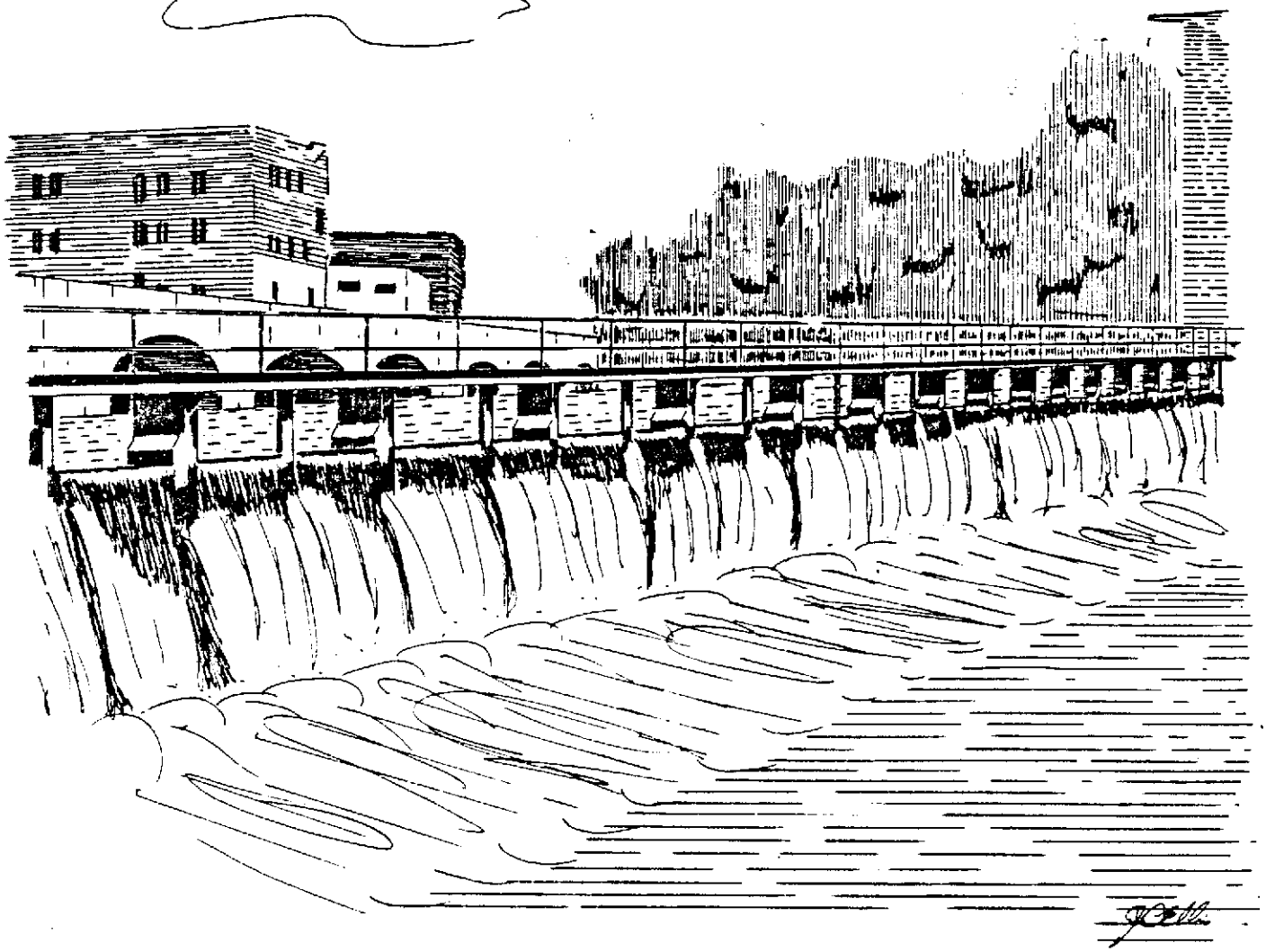
73-B-3

THE CHARLES RIVER



1973 & 1976

PART B WASTEWATER DISCHARGE DATA

department of environmental quality engineering

DIVISION OF WATER POLLUTION CONTROL

thomas c. mcmahon, director

CHARLES RIVER

1973 and 1976

WASTEWATER DISCHARGE SURVEY

Prepared by

Water Quality Section
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Westborough, Massachusetts
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FOREWORD - 1973-74 SURVEY

This report presents the results of the Charles River 1973-74 wastewater discharge survey conducted by the Massachusetts Water Resources Commission, Division of Water Pollution Control. This discharge survey is part of an on-going program of water quality and discharge monitoring by the Division, and it particularly complements the Charles River 1973 water quality survey. Note the previously published Charles River 1973 Part A and Charles River Study 1967, Parts A & B, also by the Division.

The Charles River flows 80 miles from Hopkinton to Boston Harbor in eastern Massachusetts. At the mouth, the backwater of the Charles River Dam, Boston, (an 8.6-mile-long impoundment) is called the "Charles Basin." Two major Charles River tributaries (Mine Brook, Franklin, and Stop River, Wrentham-Norfolk-Medfield) and one very small tributary (Sugar Brook, Millis) receive significant wastewater discharges, as does the main stem itself.

Wastewater discharges were sampled during the periods of December 10-13, 1973, and July 22-25, 1974. The sampling procedure for National Can, Cott, and GAF Corporations on Sugar Brook, Millis, was somewhat unusual and is described in detail in the body of this report. For the remaining discharges, only final effluents were sampled; and, except for Pondville Hospital, Norfolk, and Your Laundry, Medway, where grab samples were taken, sampling was accomplished by Serco automatic samplers. The automatic samplers collected hourly samples of each discharge for three consecutive 24-hour periods. Each set of 24 samples was composited, using hourly flow rates as weighting factors. In several instances as noted in the report, it was necessary to estimate flow rates. Flow gaging in Sugar Brook was done with a Model 625 Gurley pygmy meter.

All samples were conveyed to the Lawrence Experiment Station of the Massachusetts Department of Public Health for chemical analyses, except for dissolved oxygen determinations, which were performed by Division personnel using the azide-iodometric modification of the Winkler titration method. All analyses were performed in accordance with the APHA's Standard Methods for the Examination of Water and Wastewater (13th edition, 1971, New York).

The "Mass Discharge" data reported in Tables 15 and 16 provide the best means for comparing the various pollution discharges. The "mass discharge" is obtained by multiplying flow rate times concentration and converting to appropriate units. Since the concentrations reported in Tables 2-14 are generally for flow-weighted composite samples, the daily mass discharge is rightly calculated by using these concentrations and the corresponding average daily flows (also reported in Tables 2-14). This procedure was followed, and the resulting three daily mass discharges for each source were averaged in Tables 15 and 16.

Several omissions from this report should be noted. Garelick Farms, Franklin, located on Route 140 about three-quarters of a mile west of Mine Brook, is a dairy producer. Intermittent discharge of washwater and whey waste travels a mile through a swamp before draining into Mine Brook below the discharge

of the Franklin Municipal Sewage Treatment Plant. The relatively small but very difficult to assess impact of Garelick Farms' discharge on Mine Brook does not justify its inclusion in this report, although the Division recognizes the significance of this discharge in the context of legal enforcement. The Town of Medfield has a small sewage treatment plant on Mill Brook, a small tributary to the Charles. This plant was not sampled because it is to be replaced by a new advanced wastewater treatment plant discharging directly to the Charles; and moreover, during the 1973 water quality survey, Mill Brook below the old plant's discharge was sampled and was not found to be severely polluted. (The new plant, located near the Charles off West Street, Medfield, will go into operation in early 1975.) Cooling water and sand and gravel washing discharges, of which there were several on the Charles and its tributaries (all of a minor nature), also were not sampled.

