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DRAFT REPORT
on
CHARACTERIZATION STEP
for
CONFIRMATION STUDY ON
HAZARDOUS WASTE SITES
at
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RI

March 13, 1985

Prepared for:

Northern Division
Naval Facilities Engineering Command
Building 77-L, U.S. Naval Base
Philadelphia, PA 19112

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Comm. No. 502-10

A/E Contract No. N62472-83-C-1154

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March 13, 1985

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Att: Larry Quinn, Code 114

Re: Draft Report on Characterization Step
for Confirmation Study on
Hazardous Waste Sites
at Naval Education and Training Center
Newport, RI
A/E Contract No. N62472-83-C-1154

Gentlemen:

We are transmitting herewith our "Draft Report on Characterization Step for Confirmation Study on Hazardous Waste Sites at Naval Education and Training Center, Newport, RI". The report presents all the data obtained in the characterization step sampling and analysis on six sites and recommendations for further monitoring and/or remedial measures on four sites.

It has been a pleasure working with representatives of the Navy on this project. Please feel free to call if you have any questions.

Very truly yours,

LOUREIRO ENGINEERING ASSOCIATES

Julio Loureiro

Julio Loureiro, P.E.
President

Enc.

JL:b

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A. INTRODUCTION

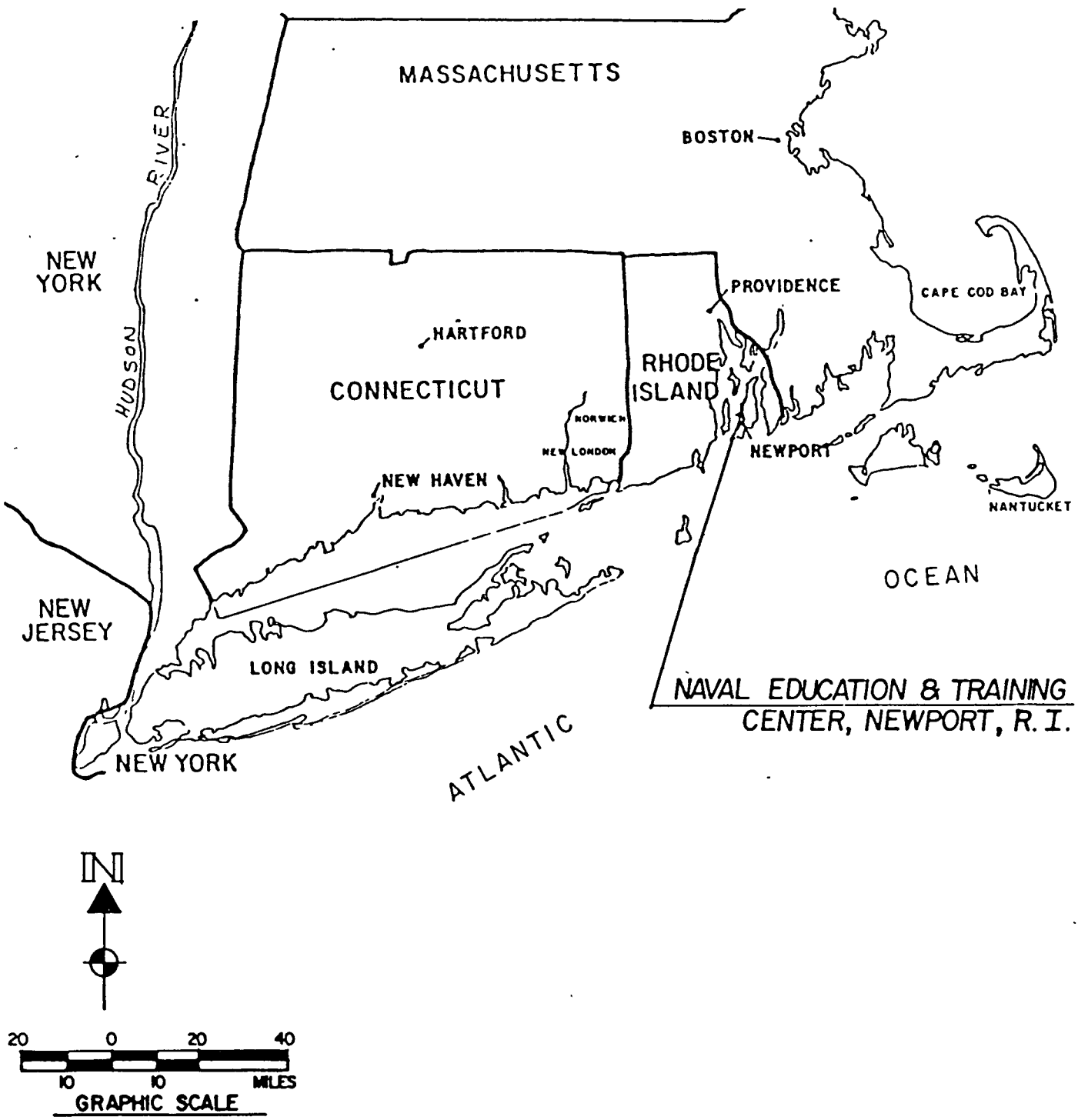
1. Scope and Purpose

This report covers the results of the characterization step of confirmation studies at six sites where hazardous wastes were suspected to be causing adverse effects on the environment due to past waste disposal practices at the Naval Education and Training Center, Newport, Rhode Island (see Vicinity Plan, Figure 1). The purpose of the characterization step was to develop a quantitative assessment of the contamination identified in the verification step. The six sites under investigation are listed in Table 1 and the locations are shown on Figure 2. In addition to the sampling program for the six disposal sites, sampling was conducted at two control sites as listed in Table 1 and shown on Figure 2.

The sampling conducted in the characterization step was conducted as a result of studies performed during the verification step.

The characterization step completes the confirmation study phase of the Navy Assessment and Control of Installation Pollution (NACIP) program which is designed to identify contamination of Navy lands resulting from past operations and to institute corrective measures as needed. The final report on the confirmation study phase of the NACIP program will include results of both the verification and characterization steps and will present cost estimates for remedial action plans suggested. Implementation of the remedial action measures will constitute the third and final phase of the NACIP program.

This report presents the details of the sampling and analysis program conducted in the characterization step. A quantitative analysis of the extent of contamination and contaminant migration potential is presented for each site. The available data is evaluated and recommendations for additional action are made for each site.



