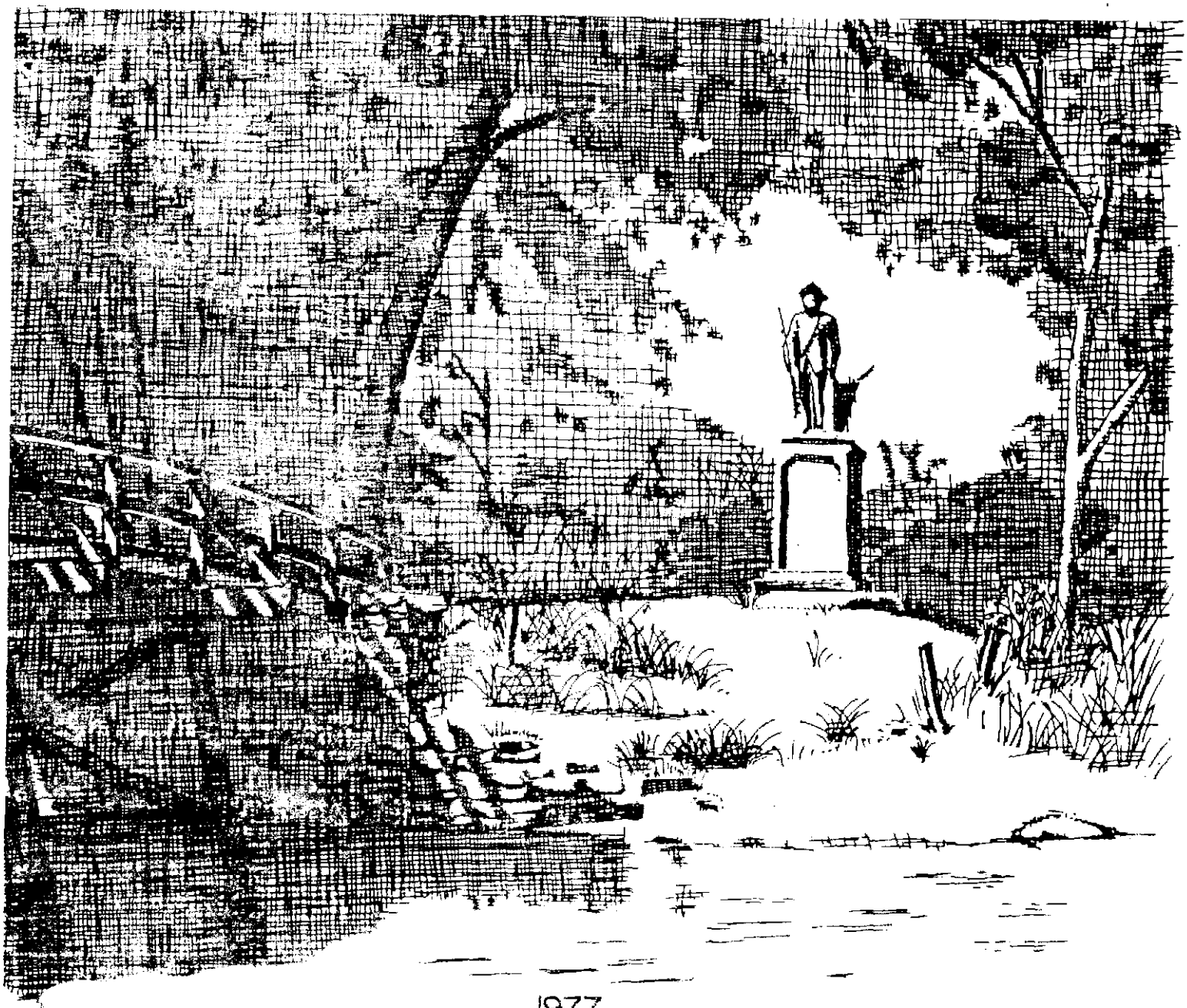
THE SUASCO RIVER BASIN



1977

PART B - WASTEWATER DISCHARGE DATA

massachusetts department of environmental quality engineering

DIVISION OF WATER POLLUTION CONTROL

thomas c. mcmahon,

SUASCO RIVER BASIN

1977

WASTEWATER DISCHARGE SURVEY DATA

PREPARED BY

WATER QUALITY AND RESEARCH SECTION
MASSACHUSETTS DIVISION OF WATER POLLUTION CONTROL

WESTBOROUGH, MASSACHUSETTS

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INTRODUCTION

This report is a compilation of the analyses of a wastewater discharge survey of the SUASCO River Basin conducted in 1977. The report presents a brief description of the discharges including the location, the method of treatment, the dates of sampling, the flow and the results of the laboratory analyses performed on the samples. The survey was conducted by personnel of the Water Quality and Research Section of the Massachusetts Division of Water Pollution Control in coordination with numerous personnel of the respective wastewater treatment facilities.