The Charles Basin, although part of the Charles River, is quite peculiar in the nature of its hydrology and water quality and is conveniently dealt with separately from the rest of the Charles River. (See the Division's Charles Basin 1974 Part A.) Pollution sources of the Charles Basin are the subject of a number of special studies done by or under contract to the Division and the Metropolitan District Commission.

The assistance and cooperation of the following persons are gratefully acknowledged: Bill Pavia, Bettinger Corporation, Milford; John Roberti, Milford Sewage Treatment Plant; Paul Caron, Franklin Sewage Treatment Plant; Walter Botis, Pondville State Hospital; Archie Tozian, Wrentham State School; Lawrence Burns and W. Hancock, Massachusetts Correctional Institute at Norfolk; Duke Aalto, Cott Corporation, Millis; Richard Barrett and Emil Verderber, Millis Department of Public Works; John Dolan and Dan Sullivan, Medfield State Hospital; and George Minasian and the staff of the Lawrence Experiment Station.

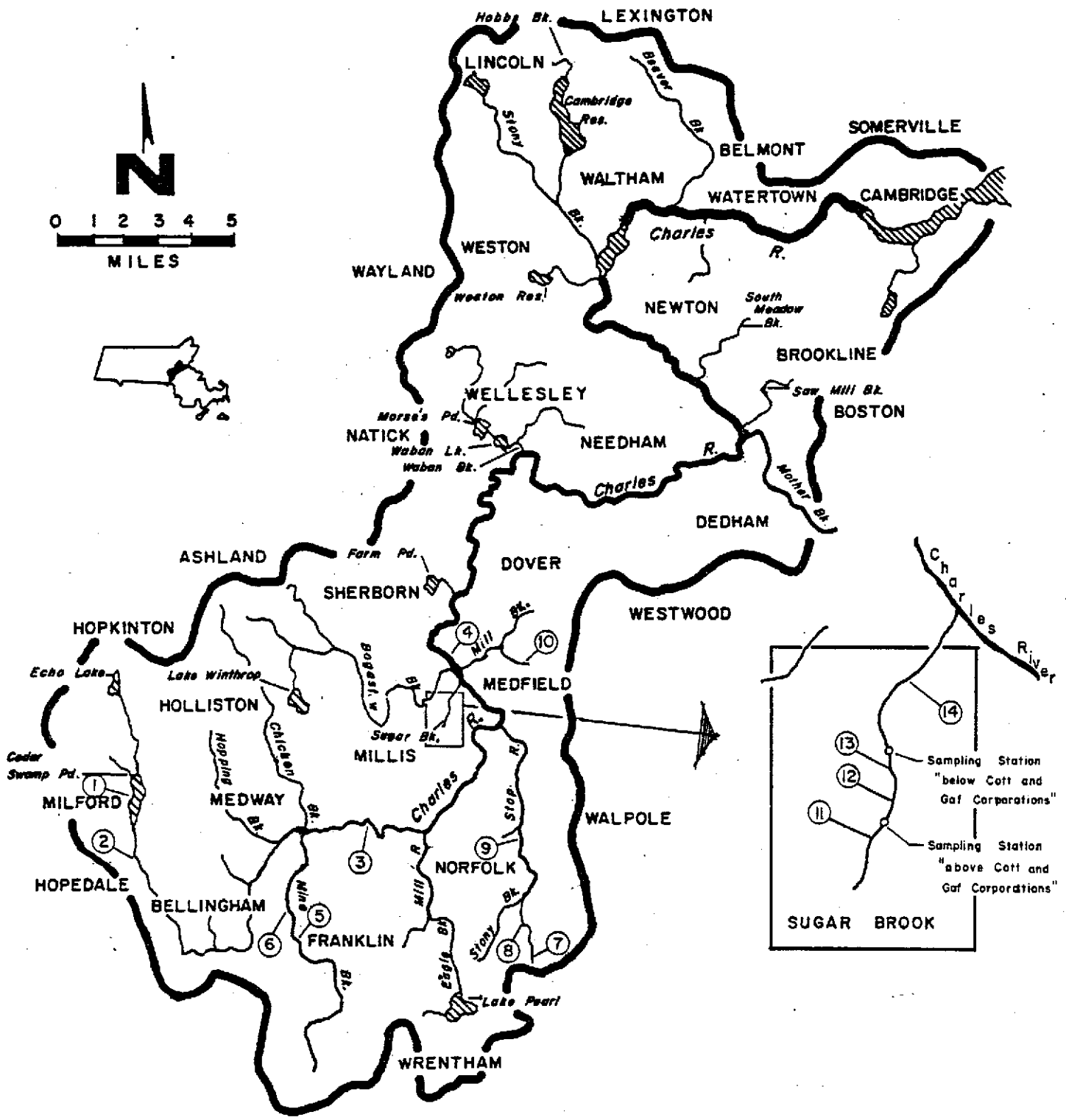
The Charles River 1973-74 discharge survey data were compiled and tabulated by personnel of the Division of Water Pollution Control.

TABLE 1

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

LIST OF WASTEWATER DISCHARGES

SOURCE NUMBER IN FIGURE 1	SOURCE	TABLE REFERENCE
	DISCHARGES TO CHARLES RIVER:	
1	Bettinger Corporation, Milford	2
2	Milford Municipal Sewage Treatment Plant, Hopedale	3
3	Your Laundry, Medway	4
4	Medfield State Hospital, Medfield	5
	DISCHARGES TO MINE BROOK:	
5	Franklin Municipal Sewage Treatment Plant, Franklin	6
6	Garelick Farms, Franklin	-
	DISCHARGES TO STOP RIVER:	
7	Pondville State Hospital, Norfolk	7
8	Wrentham State School, Wrentham	8
9	Norfolk-Walpole Massachusetts Correctional Institutes, Norfolk	9
	DISCHARGE TO MILL BROOK:	
10	Medfield Municipal Sewage Treatment Plant, Medfield	-
	DISCHARGES TO SUGAR BROOK:	
11	National Can Corporation, Millis	10
12	Cott Corporation, Millis	10, 11, 12
13	GAF Corporation, Millis	12
14	Millis Municipal Sewage Treatment Plant, Millis	13



LOCATION OF WASTEWATER DISCHARGES

Figure 1

BETTINGER CORPORATION, MILFORD

Bettinger Corporation is located on Sumner Street, Milford, and discharges into Cedar Swamp Pond (a main stem impoundment of the Charles River). The manufacturing process consists of putting ceramic coatings on metal products. Process wastewater flows through a series of three sedimentation lagoons before final discharge. In addition, hazardous wastes are removed periodically by a private contractor. The plant operates mainly in the daytime, with a small night crew.

The outlet of the last sedimentation lagoon was sampled by automatic sampler hourly for three consecutive 24-hour periods, beginning December 10, 1973. The three composite samples were weighted roughly according to plant operation, with allowance for flow stabilization resulting from the series of lagoons. The daily flows reported in Table 2 are based on metered water use less sanitary use by employees.

TABLE 2

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

BETTINGER CORPORATION, MILFORD

DATE	12/10/73-12/11/73	12/11/73-12/12/73	12/12/73-12/13/73
TIME	10:00-9:30	9:30-9:30	9:30-9:00
COD	22.	16.	16.
BOD_5	6.0	13.	1.4
pH	7.8	7.1	7.0
Total Alkalinity	47	33	21
Suspended Solids	37	44	17
Total Solids	278	338	236
Total Kjeldahl Nitrogen	0.56	1.5	0.42
Ammonia Nitrogen	0.03	0.00	0.02
Nitrate Nitrogen	0.1	0.1	0.1
Total Phosphorus	0.12	0.29	0.16
Magnesium	0.6	0.7	0.8
Copper	0.05	0.08	0.08
Chromium	0.04	0.08	0.04
Cadmium	0.02	0.01	0.01
Nickel	0.45	0.60	0.70
Zinc	0.13	0.15	0.17
Iron	4.0	6.0	8.5
Aluminum	---	---	0.5
Flow (MGD)	0.0078	0.0098	0.018
(CFS)	0.012	0.015	0.028

N.B. All concentrations in mg/l.

