

North Shore Coastal Drainage Area 1978, 1980,
and 1981 Wastewater Discharge Survey Data

NORTH COASTAL

WASTEWATER DISCHARGE SURVEY

1978 - 1981

Prepared By

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TABLE OF CONTENTS

<u>ITEM</u>	<u>PAGE</u>
List of Tables	2
Introduction	3
Map of Basin with Discharge Locations	4
List of Dischargers	5
Analysis of Discharges (Tables)	7
Glossary of Terms	20

LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
1	Manchester Municipal WWTF	7
2	Rockport Municipal WWTF	10
3	Swampscott Municipal WWTF	12
4	Eastern Tool and Stamping, Inc.	17
5	G.E. Riverworks	18
6	NEPCO Salem Harbor Station	19

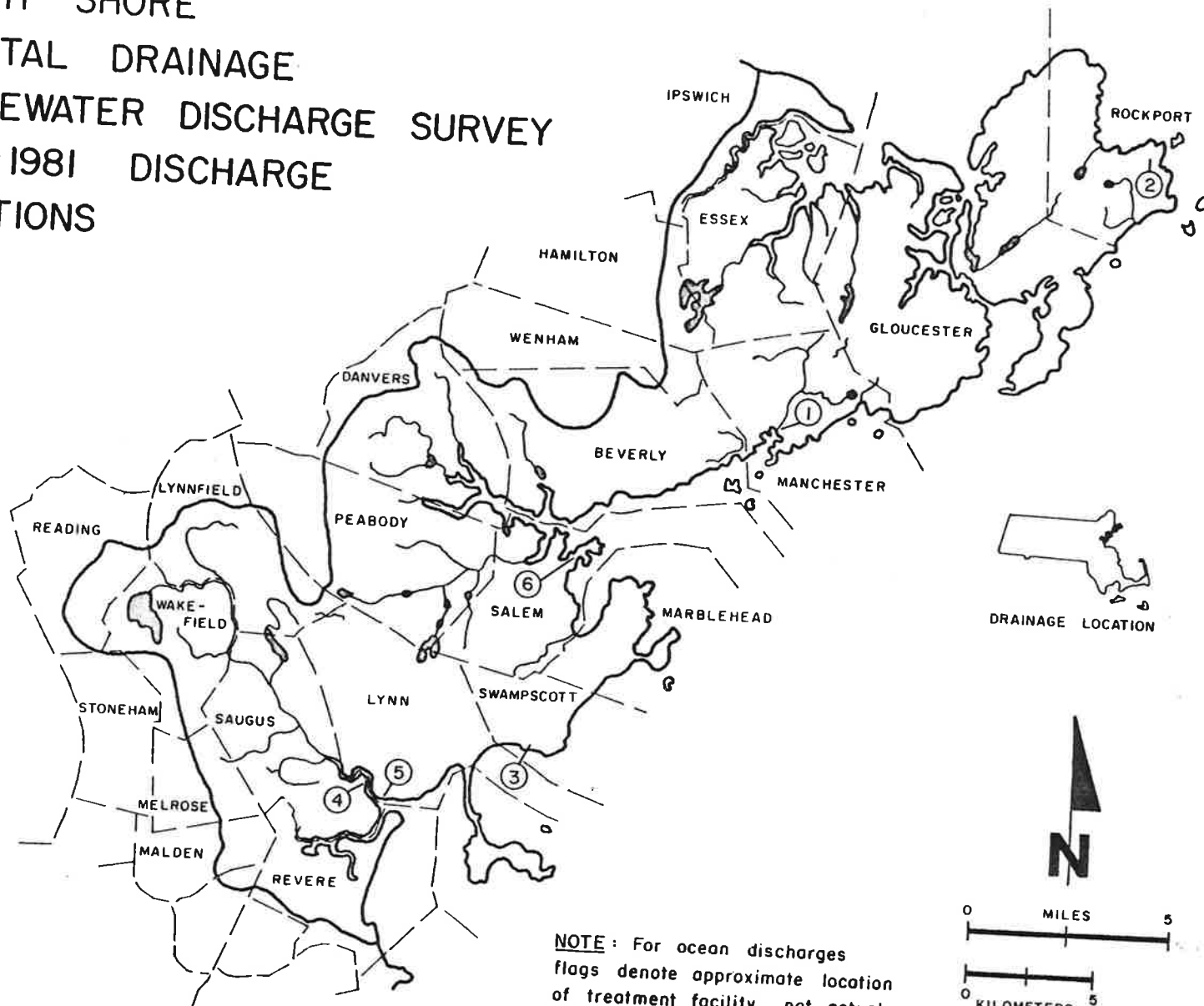
INTRODUCTION

7 This report is a compilation of data obtained from wastewater discharge
10 surveys conducted during the period from 1978 through 1981 in the North
12 Coastal Water Quality Basin. Included for each discharge is a brief
17 description of the discharge; including the community in which it is
18 located, the water body receiving the discharge, and the NPDES and state
9 permit numbers under which the discharge is operated. Also included
with the summaries of discharge data is a list of the dates on which
the sample was taken along with the type of sample.

In performing these surveys both 24 hour composite and grab sampling
techniques were used. In the case of composite samples, compositing
utilized the proportioned sampling in which equal volumes of sample
were collected once each hour for the composite period. In general
grab sampling was used for industrial discharges and composite sampling
was used for municipal wastewater treatment facilities. However, grab
sampling was used at the municipal facilities for determining chlorine
residual and bacteria levels.

Except for determining chlorine residual (which was determined in the
field using the Hach DPD Free Chlorine Analyzing kit), all analyses
were performed at the DEQE Lawrence Experiment Station. Where appli-
cable, all analyses were performed according to the procedures set
forth in Standard Methods for the Evaluation of Water and Wastewater,
published by the American Public Health Association.

NORTH SHORE COASTAL DRAINAGE WASTEWATER DISCHARGE SURVEY 1978-1981 DISCHARGE LOCATIONS



NOTE: For ocean discharges flags denote approximate location of treatment facility, not actual point of discharge.

FIGURE 1

LIST OF DISCHARGERS

1. Manchester Municipal Wastewater Treatment Facility