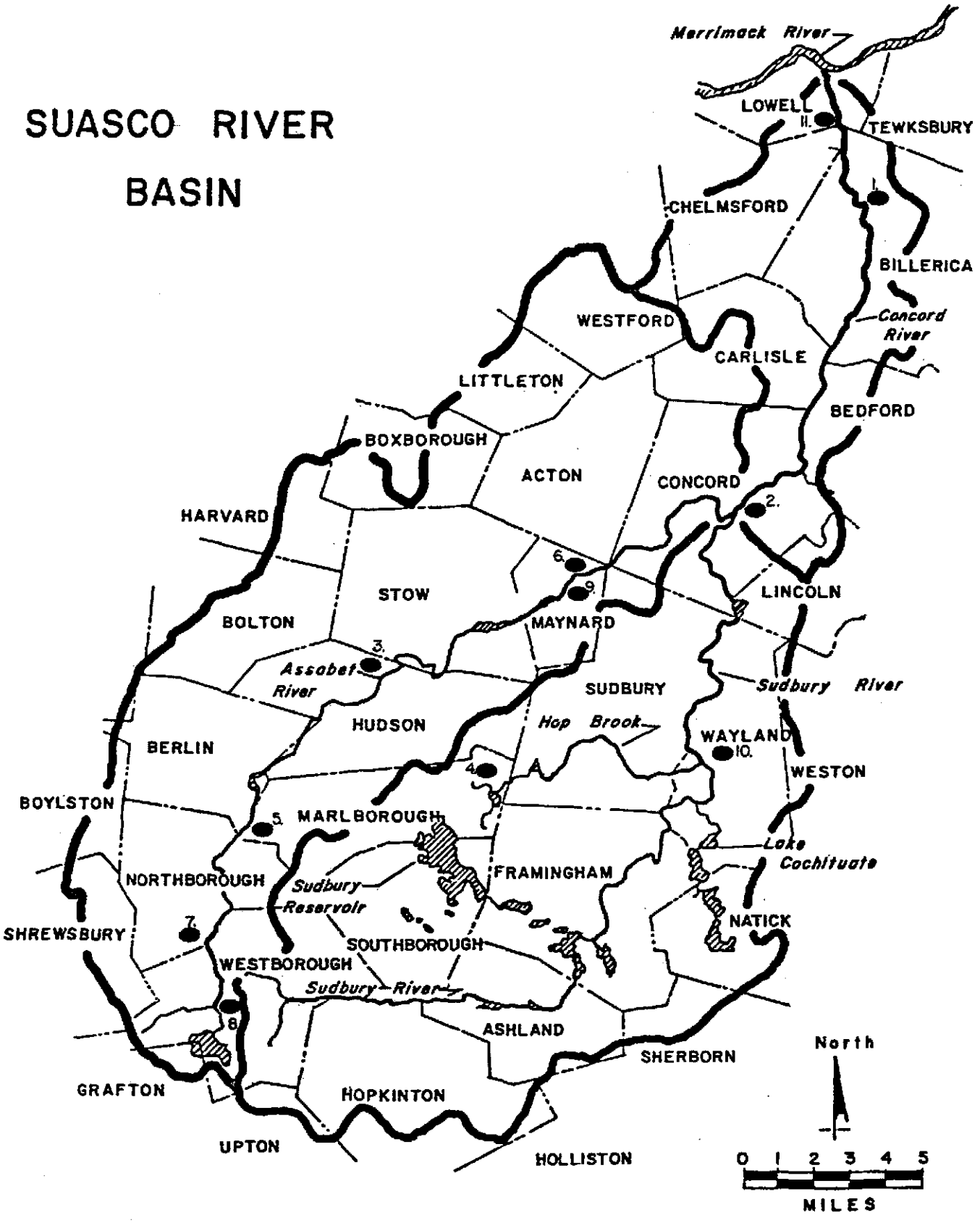
The wastewater discharges were sampled for various periods of time ranging from 24 hour composite samples to a grab sample. The sampling period was determined according to regulations established by the United States Environmental Protection Agency. The composite samples were composited according to flow ratios.