MILFORD MUNICIPAL SEWAGE TREATMENT PLANT, HOPEDALE

The Milford Sewage Treatment Plant is located below Milford on the Charles River, off Route 140 in Hopedale. The plant provides secondary treatment (trickling filters) and chlorination before discharge to the River.

Using an automatic sampler, three 24-hour composite samples of the final effluent were obtained during December 10-13, 1973. The composites were flow-weighted, using data from the plant's flow meter record for each day. The average daily flows reported in Table 3 are also derived from these records.

TABLE 3

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

MILFORD MUNICIPAL SEWAGE TREATMENT PLANT, HOPEDALE

DATE	12/10/73- 12/11/73	12/11/73- 12/12/73	12/12/73- 12/13/73
TIME	10:30- 10:30	10:30- 10:30	10:30- 10:30
COD	239.	162.	65.
BOD_5	32.	33.	26.
pH	7.1	7.1	7.3
Total Alkalinity	69	67	66
Suspended Solids	54	62	39
Total Solids	334	360	266
Total Kjeldahl Nitrogen	10.0	11.0	11.0
Ammonia Nitrogen	7.5	7.2	8.3
Nitrate Nitrogen	6.0	6.4	6.7
Total Phosphorus	6.6	1.8	2.8
Flow (MGD)	2.8	2.6	2.5
(CFS)	4.3	4.0	3.9

N.B. All concentrations in mg/l.

YOUR LAUNDRY, MEDWAY

Your Laundry is a small commercial laundry located by the Charles River on Walker Street, Medway. Discharge, which is directly to the Charles River, occurs during the daytime only. No wastewater treatment is provided.

Grab samples of the final discharge were obtained on July 23, 24 and 25, 1974. It was not possible to obtain flow data, however the total daily discharge is estimated to be not more than 1,000 gallons.

TABLE 4

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

YOUR LAUNDRY, MEDWAY

DATE	7/23/74	7/24/74	7/25/74
TIME	11:00	11:00	11:00
COD	108.	103.	38.
BOD_5	25.	0.6	3.0
pH	10.0	9.7	7.2
Total Alkalinity	98	116	25
Suspended Solids	3	19	66
Total Solids	346	348	162
Total Kjeldahl Nitrogen	3.1	3.9	1.1
Ammonia Nitrogen	0.03	0.29	0.15
Nitrate Nitrogen	1.8	1.8	1.8
Total Phosphorus	6.0	6.5	2.0
Phenolphthalein Alkalinity	98	---	---

N.B. All concentrations in mg/l.

MEDFIELD STATE HOSPITAL, MEDFIELD

The Medfield State Hospital lies north of Route 27 near the Charles River in Medfield. The Hospital has its own sewage treatment plant on the other side of Route 27. The plant has intermittent sand filters and chlorination, and discharges via a ditch, more or less directly to the Charles River.

An automatic sampler was used to collect three 24-hour composite samples beginning July 22, 1974. The composite samples were weighted on the basis of an estimated diurnal flow variation. Based on metered water use at the Hospital for the month of July, 1974, the average daily discharge is roughly 160,000 gallons.

TABLE 5

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

MEDFIELD STATE HOSPITAL, MEDFIELD

DATE	7/22/74-7/23/74	7/23/74-7/24/74	7/24/74-7/25/74
TIME	11:30-7:00	7:00-7:00	7:00-7:00
COD	54.	104.	57.
BOD_5	18.	36.	16.
pH	6.9	7.8	6.9
Total Alkalinity	105	83	103
Suspended Solids	2.	1.	6.5
Total Solids	250	380	252
Total Kjeldahl Nitrogen	7.8	6.4	5.8
Ammonia Nitrogen	4.8	4.5	4.3
Nitrate Nitrogen	0.8	0.7	1.3
Total Phosphorus	8.5	7.5	6.5

N.B. All concentrations in mg/l.

FRANKLIN MUNICIPAL SEWAGE TREATMENT PLANT, FRANKLIN

The Franklin Sewage Treatment Plant lies between Pond Street and Mine Brook, near the Route 140-495 interchange. This is a secondary plant (trickling filters). At the time of sampling, the final lagoons were being by-passed to allow much-needed renovation. (Renovation of the plant has now been completed.)

The final discharge was sampled by automatic sampler for three consecutive 24-hour periods beginning December 10, 1973. Composite samples were flow-weighted. Average daily flows reported are from the plant flow-meter records.

TABLE 6

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

FRANKLIN MUNICIPAL SEWAGE TREATMENT PLANT, FRANKLIN

DATE	12/10/73-12/11/73	12/11/73-12/12/73	12/12/73-12/13/73
TIME	11:30-11:30	12:00-11:30	11:30-11:00
COD	337.	394.	416.
BOD_5	174.	140.	126.
pH	7.0	6.9	7.1
Total Alkalinity	106	89	99
Suspended Solids	193	141	142
Total Solids	704	822	828
Total Kjeldahl Nitrogen	27.	25.	30.
Ammonia Nitrogen	19.	13.	16.
Nitrate Nitrogen	2.4	2.2	2.8
Total Phosphorus	10.	2.8	5.6
Flow (MGD)	1.5	1.5	1.6
(CFS)	2.3	2.3	2

N.B. All concentrations in mg/1.

PONDVILLE STATE HOSPITAL, NORFOLK

The Pondville State Hospital is on Route 1A, in the southeast corner of Norfolk. The Hospital has a small sewage treatment facility which provides sand filtration and chlorination. (Although this form of treatment is today considered obsolete, this facility demonstrates that with careful operation and maintenance, a high quality effluent can be obtained.) The facility discharges to a small brook tributary to the Stop River, one of the major tributaries of the Charles River.

Grab samples of the final effluent were taken on December 10, 11, 12, and 13, 1973. The Hospital's Chief Engineer estimates the daily discharge is 40,000 gallons.

TABLE 7

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

PONDVILLE STATE HOSPITAL, NORFOLK

DATE	12/10/73	12/11/73	12/12/73	12/13/73
TIME	12:00	12:40	12:30	11:30
COD	33.	27.	173.	11.
BOD_5	0.3	0.3	9.3	2.4
pH	6.6	6.8	6.5	6.5
Total Alkalinity	22	28	24	19
Suspended Solids	5.0	9.0	17	1.0
Total Solids	184	163	254	154
Total Kjeldahl Nitrogen	0.42	1.7	2.7	0.98
Ammonia Nitrogen	0.08	0.78	0.45	0.07
Nitrate Nitrogen	4.4	2.2	5.4	4.4
Total Phosphorus	0.9	1.5	1.4	1.8

N.B. All concentrations in mg/l.

WRENTHAM STATE SCHOOL, WRENTHAM

The Wrentham State School, a Massachusetts Department of Mental Health Institution, is situated at Emerald and North Street, Wrentham; a half mile north on North Street, on the Wrentham-Norfolk boundary, is the School's sewage treatment facility. This secondary treatment (activated sludge) facility went into operation in 1969. Following final lagoons and chlorination, discharge is into an unnamed tributary to the Stop River.