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER

VICINITY PLAN

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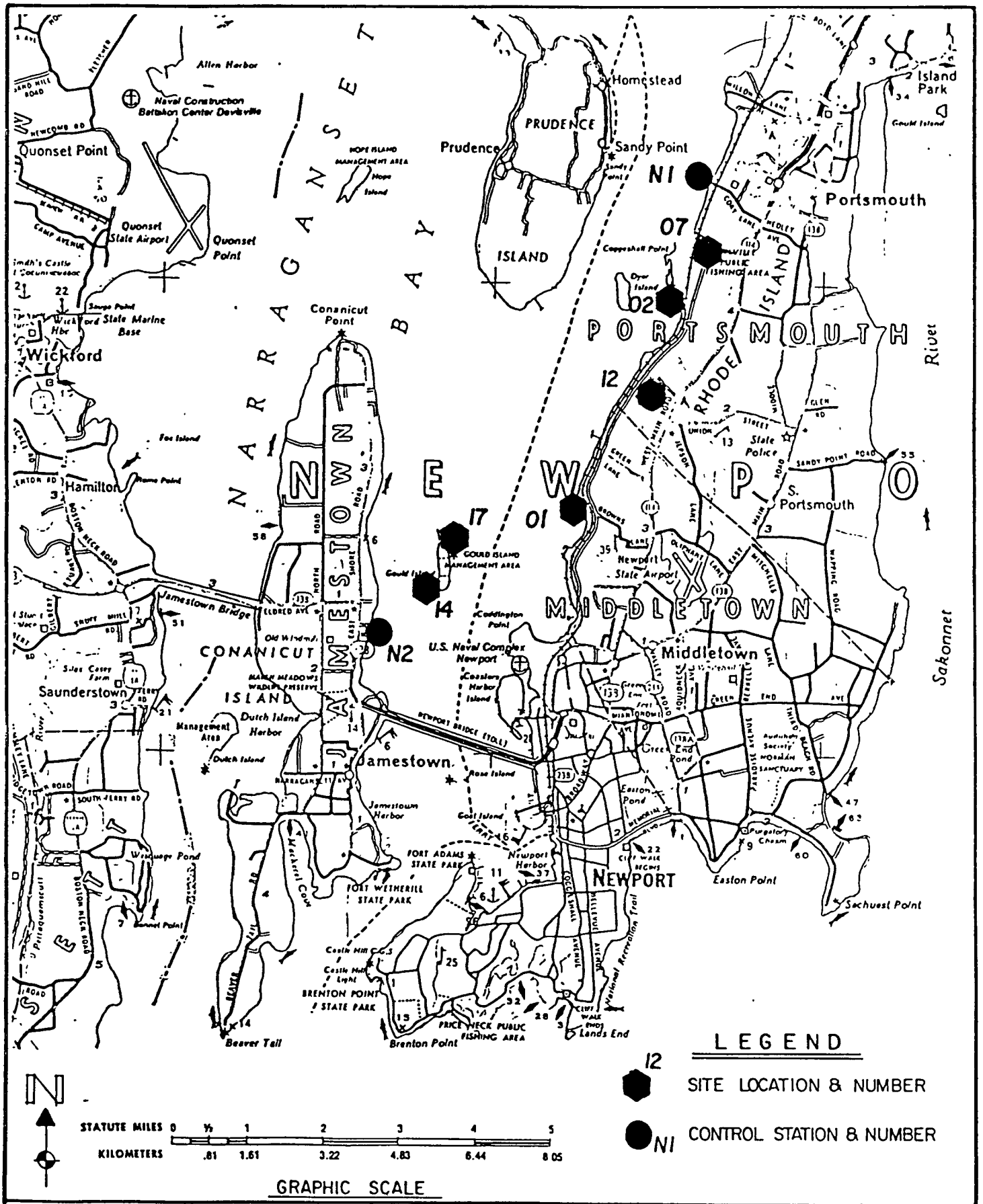
MAR. 13, 1985

FIG. NO. 1



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER	CHARACTERIZATION STEP SITES INVESTIGATED & CONTROL SAMPLING STATIONS

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MAR. 13, 1985

FIG. NO. 2

TABLE 1

CHARACTERIZATION STEP SAMPLING SITES AND CONTROL STATIONS

Site No.	Site Name	Type of Hazardous Waste Disposal Activity
01	McAllister Point Landfill	Landfilling of NETC wastes for 20 years; PCB-contaminated oils; other waste oils; spent acids, paints and solvents
02	Melville North Landfill	Similar to McAllister Point Landfill
07	Tank Farm One	Burial of light oil and gasoline tank bottom sediments
12	Tank Farm Four	Burial of residual fuel oil tank bottom sediments
14	Gould Island Disposal Area	Burial of electroplating wastes
17	Gould Island Electroplating Shop	Discharge of electroplating wastewaters into Narragansett Bay
N1	Control Station at end of Corey Lane, Portsmouth, Rhode Island	None suspected or evident near the sampling point
N2	Control Station off Rte. 138 north of Newport Bridge, Jamestown, Rhode Island	None suspected or evident near the sampling point

The work described herein was carried out under A/E Contract No. N62472-83-C-1154 by Loureiro Engineering Associates of Avon, CT with laboratory analyses and other support being provided by YWC, Inc. of Monroe, CT (formerly York Wastewater Consultants of Stamford, CT).

2. Verification Step

The work performed in the verification step indicated the need to characterize the contamination identified at all six waste disposal sites.