This is an activated sludge secondary treatment facility utilizing the extended aeration modification of the activated sludge process followed by chlorination. Discharge is via a 9500 foot long outfall to a point in the outer harbor near Sauli Rock. Designed for a daily flow of approximately 0.6 MGD the plant experiences flows in excess of 1.2 MGD during periods of prolonged rainfall. These high flows cause the occasional washout of the final clarifier, as occurred during this survey and can be seen in the drastic increase in BOD, COD and solids concentration in the effluent in the data for the period of 30 November to 3 December 1981. The facility treats a waste of predominantly sanitary origins with virtually no industrial contributions.

2. Rockport Municipal Wastewater Treatment Facility

This is an activated sludge secondary treatment facility and like Manchester is subject to high levels of inflow during periods of prolonged rain. However, being a newer facility with substantial reserve capacity, washouts of activated sludge solids when they occur are short lived phenomena with no appreciable effect on the treatment process. This plant also treats a principally sanitary waste. Chlorination of the effluent is performed on a seasonal basis during the warm weather seasons only.

3. Swampscott Municipal Wastewater Treatment Facility

This treatment plant is a primary treatment plant with pre-chlorination used for odor control. The facility is unique in that the plant is located completely underground. The facility also utilizes seasonal post chlorination of the effluent for disinfection.

4. Eastern Tool and Stamping

Located in Saugus the company is engaged in the fabrication of stamped metal products. Their operations result in the production of wastewaters consisting of non-contact cooling water and wash waters. The wash waters are discharged to the sanitary sewer system while the cooling water is discharged to the Saugus River.

5. General Electric Company, Riverworks

Located in Lynn this division manufactures industrial, marine and aircraft turbine engines of both steam powered and internal combustion types. Plant operations result in multiple small separate discharges of cooling water from various segments of the manufacturing process. The total discharge with all outfalls operating is about 100 MGD. While the company is permitted for 27 discharges, only six were sampled for this survey.

6. New England Power Co., Salem Harbor Station

Located in Salem this is a steam electric generating plant with the capability of using either coal or oil to fire 3 of its 4 boilers. The fourth boiler is designed for oil only. The plant has 6 outfalls: 001 thru 004 are cooling water discharges, 005 is backwash from cleaning the intake screen and 006 is the discharge from the Flyash transport and cleaning system. For this survey only outfall 006 was sampled.