This unnamed tributary has, in the past, been sometimes diverted by a private landowner into Stony Brook, Norfolk. Stony Brook, after flowing through Stony Brook Pond (in the Bristol-Blake State Reservation) also joins the Stop River.

The final effluent of the School's sewage treatment facility was sampled by automatic sampler during December 10-13, 1973. Three flow-weighted 24-hour composite samples were obtained. Flow data are from the facility's flow meter record.

TABLE 8

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

WRENTHAM STATE SCHOOL, WRENTHAM

DATE	12/10/73-12/11/73	12/11/73-12/12/73	12/12/73-12/13/73
TIME	14:30-14:00	14:00-14:00	14:00-14:00
COD	11.	16.	27.
BOD_5	3.9	2.4	3.6
pH	7.3	7.4	7.6
Total Alkalinity	27	30	32
Suspended Solids	11	31	35
Total Solids	236	288	176
Total Kjeldahl Nitrogen	0.84	1.7	1.1
Ammonia Nitrogen	0.03	0.02	0.12
Nitrate Nitrogen	11.	13.	11.
Total Phosphorus	3.9	1.2	2.5
Flow (MGD)	0.190	0.127	0.107
(CFS)	0.294	0.196	0.166

N.B. All concentrations in mg/l.

NORFOLK-WALPOLE MASSACHUSETTS CORRECTIONAL INSTITUTES, NORFOLK

The Massachusetts Correctional Institutes of Norfolk and Walpole are located in a State Prison Reservation lying on the Norfolk-Walpole boundary. The two Institutes share common water supply and sewerage systems. The sewage treatment facility is located off Seekonk Street in Norfolk, a half-mile below Highland Lake on the Stop River, the recipient of the facility's final discharge. At the time of sampling, this very old facility provided intermittent sand filtration and chlorination. A modern secondary treatment facility is presently under construction at this site.

Beginning December 10, 1973, the final effluent of the Institutes' sewage treatment facility was sampled hourly by automatic sampler for three 24-hour periods. Composite samples were weighted according to estimated diurnal flow variation. Personnel of the Institute at Norfolk provided the daily flow estimates given in Table 9, which are derived from metered water use.

TABLE 9

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

NORFOLK-WALPOLE MASSACHUSETTS CORRECTIONAL INSTITUTES, NORFOLK

DATE	12/10/73-12/11/73	12/11/73-12/12/73	12/12/73-12/13/73
TIME	13:30-13:15	13:30-13:30	13:00-13:00
COD	750.	130.	38.
BOD_5	51.	36.	16.
pH	6.9	6.5	7.1
Total Alkalinity	41	38	44
Suspended Solids	60	50	13
Total Solids	364	278	148
Total Kjeldahl Nitrogen	7.7	8.1	5.6
Ammonia Nitrogen	4.6	3.6	4.6
Nitrate Nitrogen	14.	13.	9.6
Total Phosphorus	1.5	1.1	1.3
Flow (MGD)	0.25	0.26	0.24
(CFS)	0.38	0.39	0.38

N.B. All concentrations in mg/1.

NATIONAL CAN, COTT, AND GAF CORPORATIONS, MILLIS

National Can, Cott, and GAF Corporations are situated near the intersection of Routes 109 and 115 in Millis; all three have direct discharges to Sugar Brook, a very small, easterly flowing stream which also receives the discharge from the Millis Municipal Sewage Treatment Plant, about a half-mile downstream, and joins the Charles River about a mile further downstream, near Dover Road. (See Figure 1) National Can Corporation, an aluminum can manufacturer, has the most upstream discharge on Sugar Brook. Next downstream is Cott Corporation, a soft drink manufacturer. Adjacent to Cott's Plant, Sugar Brook is culverted for roughly 100 yards. Cott has a major outfall at the upstream end of this culvert, and perhaps additional outfalls within it. At the GAF Plant roofing products are manufactured. GAF's discharge flows into a ditch and joins Sugar Brook at the downstream end of the culvert mentioned above.

Sampling was conducted for three daya beginning July 22, 1974. The discharge from GAF was sampled directly, while the characteristics of the discharges from National Can and Cott are to be inferred from the data for Sugar Brook itself. The two Sugar Brook sampling stations were located (1) a few feet above the culvert and Cott's major outfall, which is well below National Can's discharge ("Above Cott and GAF Corporations") and (2) a few yards below the culvert and GAF's discharge ("Below Cott and GAF Corporations"). At GAF and at the "above" and "below" stations samples were taken by hand every two hours, around the clock. From these samples, flow-weighted composite samples were obtained for each of the three days of sampling.

The rate of discharge from GAF was determined at each sampling time by V-notch weir measurements. The stream flow in Sugar Brook was determined "above" and "below" at each sampling time by gaging with a Gurley pygmy flow meter. Average daily flows reported in Tables 10, 11 and 12 were calculated by integrating the flow versus time curves over the sampling periods and dividing by the lengths of the sampling periods (because the sampling intervals were somewhat irregular). Dissolved oxygen samples and temperature measurements were taken at each station every four hours.

TABLE 10

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

SUGAR BROOK, ABOVE COTT AND GAF CORPORATIONS, MILLIS

DATE	7/22/74-7/23/74	7/23/74-7/24/74	7/24/74-7/25/74
TIME	14:00-7:30	7:30-7:30	7:30-7:30
COD	42.	77.	88.
BOD_5	4.8	7.5	6.9
pH	2.8	2.6	2.9
Acidity	158	194	178
Suspended Solids	1.	1.	3.5
Total Solids	480	672	638
Total Kjeldahl Nitrogen	1.7	3.6	11.
Ammonia Nitrogen	0.79	3.2	5.8
Nitrate Nitrogen	3.1	2.8	2.7
Total Phosphorus	0.12	0.09	0.08
Aluminum	13.	25.	0.00
Chromium	0.10	0.12	0.15
Iron	1.60	2.00	2.10
Temperature (^{o}F): Avg.	69	70	69
Range	65-75	60-76	66-71
Dissolved Oxygen: Avg.	5.8	6.2	6.5
Range	4.7-6.5	4.0-9.0	5.0-9.0
Flow (MGD)	0.06	0.06	0.06
(CFS)	0.09	0.10	0.09

N.B. All concentrations in mg/l.

TABLE 11

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

SUGAR BROOK, BELOW COTT AND GAF CORPORATIONS, MILLIS

DATE	7/22/74-7/23/74	7/23/74-7/24/74	7/24/74-7/25/74
TIME	14:00-7:30	7:30-7:30	7:30-7:30
COD	812.	1107.	1653.
BOD_5	530.	400.	990.
pH	3.6	3.3	3.6
Acidity	21	38	31
Suspended Solids	38	31	96
Total Solids	874	818	690
Total Kjeldahl Nitrogen	7.3	7.3	7.0
Ammonia Nitrogen	0.78	0.00	0.72
Nitrate Nitrogen	3.1	1.0	0.8
Total Phosphorus	3.0	4.0	3.5
Aluminum	17.	10.	0.25
Chromium	0.10	0.06	0.10
Iron	1.60	2.00	2.10
Temperature (^{o}F): Avg.	69	70	68
Range	66-70	66-74	67-70
Dissolved Oxygen: Avg.	1.9	1.5	1.0
Range	0.0-3.8	0.3-4.0	0.0-4.3
Flow (MGD)	0.19	0.19	0.18
(CFS)	0.30	0.29	0.27

N.B. All concentrations in mg/l.