At the McAllister Point Landfill, Tank Farm One and Tank Farm Four monitoring wells were proposed to determine whether or not contaminants were affecting groundwater and/or migrating off-site. At the McAllister Point Landfill and Gould Island Disposal Area, additional sediment and mussel samples were proposed to detect and establish area limits and concentrations of pollutants in the Narragansett Bay environment. An additional mussel sample was proposed at the Gould Island Electroplating Shop to supplement the verification step data. Other samples at Tank Farm One included soils for fingerprint comparisons with groundwater samples; also sampled were the inlet and outlet of the oil-water separator. At the Melville North Landfill, the characterization step was limited to defining the extent of the oil-soaked soil deposits.

A draft report on the verification step was submitted on February 28, 1984 and revised May 8, 1984. That report included a complete discussion of all the work performed in the verification step as well as the program proposed for characterization.

B. COLLECTION OF SAMPLES

1. General

The sampling program for the characterization step was based on the data presented in the revised draft report on the verification step. The selection of sampling stations and parameters for laboratory analysis were based on the need to quantitatively determine the extent of contamination and the types of contaminants found in the verification step.

2. Sediment Sampling Methods

Sediment samples were collected from the top four to six inches of the bottom deposits. Scuba divers were employed to collect the samples. Because of the presence of very coarse sediment materials such as rocks, boulders, and stones, the samples were collected by scooping into plastic scoops and then transferring the sediment into the sample containers.

3. Mussel Sampling Methods

Mussels were collected by hand from the intertidal zone. An effort was made to include only the edible blue mussel (*Mytilus edulis*) in the sample although a few others may have been collected. The laboratory was instructed to analyze only the edible blue mussel. In most cases, the sample (at least 100 animals, 1-1/2 to 2 inches long) was gathered in an area covering no more than a 50-foot length of shoreline.

4. Soil Sampling Methods

Soil samples were hand excavated by shovel and, where necessary, by use of a pick or crow bar to loosen material. Before each use, the sampling implements were inserted several times into the soil near the sampling point. At the desired depth, a soil sample was removed with a shovel and placed on a clean polyethylene sheet from which it was transferred into appropriate sample containers. Polyethylene sheets were appropriately discarded after use on each sample.

5. Tank Sampling Methods

Water samples were collected from inactive oil storage tanks by use of a depth sampler. Samples were collected at the bottom of the tank. The sampler was lowered into the tank through a sampling port in the top of the tank. The bottom port of the sampler was held closed during descent by a weighted plug which was forced away from its seat upon contact with the bottom of the tank. The inlet port of the sampler automatically closed upon lifting the sampler. The contents of the sampler were transferred to sample containers. The sampler was cleaned with potable water between sampling stations.

6. Groundwater Sampling Methods

Groundwater samples were collected by bailing from monitoring wells installed for this purpose; three wells were installed at the McAllister Point Landfill and two each at Tank Farms One and Four. Monitoring well installation is covered in Section D.

Ground water samples were collected from two other locations at Tank Farm One; one from a ground water collection pipe system normally discharging into an oil-water separator (which was bypassed during sampling) and the other from a manhole through which the oil-water separator effluent discharges to the Bay.

The ground water collection pipe system was sampled by direct discharge from an open end pipe into appropriate sample containers. The oil-water separator was bypassed for a minimum of 15 minutes into a nearby holding basin where the samples were collected at the discharge pipe at the retaining wall on the east end of the basin. The oil-water separator effluent was sampled by dipping with a long-handled sampling dipper. Surface?

Sampling of groundwater from monitoring wells involved the following steps:

(a) Determination of water level;

(b) Purging of the well by removal of three well volumes of water;

(c) Collection of samples for laboratory analysis.

Groundwater elevations were measured from the top of the well protective casing to the water surface in the well before purging. The elevations were measured using a steel tape graduated at the top in one hundredth of a foot increments. Carpenters chalk, or other appropriate methods described in EPA Publication SW-846, were used on the bottom of the tape to indicate the static water level prior to purging. The water level was recorded and was used to determine the volume of water to be evacuated from the well based on the known depth to which the well was drilled. The tape was prepared for use at the next well by wiping with a clean, dry white paper towel.