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 American Public Health Association's Standard Methods for the Analysis of Water and Wastewater (14th edition, 1976, New York). Data were compiled and placed in tabular form by personnel of the Massachusetts Division of Water Pollution Control.

WASTEWATER DISCHARGES

NUMBER	DISCHARGE
1	Billerica Sewage Treatment Plant
2	Concord Sewage Treatment Plant
3	Hudson Sewage Treatment Plant
4	Marlborough Easterly Sewage Treatment Plant
5	Marlborough Westerly Sewage Treatment Plant
6	Maynard Sewage Treatment Plant
7	Shrewsbury Sewage Treatment Plant
8	Westborough Sewage Treatment Plant
9	Digital Equipment Corporation
10	Raytheon Corporation, Wayland
11	Raytheon Missile Systems Division

LOCATION OF WASTEWATER DISCHARGES



BILLERICA SEWAGE TREATMENT PLANT

LOCATION:	Letchworth Avenue, Billerica
DATES SAMPLED:	August 29-30, 1977
RECEIVING WATER:	Concord River
CAPACITY:	1.6 MGD
TREATMENT PROCESS:	Bar rack Comminutor Extended aeration tanks Final settling tanks Chlorination
SLUDGE DISPOSAL:	Flotation Thickeners Vacuum filter Landfill
TYPE OF SAMPLES:	One 24-hour composite sample of the effluent, one grab sample of the influent, one grab sample after chlorination for coliform bacteria.

BILLERICA SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 8/30/77	EFFLUENT 8/29-8/30/77
BOD-5	1600	9.0
pH (standard units)	7.1	6.8
Total Alkalinity	250	37
Settleable Solids (ml/l)	270	1.2
Suspended Solids	5,100	100
Total Solids	7,700	470
Ammonia-Nitrogen	19	0.0
Nitrate-Nitrogen	0.3	1.8
Total Phosphorus	78.	2.6
Total Coliform/100 ml	---	1,500
Fecal Coliform/100 ml	---	50
Residual Cl_2	---	2.4
Flow (MGD)	---	1.6

CONCORD SEWAGE TREATMENT PLANT

LOCATION	Off Bedford Road, Concord
DATE SAMPLED:	August 30-31, 1977
RECEIVING WATER:	Great Meadows Wildlife Area to Concord River
CAPACITY:	1.0 MGD
TREATMENT PROCESS:	Imhoff tank Sand filter beds Chlorination
SLUDGE DISPOSAL:	Drying beds Landfill
TYPE OF SAMPLES:	One grab sample of the influent; One grab sample of the effluent from the imhoff tank; One 24-hour composite sample of the effluent; One 24-hour sample after chlorination for coliform bacteria and total residual chlorine.

CONCORD SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 8/31/77	PRIMARY EFFLUENT 8/31/77	FINAL EFFLUENT 8/30-8/31/77
BOD-5	318	160	57.
pH	6.9	6.8	6.5
Total Alkalinity	130	140	60.
Settleable Solids (ml/l)	10.0	0.2	0.0
Suspended Solids	158	47	5.0
Total Solids	468	458	374
Ammonia-Nitrogen	0.99	22.	11.
Nitrate-Nitrogen	0.1	0.1	2.7
Total Phosphorus	8.4	5.9	1.4
Total Coliform/100 ml	---	---	<36
Fecal Coliform/100 ml	---	---	<36
Residual Cl_2	---	---	3.0

HUDSON SEWAGE TREATMENT PLANT

LOCATION:	Municipal Drive, Hudson
DATES SAMPLED:	August 31, 1977 - September 1, 1977
RECEIVING WATER:	Assabet River
CAPACITY:	2.0 MGD
TREATMENT PROCESS:	Bar rack Comminutor Detrider (grit removal) Primary clarifiers Trickling filters Final clarifiers Chlorination
SLUDGE DISPOSAL:	Vacuum filtration Reused for highway fill, etc.
TYPE OF SAMPLES:	One grab sample of the influent; One 24-hour composite sample of the effluent; Two grab samples after chlorination for coliform bacteria and one grab for residual chlorine.