TABLE 12

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

GAF CORPORATION, MILLIS

DATE	7/22/74-7/23/74	7/23/74-7/24/74	7/24/74-7/25/74
TIME	14:00-7:30	7:30-7:30	7:30-7:30
COD	23.	35.	34.
BOD_5	1.8	0.9	1.8
pH	7.7	7.6	7.5
Total Alkalinity	44	46	45
Suspended Solids	4.	5.	14
Total Solids	238	236	238
Total Kjeldahl Nitrogen	0.98	0.84	0.37
Ammonia Nitrogen	0.02	0.06	0.06
Nitrate Nitrogen	1.7	1.8	1.7
Total Phosphorus	0.45	1.5	2.0
Aluminum	0.17	0.17	0.10
Chromium	0.03	0.02	0.02
Iron	0.65	0.40	0.60
Temperature (^{o}F): Avg.	72	75	71
Range	70-75	70-78	68-73
Dissolved Oxygen: Avg.	7.7	7.7	7.3
Range	7.0-9.0	6.2-9.2	6.4-8.6
Flow (MGD)	0.01	0.03	0.07
(CFS)	0.02	0.04	0.11

N.B. All concentrations in mg/l.

MILLIS MUNICIPAL SEWAGE TREATMENT PLANT, MILLIS

The Millis Sewage Treatment Plant is located on Sugar Brook near the Millis Public Works Garage. It is a secondary (activated sludge) plant with chlorination, and its discharge is into Sugar Brook about a mile from the Brook's confluence with the Charles River.

The final effluent was sampled by automatic sampler for three days from July 22-25, 1974. Composite samples were flow-weighted, using data from the plant's automatic flow recorder, also the source of the average daily flows reported in Table 13.

TABLE 13

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

MILLIS MUNICIPAL SEWAGE TREATMENT PLANT, MILLIS

DATE	7/22/74-7/23/74	7/23/74-7/24/74	7/24/74-7/25/74
TIME	12:15-8:00	8:00-8:00	8:00-8:00
COD	149.	154.	115.
BOD_5	33.	42.	20.
pH	7.3	7.9	7.4
Total Alkalinity	127	123	122
Suspended Solids	40	16	26
Total Solids	398	464	334
Total Kjeldahl Nitrogen	20.	22.	22.
Ammonia Nitrogen	18.	18.	19.
Nitrate Nitrogen	0.9	0.4	0.9
Total Phosphorus	13.	6.5	8.0
Flow (MGD)	0.165	0.133	0.146
(CFS)	0.255	0.206	0.226

N.B. All concentration in mg/l.

TABLE 14

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

LONG - TERM BOD DATA (mg/l)

SOURCE	BETTINGER CORP.	MILFORD STP	FRANKLIN STP	PONDVILLE HOSPITAL	WRENTHAM SCHOOL	NORFOLK WALPOLE MCI
DATE	12/12/73-12/13/73	12/12/73-12/13/73	12/12/73-12/13/73	12/13/73	12/12/73-12/13/73	12/12/73-12/13/73
TIME *	9:30-9:00	10:30-10:30	11:30-11:00	11:30	14:00-14:00	13:00-13:00
3 - Day BOD	3.6	20.	36.	0.6	1.5	13.
5 - Day BOD	4.2	26.	126.	2.4	3.6	16.
7 - Day BOD	4.8	38.	130.	3.3	3.9	22.

SOURCE	YOUR LAUNDRY	SUGAR BROOK "ABOVE"	GAF CORP.	SUGAR BROOK "BELOW"	MILLIS STP	MEDFIELD HOSPITAL
DATE	7/23/74	7/23/74 7/24/74	7/23/74-7/24/74	7/23/74-7/24/74	7/23/74-7/24/74	7/23/74-7/24/74
TIME *	11:00	7:30-7:30	7:30-7:30	7:30-7:30	8:00-8:00	7:00-7:00
2 - Day BOD	12.	3.0	0.6	190.	15.	14.
5 - Day BOD	25.	7.5	0.9	400.	42.	36.
7 - Day BOD	28.	9.3	0.9	500.	67.	45.
14 - Day BOD	36.	21.	3.0	915.	120.	61.
21 - Day BOD	42.	30.	3.6	1,005.	138.	72.

* All samples 24-hour composites; except grab samples for Pondville State Hospital and Your Laundry.

TABLE 15

CHARLES RIVER 1973 - 1974 DISCHARGE SURVEY

MASS DISCHARGE DATA (lb/day)

	BETTINGER CORP.	MILFORD STP	FRANKLIN STP	YOUR LAUNDRY	PONDVILLE HOSPITAL	WRENTHAM SCHOOL
COD	1.7	3500. (5600.)	4900.	0.7	20.	19.
BOD_5	0.6	670.	1900.	0.08	1.0	4.0
Suspended Solids	2.9	1100.	2000.	0.2	2.7	27.
Total Solids	27.	7100.	10,000.	2.4	63.	280.
Total Kjeldahl Nitrogen	0.07	230.	350.	0.02	0.5	1.4
Ammonia Nitrogen	0.002	170.	200.	0.001	0.1	0.06
Nitrate Nitrogen	0.01	140.	32.	0.02	1.4	14.
Total Phosphorus	0.02	84. (150.)	78. (130.)	0.04	0.5	3.2
Average Flow (MGD)	0.012 *	2.6	1.5	0.001 *	0.04 *	0.14
(CFS)	0.018 *	4.1	2.4	0.002 *	0.06 *	0.22

N.B. Values reported are the averages of the three daily mass discharge values obtained for each source. Daily maximum values are, in some instances, reported in parentheses below the corresponding average values.

* Flow estimated (see text).

TABLE 15 (CONTINUED)

	NORFOLK WALPOLE MCI	SUGAR BROOK "ABOVE"	SUGAR BROOK "BELOW"	GAF CORP.	MILLIS STP	MEDFIELD HOSPITAL
COD	630. (1500.)	35.	1800. (2400.)	10.	170.	96.
BOD_5	71.	3.3	980. (1400.)	0.5	39.	31.
Suspended Solids	85.	0.9	84.	3.3	35.	4.2
Total Solids	550.	300.	1200.	73.	490.	390.
Total Kjeldahl Nitrogen	15.	2.7	11.	0.2	26.	9.
Ammonia Nitrogen	9.	1.6	0.8	0.02	23.	6.
Nitrate Nitrogen	25.	1.4	2.6	0.5	0.9	1.2
Total Phosphorus	2.7	0.05	5.4	0.5	12.	10.
Average Flow (MGD)	0.25 *	0.06	0.19	0.04	0.15	0.16 *
(CFS)	0.38 *	0.09	0.29	0.06	0.23	0.25 *

* *Flow estimated (see text).*

TABLE 16

CHARLES RIVER 1973-1974 DISCHARGE SURVEY

MASS DISCHARGE OF METALS DATA (lb/day)

BETTINGER CORPORATION, MILFORD

Magnesium	0.07	Cadmium	0.001	Iron	0.7
Copper	0.007	Nickel	0.06	Avg. Flow (MGD)	0.012 *
Chromium	0.005	Zinc	0.02	(CFS)	0.018 *

SUGAR BROOK, MILLIS

	SUGAR BROOK ABOVE COTT & GAF CORP.	SUGAR BROOK BELOW COTT & GAF CORP.	GAF CORP.
Aluminum	6.6	15.	0.04
Chromium	0.06	0.13	0.01
Iron	1.0	2.9	0.2
Avg. Flow (MGD)	0.06	0.19	0.04
(CFS)	0.09	0.29	0.06

N.B. Values reported are the averages of the three daily mass discharge values obtained for each source.

* Flow estimated (see text).

FOREWORD - 1976 SURVEY

The following report presents the results of the Charles River 1976 Wastewater Discharge Survey conducted by the Massachusetts Division of Water Pollution Control. This survey is part of the state-wide discharge monitoring program which has been established in conjunction with the National Pollutant Discharge Elimination System. The survey is also a continuation of a previously established on-going program of water quality and discharge monitoring by the Division. Related publications by the Division include the Charles River 1976 Water Quality Management Plan, 1973 Part A, 1967 Parts A & B, Charles Basin 1974 Part A, and Report on the Charles River (1971).