The difference between the static water level and the bottom of the well was used to calculate the volume of water to be purged in a single evacuation. Three such volumes were evacuated from each of the wells prior to sampling. In some cases, a period of recovery was necessary before the purging could be completed.

The wells were purged using a bailer attached to a nylon rope. The bailers were of PVC construction and were up to six feet in length. The water withdrawn from the well during the purging procedure was placed in a container. When full, the container was emptied onto the ground downgrade of the well. This procedure was repeated until the predetermined quantity of water had been evacuated from the well.

All groundwater samples were collected using the same PVC bailer and nylon rope as was used for purging. To prevent cross-contamination, a separate bailer and rope were dedicated to each well to be sampled. The PVC bailers and nylon rope set-ups were pre-cleaned and brought to the site in clean plastic bags. The cleaning consisted of scrubbing in soapy water, soaking in soapy water for several hours, followed by a one-hour tap water rinse and a distilled water rinse.

While using the bailer to collect a sample, the plastic bag used to transport to the site was used as a liner in a 30-gallon trash container to receive the rope as it was withdrawn from the well, thereby preventing contaminants from being picked up by the rope. Samples were poured from the bailer into appropriate containers.

7. Sample Containers and Field Preservation

The following types of sample containers were used:

- One-liter and 500-milliliter wide-mouth glass bottles with Teflon or aluminum foil-lined screw caps.
- 500-milliliter plastic bottle with Teflon-lined screw cap.
- 50-milliliter glass, Teflon septum-capped vial.
- Zip-loc plastic bag (with sample pre-wrapped in aluminum foil).

All samples (except mussels) were preserved by placing them in coolers chilled with ice. In addition, the following preservation techniques were used for specific analyses on groundwater samples:

Metals - Add 1-2 milliliters of concentrated nitric acid (pH < 2)

Cyanide - Add 1-2 milliliters of 50% sodium hydroxide (pH > 12)

Phenols - Add 1-2 milliliters of phosphoric acid (pH < 4) and 1± gram copper sulfate crystals

PBHC - Add 1 - 2 milliliters of sulfuric acid (pH<3).

The 50-milliliter vials for volatile organic and BTX testing were slowly filled to overflowing and capped to exclude air from the samples; for soil samples, the vials were filled as much as practical and then tightly capped. The mussel samples were packed in dry ice to freeze the mussles and keep them frozen until delivery to the laboratory.

Table 2 shows a summary of the sample containers and field preservation techniques for the various types of samples collected.

8. Sample Identification and Custody

Each sample container was labeled as soon as possible after collection (and

TABLE 2
SAMPLE CONTAINERS AND FIELD PRESERVATION

Sample Type	Container Description	Minimum Sample Quantity	Parameters to be Analyzed	Preservation Techniques
Soil	Vial, 50-millileter	20 grams	Fingerprint	Cool, 4°C
Sediment	Plastic bottle, wide-mouth, one-liter	100 grams	Metals	Cool, 4°C
Mussels	Pre-wrapped in aluminum foil and placed in plastic bag	100 mussels	Metals	Freeze with dry ice
Ground-water	Vial, 50-milliliter	100 milliliters (2 vials)	VOC	Cool, 4°C
		50 milliliters	BTX	Cool, 4°C
		100 milliliters (2 vials)	Fingerprint	Cool, 4°C
	Glass bottle, one liter	2 liters (2 bottles)	Acid & B/N Extract	Cool, 4°C
	Glass bottle, 500 milliliters	500 milliliters	Pet. based Hyd. Carb.	H_2SO_4 pH < 3 Cool, 4°C
		500 milliliters	Phenols	1 gram CuSO4 H_3PO4 to pH < 4, Cool, 4°C
	Plastic bottle, 500 milliliters or 1-liter	500 milliliters or 1-liter	Metals	HNO_3 to pH < 2 Cool, 4°C
		500 milliliters	Cyanide	NaOH to pH > 12, Cool, 4°C
		500 milliliters	pH, Chlorides	Cool, 4°C
Water in tanks	Glass bottle 1 liter	2 liters (2 bottles)	Lead, PBHC, pH, TSS, BOD, NH_3	Cool, 4°C

