium and magnesium soaps, mineral oils, and certain other nonfatty materials. The type of solvent and method used for extraction should be stated for quantification.

Grit Chamber - A detention chamber or enlargement of a sewer designed to reduce the velocity of flow of the liquid to permit the separation of mineral from organic solids by differential sedimentation.

Hardness - A characteristic of water imparted by salts of calcium, magnesium, and iron such as bicarbonates, carbonates, sulfates, chlorides, and nitrates, that cause curdling of soap, deposition of scale in boilers, damage in some industrial processes, and sometimes objectionable taste. It is expressed as equivalent calcium carbonate.

Heavy Metals - These elements are toxic when present in sufficient quantities and can be fatal. They can adversely affect sewage treatment systems and the biological systems of waterbodies. They include cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc.

Industrial Wastes - The liquid wastes from industrial processes, as distinct from domestic or sanitary wastes.

Inorganic Matter - Chemical substances of mineral origin, or, more correctly, not of basically carbon structure.

Lagoon - A pond containing raw or partially treated wastewater in which aerobic or anaerobic stabilization occurs.

Most Probable Number (MPN) - That number of organisms per unit volume that, in accordance with statistical theory, would be more likely than any other number to yield the observed test result with the greatest frequency. Expressed as density of organisms per 100 ml. Results are computed from the number of positive findings of coliform-group organisms resulting from multiple-portion decimal-dilution plantings.



Nitrogen - A common non-metallic element that in free form is normally a colorless, odorless, tasteless, insoluble, inert, diatomic gas. In the combined form, it has a wide range of valences and is a constituent of biologically important compounds (as proteins) and hence of all living cells as well as industrially important substances (as cyanides, fertilizers, dyes).

Nitrogen, Ammonia - A compound of nitrogen and hydrogen,  $\text{NH}_3$ , which is part of the nitrogen cycle. Its presence in sufficient amounts in a stream can indicate a wastewater discharge. The oxidation of ammonia depletes a stream of dissolved oxygen. It is toxic in sufficient amounts, especially to fish.

Nitrogen, Kjeldahl - This represents the total organic nitrogen content of water.

Nitrogen, Nitrate - Nitrate represents the most highly oxidized phase in the nitrogen cycle and normally reaches important concentrations in the final stages of biological oxidation. Nitrogen in this form is readily available to plants.

Organic Matter - Chemical substances of animal or vegetable origin, or more correctly, of basically carbon structure, comprising compounds consisting of hydrocarbons and their derivatives.

Oxidation - The addition of oxygen to a compound. More generally, any reaction which involves the loss of electrons from an atom.

Oxidation Pond - A basin used for the retention of wastewater before final disposal, in which biological oxidation of organic matter is affected by natural or artificially accelerated transfer of oxygen to the water from air.

Parshall Flume - A calibrated device developed by Parshall for measuring the flow of a liquid in an open conduit.

Pathogenic Bacteria - Bacteria that may cause disease in the host organism by their parasitic growth.

pH - The reciprocal of the logarithm of the hydrogen ion concentration. The concentration is the weight of hydrogen ions in grams per liter of solution. Neutral water, for example, has a pH value of 7 and hydrogen ion concentration of  $10^{-7}$ .

Phenol - An aromatic compound which is a monohydroxy derivative of benzene. In concentrated solution, it is quite toxic to bacteria. Widely used as a germicide. Commonly known as carboic acid.

Phosphorus - A nonmetallic multivalent element of the nitrogen family that occurs widely in combined form, especially as inorganic phosphates in minerals, soils, and natural waters, and as organic phosphates in all living cells; it exists in several allotropic forms. The majority of

the phosphorus contained in domestic sewage and industrial wastes comes from detergents.

Primary Settling Tank - The first settling tank for the removal of settleable solids through which wastewater is passed in a treatment works.

Primary Treatment - The first major (sometimes the only) treatment in a wastewater treatment works, usually sedimentation. The removal of a substantial amount of suspended matter but little or no colloidal and dissolved matter.

Residual Chlorine - Chlorine remaining in water or wastewater at the end of a specified contact time as combined or free chlorine.

Sampler - A device used with or without flow measurement to obtain an aliquot portion of water or waste for analytical purposes. May be designed for taking a single sample (grab), composite sample, continuous sample, or periodic sample.

Secondary Settling Tank - A tank through which effluent from some prior treatment process flows for the purpose of removing settleable solids.

Secondary Wastewater Treatment - The treatment of wastewater by biological methods after primary treatment by sedimentation.

Sludge Digestion - The process by which organic or volatile matter in sludge is gasified, liquified, mineralized, or converted into more stable organic matter through the activities of either anaerobic or aerobic organisms.

Sludge Thickening - The increase in solids concentration of sludge in a sedimentation or digestion tank.

Solids, Settleable - That matter in wastewater which will not stay in suspension during a pre-selected settling period, such as an hour, but which either settles to the bottom or to the top. In the Imhoff cone test, the volume of matter that settles to the bottom in one hour.

Solids, Suspended - Solids that either float on the surface of, or are in suspension in, water, wastewater, or other liquids and which are largely removable by laboratory filtering. The quantity of material removed from wastewater in a laboratory test, as prescribed in Standard Methods for the Examination of Water and Wastewater, and referred to as non-filterable residue.

Solids, Total - The sum of dissolved and undissolved constituents in water or wastewater, usually stated in milligrams per liter.

Wastewater Survey - An investigation of the quality and characteristics of each waste stream, as in an industrial plant or municipality.