The Charles River flows 80 miles in eastern Massachusetts from Hopkinton to Boston Harbor. The lower-most 8.6 miles, the "Charles Basin", are impounded by the Museum of Science Dam. Downstream in the remaining estuarine portion, a new dam will extend the Basin to include the Millers River, now a tidal inlet. The new dam is currently under construction. The Charles main stem and several tributaries receive wastewater discharges (see Figure 2).

Wastewater discharges were sampled March 1-2 and May 3-5, 1976. Serco automatic samplers were employed in obtaining composite samples for the discharges reported in Tables 18-29. The composites for all of the municipal and institutional discharges were flow-weighted. Separate grab samples were required for the coliform bacteria and the oil and grease analyses. A Model 625 Gurley pygmy current meter was used in gauging the streamflow of the brook which receives Garelick Farms' discharges.

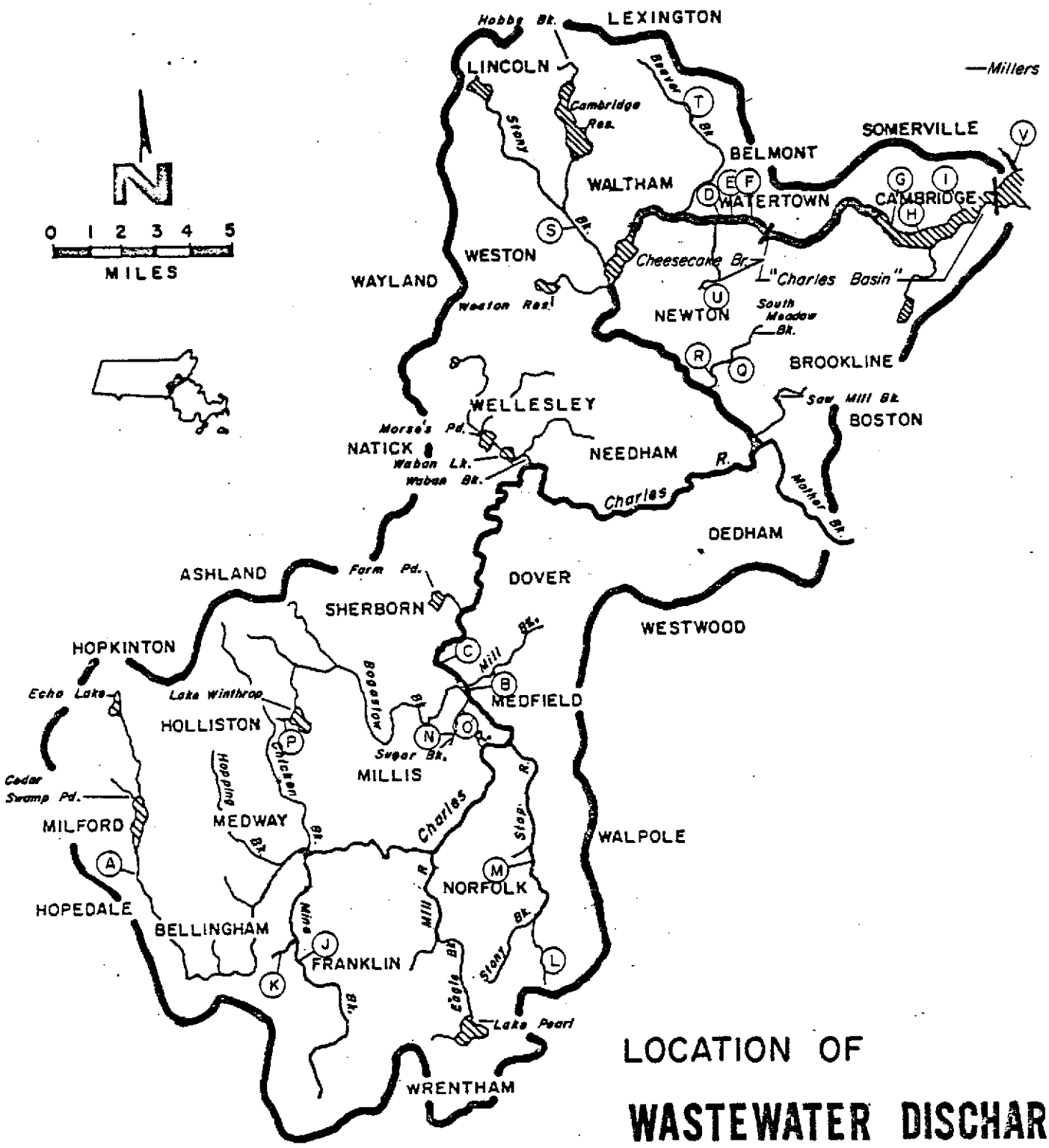
All samples were conveyed to the Lawrence Experiment Station of the Massachusetts Department of Environmental Quality Engineering for chemical and bacterial analyses. All analyses were performed in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater (APHA, New York). Data on the cooling water discharges (Table 29) were obtained with a field thermometer and Hach chlorine and pH kits.

As always, the Division is appreciative of the excellent cooperation of George Minasian and the staff of the Lawrence Experiment Station.

The data reported herein were compiled and tabulated by personnel of the Division of Water Pollution Control.

LIST OF TABLES - 1976 SURVEY

LIST OF FIGURES - 1976 SURVEY



LOCATION OF
WASTEWATER DISCHARGES
1976 SURVEY

FIGURE 2

TABLE 17

CHARLES RIVER 1976 DISCHARGE SURVEY

LIST OF WASTEWATER DISCHARGES

SOURCE LETTER IN FIGURE 2	SOURCE	TABLE REFERENCE
	Discharges to Charles River:	
A	Milford Municipal Sewage Treatment Plant, Hopedale	18
B	Medfield Municipal STP, Medfield	19
C	Medfield State Hospital STP, Medfield	20
D	Barry Division, Barry-Wright Corporation, Watertown	29
E	Quincy Market Cold Storage, Watertown	29
F	Haartz-Mason, Inc., Watertown	29
	Discharges to Charles Basin:	
G	Cambridge Electric - Blackstone Station, Cambridge	29
H	Massachusetts Institute of Technology - Magnetics Laboratory, Cambridge	29
I	Cambridge Electric - Kendall Station, Cambridge	29
	Discharges to Mine Brook:	
J	Franklin Municipal STP, Franklin	21
K	Garelick Farms, Franklin	22
	Discharges to Stop River:	
L	Wrentham State School STP, Wrentham	23
M	Norfolk-Walpole MCI, Norfolk	24
	Discharges to Sugar Brook:	
N	Cott Corporation, Millis	25
O	Millis Municipal STP, Millis	26
	Discharge to Lake Winthrop Tributary:	
P	Ty-Car Manufacturing, Holliston	27
	Discharge to South Meadow Brook:	
Q	Community Service Stations, Inc., Newton	30
R	St. Regis Paper Company, Newton	29
	Discharge to Stony Brook:	
S	Massachusetts Broken Stone, Weston	30
	Discharge to Beaver Brook:	
T	Belmont Springs Water Company, Belmont	30

TABLE 17 (Continued)

SOURCE LETTER IN FIGURE 2	SOURCE	TABLE REFERENCE
	Discharge to Cheesecake Brook:	
U	White Fuel Terminal, Newton	30
	Discharge to Millers River:	
V	Boston Sand and Gravel, Boston	28

CHARLES RIVER 1976 WASTEWATER DISCHARGE SURVEY

A. Milford Municipal Sewage Treatment Plant, Hopedale: Influent and effluent sampled by automatic samplers (24-hour composites) March 1-2. Flow data from influent meter. See also text of 1973-74 survey.