TABLE 1

MANCHESTER MUNICIPAL WASTEWATER TREATMENT FACILITY

LOCATION: Manchester

RIVER BASIN: North Coastal

RECEIVING WATER: Manchester Outer Harbor (Atlantic Ocean)

NPDES PERMIT NO.: MA0100871 (State No. M080)

DATE AND TYPE OF SAMPLE:

- 11 September-12 September 1978, 24 Hr. Composite - Effluent
- 12 September 1978, Coliform Grab - Effluent
- 12 September-13 September 1978, 24 Hr. Composite - Influent & Effluent
- 13 September-14 September 1978, 24 Hr. Composite - Effluent
- 22 April-23 April 1980, 24 Hr. Composite - Effluent
- 23 April 1980, Coliform Grab - Effluent
- 30 November-1 December 1981, 24 Hr. Composite - Influent & Effluent
- 1 December 1981, Coliform Grab
- 1 December-2 December 1981, 24 Hr. Composite - Influent & Effluent
- 2 December-3 December 1981, 24 Hr. Composite - Influent & Effluent

RESULTS OF LABORATORY ANALYSES

(mg/l unless noted otherwise)

PARAMETER	9/11-12/78	9/12-13/78		9/13-14/78
	EFFLUENT	INFLUENT	EFFLUENT	EFFLUENT
Flow (MGD)	0.28	--	0.28	0.28
COD	250	340	93	160
BOD ₅	15	120	3	12
pH (Standard Units)	7.5	7.4	7.6	7.7
Total Alkalinity	136	160	110	112
Suspended Solids	17	74	6.0	14
Settleable Solids (ml/l)	0.0	--	0.0	0.0
Total Solids	680	668	682	1236
Ammonia-Nitrogen	6.0	0.0	0.0	0.6
Nitrate-Nitrogen	0.6	30	18	21
Total Phosphorus	5.0	12	5.5	5.0
Total Coliform/100ml	<i>grab</i> 170,000(1)	--	--	--
Fecal Coliform/100ml	25,000 (1)	--	--	--
Chlorine Residual	0.9(1)	--	--	--

(1) No chlorine contact chamber. Sample taken within 1 foot of chlorine diffuser.

TABLE 1 (Cont.)
MANCHESTER MUNICIPAL WASTEWATER TREATMENT FACILITY
 Results of Laboratory Analyses

PARAMETER	4/22-23/80 EFFLUENT
Flow (MGD)	0.41
BOD ₅	24
pH (Standard Units)	6.8
Total Alkalinity	24
Suspended Solids	16
Settleable Solids	0.0
Total Solids	398
Total Kjeldahl Nitrogen	1.1
Ammonia-Nitrogen	0.6
Nitrate-Nitrogen	9.5
Total Phosphorus	0.93
Total Coliform/100ml	900 (1)
Fecal Coliform/100ml	180 (1)
Chlorine Residual	0.7 (1)
Ni	0.00
Cr	0.10
Cu	0.10
Hg	0.0007
Pb	0.00
Ag	0.00
As	0.00
Cd	0.00

grab

(1) No chlorine contact chamber. Sample taken within
 1 foot of chlorine diffusor.

TABLE 1 (Cont.)

TABLE 1 (Cont.)

MANCHESTER WWTF

Results of Laboratory Analyses

PARAMETER	11/30-12/1/81		12/1-2/81		12/2-3/81	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
Flow (MGD)	0.49	--	0.53	--	1.22	--
COD	295	49	204	330	97	291
BOD ₅	120	12	96	216	24	360
pH (Standard Units)	7.2	6.9	7.1	6.6	6.8	6.6
Suspended Solids	97	8	64	280	32	164
Settleable Solids (ml/l)	--	0.0	--	28	--	15
Total Solids	382	320	324	568	204	338
Total Kjeldahl-Nitrogen	17	2.5	12	17	7.5	7.6
Ammonia-Nitrogen	15.2	0.08	10	0.39	5.6	0.03
Nitrate-Nitrogen	0.0	9.5	0.0	6.4	0.7	5.2
Total Phosphorus	5.2	3.9	4.5	11	2.0	4.3
Chlorine Residual(DPD Free)	--	0.8 (1)(2)	--	--	--	--
Total Coliform/100ml	--	<10 (1)(2)	--	--	--	--
Fecal Coliform/100ml	--	<5 (1)(2)	--	--	--	--
Cu	0.19	0.06	--	--	--	--
Fe	1.0	0.12	--	--	--	--
Cd	0.00	0.00	--	--	--	--
Hg	0.0005	0.0002	--	--	--	--
Cr	0.00	0.00	--	--	--	--
As	0.00	0.00	--	--	--	--
Pb	0.00	0.05	--	--	--	--
Zn	0.08	0.04	--	--	--	--
Ni	0.06	0.06	--	--	--	--
Chlorides	--	76	--	66	--	52