HUDSON SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 9/1/77	EFFLUENT 8/31-9/1/77
BOD-5	270.	27.
pH (standard units)	7.6	7.2
Total Alkalinity	180.	98.
Settleable Solids (ml/l)	12.0	0.0
Suspended Solids	224	22.
Total Solids	672	398
Ammonia-Nitrogen	1.7	1.1
Nitrate-Nitrogen	0.0	0.1
Total Phosphorus	10.0	7.0
Total Coliform/100 ml	---	7,000 (8/31/77)
		10,000 (9/1/77)
Fecal Coliform/100 ml	---	50 (8/31/77)
		400 (9/1/77)
Residual Cl_2	---	2.7 (8/31/77)
Flow (MGD)	---	0.947

MARLBOROUGH EASTERLY SEWAGE TREATMENT PLANT

LOCATION:	Boston Post Road, Marlborough
DATES SAMPLED:	August 30-31, 1977
RECEIVING WATER:	Hop Brook
CAPACITY:	5.5 MGD
TREATMENT PROCESS:	Aerated grit chambers Comminutor Primary clarifiers Aeration tanks Phosphorus removal Secondary clarifiers Nitrification aeration tanks Final clarifiers Chlorination
SLUDGE DISPOSAL:	Vacuum filter Stockpiled on-site
TYPE OF SAMPLES:	One grab sample of the influent; One 24-hour composite sample of the effluent; Two grab samples after chlorination for coliform bacteria.

MARLBOROUGH EASTERLY SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETERS	INFLUENT 8/31/77	EFFLUENT 8/30-8/31/77
BOD-5	336	11.
pH (standard units)	7.1	7.5
Total Alkalinity	174	98
Settleable Solids (ml/l)	12.0	0.1
Suspended Solids	176	12.
Total Solids	512	626
Ammonia-Nitrogen	35.	3.0
Nitrate-Nitrogen	2.0	22.
Total Phosphorus	12.	1.0
Total Coliform/100 ml	---	1,200 (8/30/77)
	---	80 (8/31/77)
Fecal Coliform/100 ml	---	20 (8/30/77)
	---	20 (8/31/77)
Residual Cl_2	---	2.2 (8/31/77)
Flow (MGD)	---	1.8

MARLBOROUGH WESTERLY SEWAGE TREATMENT PLANT

LOCATION:	Boundary Road, Marlborough
DATES SAMPLED:	August 29-30, 1977
RECEIVING WATER:	Assabet River
CAPACITY:	2.0 MGD
TREATMENT PROCESS:	Bar rack Aerated grit chamber Comminutor Primary clarifiers Activated sludge Secondary clarifiers Chlorination
SLUDGE DISPOSAL:	Vacuum filter Stockpiled at Easterly Plant
TYPE OF SAMPLES:	One grab sample of the influent; One 24-hour composite of the effluent; One grab sample after chlorination for coliform bacteria.

MARLBOROUGH WESTERLY SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/1)

PARAMETER	INFLUENT 8/30/77	EFFLUENT 8/29-8/30/77
BOD-5	500	10.
pH (standard units)	7.7	7.7
Total Alkalinity	205	132
Settleable Solids (ml/l)	12.	0.0
Suspended Solids	880	1.0
Total Solids	1,600	590
Ammonia-Nitrogen	20.	2.7
Nitrate-Nitrogen	0.0	15.
Total Phosphorus	8.2	7.0
Total Coliform/100 ml	---	20
Fecal Coliform/100 ml	---	<10
Flow (MGD)	---	1.43

MAYNARD SEWAGE TREATMENT PLANT

LOCATION:	Pine Hill Road, Maynard
DATES SAMPLED:	August 31 - September 1, 1977
RECEIVING WATER:	Assabet River
CAPACITY:	1.28 MGD
TREATMENT PROCESS:	Bar rack (75% of flow) Comminutor (75% of flow) Grit chamber and classifier Primary clarifier Aeration tanks Secondary clarifier Chlorination
SLUDGE DISPOSAL:	Reaeration Wet well Incineration Ashes buried at dump
TYPE OF SAMPLES:	One grab sample of the influent; One 24-hour composite of the effluent; Two grab samples for coliform bacteria.