B. Medfield Municipal STP, Medfield: Influent and effluent sampled by automatic samplers (24-hour composites) May 4-5. Flow data from effluent meter. This plant is a newly constructed advanced treatment facility with phosphorus removal. Although not designed for nitrification, it currently operates at about one-tenth of its design capacity (1.52 MGD) and a high degree of nitrification occurs as a result.

C. Medfield State Hospital STP, Medfield: Influent and effluent sampled by automatic samplers (24-hour composites) May 3-4. Flow estimate of 0.16 MGD dates from 1974 and may be low. See also text of 1973-74 survey.

D. Barry Division, Barry-Wright Corp., Watertown: Non-contact cooling water discharge, sampled March 3. Flow measured with bucket and watch.

E. Quincy Market Cold Storage, Watertown: Non-contact cooling water discharge sampled March 3. Flow estimated from six month water use.

F. Haartz-Mason, Inc., Watertown: Cooling water discharge, sampled March 3. Flow estimate from plant personnel.

G. Cambridge Electric - Blackstone Station, Cambridge: Power plant uses water from Charles Basin and chlorinates influent to prevent biological growth. Sampled March 2. Flow based on pump capacity.

H. Massachusetts Institute of Technology - Magnetics Laboratory, Cambridge: Cooling water discharge sampled March 2.

I. Cambridge Electric - Kendall Station, Cambridge: Power plant uses water from Charles Basin and chlorinates influent to prevent biological growth. Sampled March 2. Flow data from plant meter.

J. Franklin Municipal STP, Franklin: Influent and effluent sampled by automatic samplers (24-hour composites) March 1-2. Flow data from effluent meter. See also text of 1973-74 survey.

K. Garelick Farms, Franklin: Dairy plant has several discharge points to small brook (tributary to Mine Brook) which runs underneath the plant. Upstream of all discharges, the brook's flow was gaged at noontime, March 1, and grab samples obtained March 1 and 2. (There was no precipitation on these two days.) Downstream of all discharges, a 24-hour composite sample was obtained with an automatic sampler. Average total plant discharge based on metered water use during sampling period.

L. Wrentham State School STP, Wrentham: Influent and effluent sampled by automatic samplers (24-hour composites) May 3-4. Flow data from influent meter. See also text of 1973-74 survey.

M. Norfolk-Walpole Massachusetts Correctional Institutes, Norfolk: Newly constructed extended aeration plant. Influent and effluent sampled by automatic samplers (24-hour composites) May 3-4. Flow data from effluent meter.

N. Cott Corporation, Millis: Effluent sampled by automatic sampler (24-hour composite) May 4-5. Flow estimate provided by engineering consultant to Cott. See also text of 1973-74 survey.

O. Millis Municipal STP, Millis: Influent and effluent sampled by automatic samplers (24-hour composites) May 4-5. Flow data from influent meter. See also text of 1973-74 survey.

P. Ty-Car Manufacturing, Holliston: Effluent from this small metal finishing plant was sampled by automatic sampler (7-hour composite) on March 1.

Q. Community Service Stations, Inc., Newton: Surface runoff from fuel terminal area. Grab sample obtained during rain May 3 from oil/water separator.

R. St. Regis Paper Company, Newton: Non-contact cooling water discharges sampled May 3. Specialty paper plant.

S. Massachusetts Broken Stone, Weston: Bituminous concrete operation uses water for air pollution control device. Discharge sampled May 3.

T. Belmont Springs Water Company, Belmont: Grab sample obtained during time of water use on May 3.

U. White Fuel Terminal, Newton: Surface runoff from fuel terminal area. Grab sample obtained during rain May 3 from oil/water separator.

V. Boston Sand and Gravel, Boston: Grab sample obtained March 2.

TABLE 18

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Milford Municipal Sewage Treatment Plant, Hopedale

Parameter	Influent 3/1-2 1000-1000	Effluent 3/1-2 1000-1000
BOD_5	162.	63.
pH (std. units)	7.1	6.7
Suspended solids	132.	42.
Settleable solids (ml/l)	8.0	0.3
Total Kjeldahl-N	22.	16.
Ammonia-N	13.	11.
Nitrate-N	0.1	2.5
Total Phosphorus	5.5	5.2
Total coliform/100 ml.*	---	24,000
Fecal coliform/100 ml.*	---	4,300
Flow (MGD)	2.76	---
(cfs)	4.28	---

*Grab sample taken at 10:00 on 3/2/76

TABLE 19

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Medfield Municipal Sewage Treatment Plant, Medfield

Parameter	Influent 5/4-5 0800-0800	Effluent 5/4-5 1330-1330
BOD_5	168.	5.1
pH (std. units)	7.4	7.5
Suspended solids	260	2.0
Settleable solids (ml/l)	10.	0.0
Total Kjeldahl-N	26.	1.5
Ammonia-N	9.7	0.20
Nitrate-N	3.0	15.
Total Phosphorus	9.0	0.52
Total coliform/100 ml.*	---	<36
Fecal coliform/100 ml.*	---	<36
Flow (MGD)	---	0.247
(cfs)	---	0.382

*Grab sample 5/4/76 at 1330.

TABLE 20

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Medfield State Hospital Sewage Treatment Plant, Medfield

Parameter	Influent 5/3-4 1300-1300	Effluent 5/3-4 1300-1300
BOD_5	270	15.
pH (std. units)	7.4	7.0
Suspended solids	400	4.5
Settleable solids (ml/l)	2.5	0.1
Total Kjeldahl-N	27.	7.4
Ammonia-N	8.9	5.3
Nitrate-N	0.5	0.5
Total Phosphorus	9.3	5.3
Total coliform/100 ml.*	---	<36
Fecal coliform/100 ml.*	---	<36

*Grab sample 5/3/76 at 1300.

TABLE 21

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Franklin Municipal Sewage Treatment Plant, Franklin

Parameter	Influent 3/1-2 1100-1100	Effluent 3/1-2 1100-1100
BOD_5	156	4.0
pH (std. units)	7.3	6.9
Suspended solids	136	6.5
Settleable solids (ml/l)	6.5	0.1
Total Kjeldahl-N	25.	16.
Ammonia-N	17.	13.
Nitrate-N	0.3	1.3
Total Phosphorus	4.7	4.7
Total coliform/100 ml.*	---	<36
Fecal coliform/100 ml.*	---	<36
Flow (MGD)	---	1.44
(cfs)	---	2.22

*Grab sample 3/1/76 at 1100.

TABLE 22

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Garelick Farms, Franklin

Parameter	Upstream of Discharges 3/1 1300	3/2 1330	Downstream of Discharges 3/1-2 1200-1200
BOD_5	0.9	1.5	150
pH (std. units)	6.1	7.1	6.7
Suspended solids	0.5	0.5	29
Total Phosphorus	0.05	0.04	1.4
Total coliform* per 100 ml.	---	760	75,000
Fecal coliform* per 100 ml.	---	36	9,300
Flow (MGD)	1.06	---	1.15**
(cfs)	1.64	---	1.79**

*Grab samples 3/2/76 at 1330.

**Based on average total plant discharge of 0.15 cfs.

TABLE 23

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Wrentham State School STP, Wrentham

Parameter	Influent 5/3-4 0930-0930	Effluent 5/3-4 0930-0930
BOD_5	246	3.3
pH (std. units)	6.9	4.6
Suspended solids	140	1.0
Settleable solids (ml/l)	5.5	0.0
Total Kjeldahl-N	32	0.84
Ammonia-N	16	0.75
Nitrate-N	0.1	19
Total Phosphorus	7.5	5.8
Total coliform/100 ml.*	---	<36
Fecal coliform/100 ml.*	---	<36
Flow (MGD)	0.22	---
(cfs)	0.34	---

*Grab sample 5/3/76 at 0930.