Notes: (1) No chlorine contact chamber.

Sample taken within 1 foot of chlorine diffusor.

(2) Sample allowed to stand approximately 20 minutes before fixing for analysis to simulate travel time in outfall pipe.

TABLE 2

ROCKPORT MUNICIPAL WASTEWATER TREATMENT FACILITY

LOCATION: Rockport
 RIVER BASIN: North Coastal
 RECEIVING WATER: Rockport Harbor (Atlantic Ocean)
 NPDES PERMIT NO.: MA0100145 (State No. M016)

DATE AND TYPE OF SAMPLE:

13 December 1978, Grab - Effluent
 30 November-1 December 1981, 24 Hr. Composite - Influent & Effluent
 1 December 1981, Coliform Grab - Effluent
 1 December - 2 December 1981, 24 Hr. Composite - Influent & Effluent
 2 December - 3 December 1981, 24 Hr. Composite - Influent & Effluent

RESULTS OF LABORATORY ANALYSES

(all values in mg/l unless noted otherwise)

<u>PARAMETER</u>	<u>12/13/78 EFFLUENT</u>
Flow (MGD)	0.41
COD	70
BOD ₅	6.0
pH (Standard Units)	7.2
Suspended Solids	1.0
Settleable Solids (ml/l)	0.0
Total Solids	358
Total Kjeldahl Nitrogen	3.1
Ammonia-Nitrogen	0.44
Nitrate-Nitrogen	5.9
Total Phosphorus	2.6
Total Coliform/100ml	100
Fecal Coliform /100ml	<5

TABLE 2 (Cont.)

luent
luent
uent

TABLE 2 (Cont.)

ROCKPORT WWTF

Results of Laboratory Analyses

PARAMETER*	11/30-12/1/81		12/1-2/81		12/2-3/81	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
Flow (MGD)	--	0.31	--	0.45	--	1.14
COD	394	59	272	97	165	126
BOD ₅	168	18	138	62	42	132
pH (Standard Units)	7.5	7.3	7.2	7.0	7.1	6.8
Suspended Solids	154	8	108	46	68	68
Settleable Solids (ml/l)	--	0.0	--	5.0	--	6.0
Total Solids	446	362	376	340	292	286
Total Kjeldahl-Nitrogen	23	6.8	21	8.5	9.2	2.4
Ammonia-Nitrogen	23	7.3	15	3.0	7.1	0.03
Nitrate-Nitrogen	0.01	6.0	0.1	9.1	3.8	6.2
Total Phosphorus	6.7	4.2	5.2	5.5	2.0	2.5
Chlorides	--	87	--	76	--	60
Cu	0.10	0.01	--	--	--	--
Fe	0.51	0.07	--	--	--	--
Cd	0.00	0.00	--	--	--	--
Hg	0.0004	0.0001	--	--	--	--
Cr	0.24	0.02	--	--	--	--
As	0.00	0.00	--	--	--	--
Pb	0.06	0.06	--	--	--	--
Zn	0.13	0.05	--	--	--	--
Ni	0.03	0.02	--	--	--	--

*all values in mg/l unless noted otherwise

TABLE 3

SWAMPSCOTT MUNICIPAL WASTEWATER TREATMENT FACILITY

LOCATION: Swampscott

RIVER BASIN: North Coastal

RECEIVING WATER: Nahant Bay (Atlantic Ocean)

NPDES PERMIT NO.: MA0101907 (State No. M039)

DATE AND TYPE OF SAMPLE:

- 11 September - 12 September 1978, 24 Hr Composite - Influent and Effluent
- 12 September 1978, Coliform Grab - Effluent
- 12 September - 13 September 1978, 24 Hr. Composite - Effluent
- 13 September - 14 September 1978, 24 Hr. Composite - Effluent
- 22 April - 23 April 1980, 24 Hr. Composite - Effluent
- 6 April - 7 April 1981, 24 Hr. Composite - Influent & Effluent
- 7 April 1981, Coliform Grab
- 7 April - 8 April 1981, 24 Hr. Composite - Influent & Effluent
- 8 April - 9 April 1981, 24 Hr. Composite - Influent & Effluent
- 30 November - 1 December 1981, 24 Hr. Composite - Influent and Effluent
- 1 December - 2 December 1981, 24 Hr. Composite - Influent and Effluent
- 2 December - 3 December 1981, 24 Hr. Composite - Influent and Effluent

TABLE 3 (Cont.)
SWAMPSCOTT WWTF
 Results of Laboratory Analyses

<u>PARAMETER*</u>	9/11-12/78		9/12-13/78	9/13-14/78
	<u>INFLUENT</u>	<u>EFFLUENT</u>	<u>EFFLUENT</u>	<u>EFFLUENT</u>
Flow (MGD)	--	1.69	1.67	1.69
COD	240	240	240	190
BOD ₅	84	135	130	100
pH (Standard Units)	6.7	6.8	7.0	7.0
Total Alkalinity	80	97	90	91
Suspended Solids	138	138	110	68
Settleable Solids (ml/l)	--	1.3	0.9	0.1
Total Solids	382	414	374	312
Ammonia-Nitrogen	14	19	0.3	0.1
Nitrate-Nitrogen	0.8	0.7	18	16
Total Phosphorus	0.5	0.65	10	5.6
Total Coliform/100ml	--	2.4x10 ⁷	--	--
Fecal Coliform/100ml	--	950,000	--	--
Chlorine Residual	--	1.5	--	--

*all values in mg/l unless noted otherwise

TABLE 3 (Cont.)

SWAMPSCOTT WWTF

Results of Laboratory Analyses

PARAMETER	4/22-23/80
	<u>EFFLUENT</u>
Flow (MGD)	1.20
BOD ₅	59
pH (Standard Units)	7.0
Total Alkalinity	91
Suspended Solids	55
Settleable Solids (ml/l)	0.1
Total Solids	318
Total Kjeldahl-Nitrogen	17
Ammonia-Nitrogen	11
Nitrate-Nitrogen	0.3
Total Phosphorus	0.75
Nickel	0.00
Cadmium	0.00
Chromium	0.00
Copper	0.007
Lead	0.00
Silver	0.00
Arsenic	0.00
Mercury	0.0006

TABLE 3 (Cont.)
SWAMPSCOTT WWTF
Results of Laboratory Analyses

PARAMETER*	4/6-7/81		4/7-8/81		4/8-9/81	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
Flow (MGD)	--	**	--	--	--	--
COD	234	102	250	205	310	215
BOD ₅	111	43	138	123	150	102
pH (Standard Units)	7.3	6.8	6.8	6.4	6.6	6.7
Suspended Solids	114	34	47	31	138	65
Settleable Solids (ml/l)	--	0.0	--	0.0	--	0.0
Total Solids	340	302	388	382	482	362
Total Kjeldahl-Nitrogen	25	11	12	14	12	15
Ammonia-Nitrogen	13	7.8	85	6.8	8.7	8.1
Nitrate-Nitrogen	1.8	1.7	0.7	6.4	0.2	0.3
Total Phosphorus	4.3	2.8	4.3	4.3	4.3	4.8
Chlorides	--	90	--	80	--	75
Total Coliform/100ml	--	5,000	--	--	--	--
Fecal Coliform/100ml	--	400	--	--	--	--
Cd	--	0.00	--	--	--	--
Sn	--	0.12	--	--	--	--
Ni	--	0.00	--	0.01	--	0.01
Cr	--	0.00	--	0.00	--	0.00
Cr ⁺⁶	--	0.00	--	0.00	--	0.00
Cu	--	0.05	--	0.04	--	0.48
Pb	--	0.00	--	0.00	--	0.00
Zn	--	0.05	--	0.06	--	--