MAYNARD SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 9/1/77	EFFLUENT 8/31-9/1/77
BOD-5	460	34
pH (standard units)	7.4	7.5
Total Alkalinity	180	130
Settleable Solids (ml/l)	14.	0.9
Suspended Solids	254	27.
Total Solids	724	324
Ammonia-Nitrogen	2.0	1.3
Nitrate-Nitrogen	0.0	0.0
Total Phosphorus	12.	8.2
Total Coliform/100 ml	---	2,400 (8/31/77)
		1,000 (9/1/77)
Fecal Coliform/100 ml	---	36 (8/31/77)
	---	200 (9/1/77)
Residual Cl_2	---	2.9
Flow (MGD)	---	2.0

SHREWSBURY SEWAGE TREATMENT PLANT

LOCATION:	Off Main Street, Shrewsbury/Northborough
DATES SAMPLED:	August 29-30, 1977
RECEIVING WATER:	Assabet River
CAPACITY:	1.75 MGD
TREATMENT PROCESS:	Bar rack Aerated grit chamber Comminutor Primary settling tank High-rate trickling filter Secondary settling tank Chlorination
SLUDGE DISPOSAL:	Vacuum filter Polymer-Lime treatment Landfill
TYPE OF SAMPLES:	One grab sample of the influent; One 24-hour composite sample of the effluent; One grab sample after chlorination for coliform bacteria.

SHREWSBURY SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 8/30/77	EFFLUENT 8/29-8/30/77
BOD-5	240	22.
pH (standard units)	7.2	7.3
Total Alkalinity	180	129.
Settleable Solids (ml/l)	10.	0.5
Suspended Solids	216	19.
Total Solids	620	410.
Ammonia-Nitrogen	23.	14.
Nitrate-Nitrogen	0.3	3.0
Total Phosphorus	12.	7.0
Total Coliform/100 ml	---	35,000
Fecal Coliform/100 ml	---	600
Residual Cl_2	---	0.2
Flow (MGD)	---	1.29

WESTBOROUGH SEWAGE TREATMENT PLANT

LOCATION:	Meadow Road, Westborough
DATES SAMPLED:	August 29-30, 1977
RECEIVING WATER:	Assabet River
CAPACITY:	1.1 MGD
TREATMENT PROCESS:	Bar rack Comminutor Grit chamber Extended aeration tanks Final clarifier Sand filter beds (May to October) Chlorination
SLUDGE DISPOSAL:	Aerobic digestor Drying beds Stockpiled on-site
TYPE OF SAMPLES:	One 24-hour sample of the influent; One grab sample of the secondary effluent; One 24-hour composite sample of the final effluent; One grab sample after chlorination for coliform bacteria and residual chlorine.

WESTBOROUGH SEWAGE TREATMENT PLANT

LABORATORY ANALYSES (mg/l)

PARAMETER	INFLUENT 8/29-8/30/77	SECONDARY EFFLUENT 8/30/77	FINAL EFFLUENT 8/29-8/30/77
BOD-5	220	9.9	4.8
pH (standard units)	7.1	6.7	6.7
Total Alkalinity	142	29.	18.
Settleable Solids (ml/l)	13	0.0	0.0
Suspended Solids	214	12.	1.5
Total Solids	750	380	360
Ammonia-Nitrogen	18.	1.0	0.4
Nitrate-Nitrogen	0.1	12.	12.
Total Phosphorus	9.0	6.0	6.0
Total Coliform/100 ml	---	---	800
Fecal Coliform/100 ml	---	---	20
Residual Cl_2	---	---	1.0
Flow (MGD)	---	---	0.98

DIGITAL EQUIPMENT CORPORATION

LOCATION:	146 Main Street, Maynard
DATE SAMPLED:	August 31, 1977
RECEIVING WATER:	Assabet River
INDUSTRIAL PROCESS:	Plating
TREATMENT PROCESS:	Metals and cyanide removal
TYPE OF SAMPLE:	8-hour composite of the effluent

DIGITAL EQUIPMENT CORPORATION

LABORATORY ANALYSES (mg/l)

PARAMETERS	EFFLUENT 8/31/77
pH (standard units)	8.2
Suspended Solids	23.
Total Phosphorus	2.4
Fluoride	7.0
Aluminum	0.00
Cadmium	0.00
Chromium	0.09
Copper	2.3
Cyanide	0.00
Iron	0.08
Lead	0.47
Nickel	0.19
Silver	0.02
Tin	<0.10
Zinc	5.8
Flow (GPM)	50.6