TABLE 24

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Norfolk-Walpole Massachusetts Correctional Institutes, Norfolk

Parameter	Influent 5/3-4 1100-1100	Effluent 5/3-4 1100-1100
BOD_5	204	6.9
pH (std. units)	6.9	6.4
Suspended solids	390	3.0
Settleable solids (ml/l)	28	0.1
Total Kjeldahl-N	32	3.4
Ammonia-N	11	3.0
Nitrate-N	0.1	4.5
Total Phosphorus	4.3	1.1
Total coliform/100 ml.*	---	91
Fecal coliform/100 ml.*	---	<36
Flow (MGD)	---	0.260
(cfs)	---	0.402

*Grab sample 5/3/76 at 1100.

TABLE 25

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Cott Corporation, Millis

Parameter	5/4-5/76 1200-1200
BOD_5	3,345
pH (std. units)	6.2
Suspended solids	48
Settleable solids (ml/l)	0.3
Oil and grease**	41
Total Phosphorus	4.5
Aluminum	0.33
Total coliform/100 ml.*	<36
Fecal coliform/100 ml.*	<36

*Grab sample 5/4/76 at 1210.
**Grab sample 5/4/76 at 1210 was 8.4 mg/l.

TABLE 26

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Millis Municipal STP, Millis

Parameter	Influent 5/4-5 1230-1230	Effluent 5/4-5 1230-1230
BOD_5	108	39
pH (std. units)	7.3	7.5
Suspended solids	142	36
Settleable solids (ml/l)	10	1.0
Total Kjeldahl-N	30	26
Ammonia-N	17	17
Nitrate-N	0.1	0.3
Total Phosphorus	7.0	6.3
Total coliform/100 ml.*	---	9,300
Fecal coliform/100 ml.*	---	430
Flow (MGD)	0.22	---
(cfs)	0.34	---

*Grab sample 5/4/76 at 1240.

TABLE 27

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Ty-Car Manufacturing Company, Holliston

Parameter	Effluent 3/1/76 0900-1600
BOD_5	8.0
pH (std. units)	6.9
Suspended solids	8.0
Settleable solids (ml/l)	0.1
Total Phosphorus	0.70
Aluminum	0.0
Copper	0.02
Zinc	0.05
Oil and grease	0.62

TABLE 28

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Boston Sand and Gravel, Boston

Parameter	Effluent 3/2/76 1150
pH (std. units)	12.2
Suspended solids	22
Total Phosphorus	0.08
Aluminum	0.10
Sulfate	550

TABLE 29

CHARLES RIVER 1976 DISCHARGE SURVEY

COOLING WATER DISCHARGES

DISCHARGER	Date Sampled	Temperature (°F)	pH	Flow (MGD)[1]
Barry Division, Barry Wright Corp., Watertown	3/3/76	38	7.5	0.065
Quincy Market Cold Storage, Watertown	3/3/76	48	8.5	0.0040
Haartz-Mason, Inc., Watertown	3/3/76	48	7.5	<0.12
Cambridge Electric, Blackstone Station[2]	3/2/76	64	6.5	0.864
MIT - Magnetics Laboratory, Cambridge	3/2/76	40	7.5	---
Cambridge Electric, Kendall Station[3]	3/2/76	52	7.5	54.6 effluer
		44	---	54.6 influer
St. Regis Paper Company, Newton	5/3/76	58	7.0	--- discha 001
		54	7.0	--- discha 002

[1]See text for sources of flow data.

[2]Effluent free residual chlorine 3.0 mg/l.

[2]Effluent free residual chlorine <0.1 mg/l.

TABLE 30

CHARLES RIVER 1976 DISCHARGE SURVEY

Results of Laboratory Analyses (mg/l)

Miscellaneous Discharges

SOURCE	DATE	TIME	pH	SETTLEABLE SOLIDS	SUSPENDED SOLIDS*	TOTAL P	OIL & GREASE
Community Service Stations, Inc., Newton	5/3/76	1535	6.6	0.1	---	---	11
Massachusetts Broken Stone, Weston	5/3/76	1100	7.4	---	12.	0.05	---
Belmont Springs Water Company, Belmont	5/3/76	1415	6.6	0.0	1.0	13.	---
White Fuel Terminal, Newton	5/3/76	1600	6.6	0.2	---	---	6.1

*Concentrations in ml/l.

TABLE 31

CHARLES RIVER 1976 DISCHARGE SURVEY

Long-Term BOD Data (mg/l)

SOURCE:	Medfield STP Influent	Medfield STP Effluent	Cott Corporation	Millis STP Influent	Millis STP Effluent
Date:	5/4-5	5/4-5	5/4-5	5/4-5	5/4-5
Time*	0800-0800	1330-1330	1200-1200	1230-1230	1230-1230
1-day BOD	36	1.1	768	48	5.4
5-day BOD	168	5.1	3,345	108	39
7-day BOD	198	6.0	3,600	144	45

SOURCE:	Milford STP Effluent	Medfield State Hospital Influent	Medfield State Hospital Effluent	Garelick Farms Upstream	Garelick Farms Downstream
Date:	3/1-2	5/3-4	5/3-4	3/1	3/1-2
Time*	1000-1000	1300-1300	1300-1300	1330	1200-1200
2-day BOD	24	156	13	1.2	54
5-day BOD	63	270	15	1.5	150
7-day BOD	96	294	19	1.5	180

SOURCE:	Franklin STP Effluent	Wrentham STP Influent	Wrentham STP Effluent	Norfolk-Walpole MCI Influent	Norfolk-Walpole MCI Effluent
Date:	3/1-2	5/3-4	5/3-4	5/3-4	5/3-4
Time*	1100-1100	0930-0930	0930-0930	1100-1100	1100-1100
2-day BOD	1.2	174	3.3	126	3.9
5-day BOD	4.0	246	3.3	204	6.9
7-day BOD	13.	282	4.5	252	10.8

*all samples 24-hour composites except for grab sample for Garelick Farms taken upstream of discharges.

TABLE 32

CHARLES RIVER 1976 DISCHARGE SURVEY

MASS DISCHARGE DATA (lbs/day)

SOURCE	BOD_5	Susp. Solids	Total Kjeldahl-N	NH_3-N	NO_3-N	Total P	Average Flow*
Milford STP	1450	967	368	253	58	120	2.76 MGD 4.28 cfs
Medfield Municipal STP	11	4.1	3.1	0.4	31	1.1	0.247 MGD 0.382 cfs
Medfield State Hospital STP	20	6.0	10.	7.1	0.7	7.1	0.16 MGD 0.25 cfs
Franklin STP	48	78	192	156	16	56	1.44 MGD 2.22 cfs
Garelic Farms - upstream	11	4.4	---	---	---	0.4	1.06 MGD 1.64 cfs
- downstream	1440	278	---	---	---	13	1.15 MGD 1.79 cfs
Wrentham State School	6.1	1.8	1.5	1.4	35	11	0.22 MGD 0.34 cfs
Norfolk-Walpole MCI	15	6.5	7.4	6.5	9.8	2.4	0.260 MGD 0.402 cfs
Cott Corporation	1170	17	---	---	---	1.6	0.042 MGD 0.065 cfs
Millis STP	72	66	48	31	0.6	12	0.22 MGD 0.34 cfs

Note: All data are for effluents except Garelick Farms, which are for receiving stream.

*See text for source.