*all values in mg/l unless noted otherwise
**flow meter not operating

TABLE 3 (Cont.)
SWAMPSCOTT WWTF
 Results of Laboratory Analyses

PARAMETER*	11/30-12/1/81		12/1-2/81		12/2-3/81	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
Flow (MGD)	--	1.8**	--	--	--	--
COD	394	324	301	213	321	155
BOD ₅	168	129	150	120	64	58
pH (standard Units)	7.4	7.3	7.2	7.2	7.0	7.0
Suspended Solids	324	104	124	56	82	104
Settleable Solids (ml/l)	--	1.0	--	3.0	--	0.0
Total Solids	614	428	418	354	272	260
Total Kjeldahl-Nitrogen	30	20	17	14	9.8	11
Ammonia-Nitrogen	30	15	14	12	6.0	6.9
Nitrate-Nitrogen	0.1	0.0	0.1	0.3	0.2	0.1
Total Phosphorus	6.3	6.0	5.3	5.0	2.5	3.3
Chlorides	--	66	--	62	--	44
Cu	0.05	0.08	--	--	--	--
Fe	1.5	0.91	--	--	--	--
Cd	0.00	0.00	--	--	--	--
Hg	0.0006	0.0003	--	--	--	--
Cr	0.01	0.01	--	--	--	--
Pb	0.07	0.03	--	--	--	--
Zn	0.18	0.11	--	--	--	--
Ni	0.05	0.00	--	--	--	--
As	0.02	0.02	--	--	--	--

*all values in mg/l unless noted otherwise
 **estimate - flow recorder inoperative

TABLE 4

EASTERN TOOL AND STAMPING, INC.

LOCATION: Saugus
 RIVER BASIN: North Coastal
 RECEIVING WATERS: Saugus River
 NPDES PERMIT NO.: MA0004634 (State No. 475)
 DATE AND TYPE OF SAMPLE: 19 December 1978, Grab - Effluent

RESULTS OF LABORATORY ANALYSES

<u>PARAMETER*</u>	<u>12/19/78</u> <u>EFFLUENT</u>
Flow (MGD)	N.A.
Suspended Solids	13
Total Solids	384
Iron	1.5
Zinc	0.05
Oil and Grease	4.7
pH (Standard Units)	9.5
BOD ₅	3.9

*all values in mg/l unless otherwise noted

TABLE 5

GENERAL ELECTRIC COMPANY, RIVERWORKS

LOCATION: Lynn
RIVER BASIN: North Coastal
RECEIVING WATER: Saugus River
NPDES PERMIT NO.: MA0003905 (State No. 346)
DATE AND TYPE OF SAMPLE: 20 December 1978, Grab - Effluent

RESULTS OF LABORATORY ANALYSES

12/20/78 - EFFLUENT

OUTFALL NO.	007	013	019	028	029	031
Oil & Grease (mg/l)	4.0	5.6	3.2	1.1	1.0	2.2

TABLE 6

NEW ENGLAND POWER COMPANY, SALEM HARBOR STATION

LOCATION: Salem
 RIVER BASIN: North Coastal
 RECEIVING WATER: Salem Harbor (Atlantic Ocean)
 NPDES PERMIT NO.: MA0022403 (State No. 020)
 DATE AND TYPE OF SAMPLE: 20 December 1978, Grab - Effluent
 22 April 1980, Grab - Effluent

RESULTS OF LABORATORY ANALYSES

OUTFALL NO.:	12/20/78 EFFLUENT 006	4/22/80 EFFLUENT 006
<u>Parameter*</u>		
Flow (MGD)	N.A.	0.26
Turbidity (Standard Units)	1.2	--
Suspended Solids	6.0	--
Settleable Solids (ml/l)	0.0	--
Oil & Grease	0.8	1.2
Zinc	0.00	--
Nickel	0.30	0.35
Copper	0.02	0.03
Aluminum	<0.1	--
Iron	0.50	1.0
pH (Standard Units)	9.3	--

*all values in mg/l unless noted otherwise

GLOSSARY OF TERMS

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 coliforms 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 normal 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 living cells as well as industrially important substances (as fertilizers, dyes).

Nitrogen, Ammonia - A compound of nitrogen and hydrogen, NH_3 , which is a part of the nitrogen cycle. Its presence in sufficient amounts in a stream can indicate a wastewater discharge. The oxidation of ammonia consumes 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 of 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 composed 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 a 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 living cells; it exists in several allotropic forms. The majority

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.