RAYTHEON CORPORATION

LOCATION:	430 Boston Post Road, Wayland
DATE SAMPLED:	August 31, 1977
RECEIVING WATER:	Sudbury River
INDUSTRIAL WASTEWATER TREATMENT PROCESS:	Continuous pH monitoring, Neutralization, Sludge stored and removed
TYPE OF SAMPLE:	One 8-hour composite of the effluent
SANITARY WASTEWATER TREATMENT PROCESS:	Comminutor, Extended aeration, Sand filtration, Sludge removal
TYPES OF SAMPLES:	One 8-hour composite of the influent; One 8-hour composite of the effluent; One grab sample after chlorination for coliform bacteria.

RAYTHEON CORPORATION

LABORATORY ANALYSES (mg/l)

PARAMETER	SANITARY INFLUENT	SECONDARY SANITARY EFFLUENT	FINAL SANITARY EFFLUENT	INDUSTRIAL EFFLUENT
BOD-5	414	8.4	12.	---
pH (standard units)	8.0	7.3	7.1	9.1
Total Alkalinity	170	64.	50.	---
Settleable Solids (ml/l)	15.	0.0	0.0	---
Suspended Solids	164	5.0	2.0	11.
Total Solids	604	552	532	---
Ammonia-Nitrogen	30.	10.	9.4	---
Nitrate-Nitrogen	6.6	31.	29.	---
Total Phosphorus	9.6	0.6	0.08	0.61
Total Coliform/100 ml	---	---	50	---
Fecal Coliform/100 ml	---	---	<10	---
Aluminum	---	---	---	0.00
Cadmium	---	---	---	0.00
Chromium	---	---	---	0.00
Copper	---	---	---	0.37
Cyanide	---	---	---	0.00
Iron	---	---	---	0.10
Lead	---	---	---	0.00
Nickel	---	---	---	0.00
Silver	---	---	---	0.00
Tin	---	---	---	<0.10
Zinc	---	---	---	0.00
Fluoride	---	---	---	< 0.1
Flow (GPD)	---	---	24,000	7,000

RAYTHEON MISSILE SYSTEMS DIVISION

LOCATION:	Woburn Street, South Lowell
DATE SAMPLED:	August 29, 1977
RECEIVING WATER:	Concord River
TREATMENT PROCESS:	Cyanide removal Chromium removal Neutralization Secondary settling tanks Charcoal filters
TYPE OF SAMPLE:	8-hour composite of the effluent

RAYTHEON MISSILE SYSTEMS DIVISION

LABORATORY ANALYSES (mg/l)

PARAMETER	EFFLUENT
pH (standard units)	7.5
Total Phosphorus	0.22
Fluoride	2.8
Aluminum	0.60
Cadmium	0.05
Chromium	0.01
Copper	0.65
Iron	0.08
Lead	0.00
Nickel	0.05
Silver	0.05
Tin	<0.10
Zinc	0.00
Flow (GPD)	40,000 (0700 - 1530)

BILLERICA HOUSE OF CORRECTION

LOCATION:	Treble Cove Road, South Billerica
DATES SAMPLED:	August 30-31, 1977
RECEIVING WATER:	Concord River
TREATMENT PROCESS:	Bar rack Clarigester Trickling filter Final settling tank Chlorination
TYPE OF SAMPLES:	One 24-hour composite sample of the effluent; Two grab samples for coliform bacteria after chlorination.

BILLERICA HOUSE OF CORRECTION

LABORATORY ANALYSES (mg/l)

PARAMETER	EFFLUENT 8/30-8/31/77
BOD-5	53.
pH (standard units)	7.2
Total Alkalinity	100
Settleable Solids (ml/l)	0.1
Suspended Solids	20.
Total Solids	376
Ammonia-Nitrogen	14.
Nitrate-Nitrogen	0.0
Total Phosphorus	4.6
Total Coliform/100 ml	230 (8/30/77)
	240,000 (8/31/77)
Fecal Coliform/100 ml	36 (8/30/77)
	240,000 (8/31/77)
Residual Cl_2	0.5
Flow (MGD)	0.045

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 synonomous 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, 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 carbolic 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 constitutents 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.