after addition of preservatives, if required) with a pre-numbered peel off gummed label furnished by the laboratory. Each label was composed of three parts, each part having the same pre-printed laboratory sample number to facilitate cross references to Chain-of- Custody sheets and Laboratory Services Request sheets. The three-section label served the functions of (1) maintaining a seal by affixing the large portion of the label to both the container lid and body of the container; (2) maintaining chain-of-custody records by affixing the smallest portion of the label to the Chain-of-Custody sheet; and (3) minimizing numerical transcription errors by affixing the lower part of the label to the Laboratory Services Request sheet.

The large main section of each label was filled out to provide the following information:

- Job number and client
- Date of sample collection
- Check box to indicate that sample is to be saved
- Sample identification number

The lower part of the label was also filled out with the sample identification number identical to that entered on the main section of the label. The three parts of the label were then placed on the sample container, Sample Custody sheet, and Laboratory Services Request sheet.

The sample identification entered on the labels consisted of three parts separated by dashes; e.g. 01-13-MS. The first two digits designated the site number at which the sample was collected (see Table 1 for site numbers; control stations were assigned numbers N1 and N2). The next two digits were the station number at the sites as identified in the discussions of each site. The letters in the last part of the sample identification designated the type of sample (see Table 3 for a complete list of codes). The above example represents a sample of

TABLE 3
CODES USED IN SAMPLE IDENTIFICATION

Code	Sample Types
MS	Mussels (*Mytilus edulis*)
SD	Sediment
SL	Soil (suffixes A and B represent bottles for different types of analyses)
GW	Groundwater collected from monitoring wells (or from groundwater collection system at Tank Farm One); suffixes A through H represent different bottles for different types of analyses.
SP	Effluent of oil-water separator at Tank Farm One; suffixes A through C represent different bottles for different types of analyses.
TK	Water from bottom of inactive oil storage tanks.

mussels collected at Station 13 at Site No. 01, the McAllister Point Landfill.

To maintain control over the sample from its orignation in the field sampling program through receipt and analysis in the laboratory, a chain-of-custody program was instituted for convenience in handling and legal considerations.

At the sampling site, the person who collected the sample placed it in the appropriate container and transferred the sample to the project manager or delegated alternate who was responsible for addition of proper preservatives to the samples. The project manager or delegated alternate then completed all the necessary labeling and preparation of Sample Custody and Laboratory Services Request sheets. The Sample Custody sheet was signed by the person collecting the sample and by the project manager or delegated alternate.

The project manager or designated alternate was responsible for continuing preservation, storage and transportation of the samples to the laboratory. Samples were kept on ice (or dry ice for mussels) in coolers in a vehicle kept locked when not attended.

At the laboratory, the samples and Custody Sheets were transferred to the incoming sample log-in room and the person receiving the sample signed the Custody Sheets. The samples were then logged in by the Sample Custodian.

Each analyst who worked on a sample signed the corresponding Laboratory Request Sheet and maintained responsibility for the sample until the next analyst worked on the sample. This procedure was monitored by the Sample Custodian. Upon completion of the analyses, completed results, analyst's initials, date of analysis, notebook and page numbers were recorded on Results of Analyses Sheets which were then attached to the Laboratory Services Request Sheet and given to the Sample Custodian for review. After review of the data, the results were organized on a computer and archived.

The samples were stored (or preserved if not already preserved) as dictated

by sample type, which was the responsibility of the Sample Custodian. While samples were "work-in-progress" they were stored on the Sample Holding Shelves or the freezer or refrigerator (as required). This was noted on the Laboratory Services Request sheet for expeditious sample location by the next analyst. Completed samples were placed on the thirty day holding shelves and then transferred to the sample storage trailer for holding for an indefinite period.

9. McAllister Point Landfill Samples

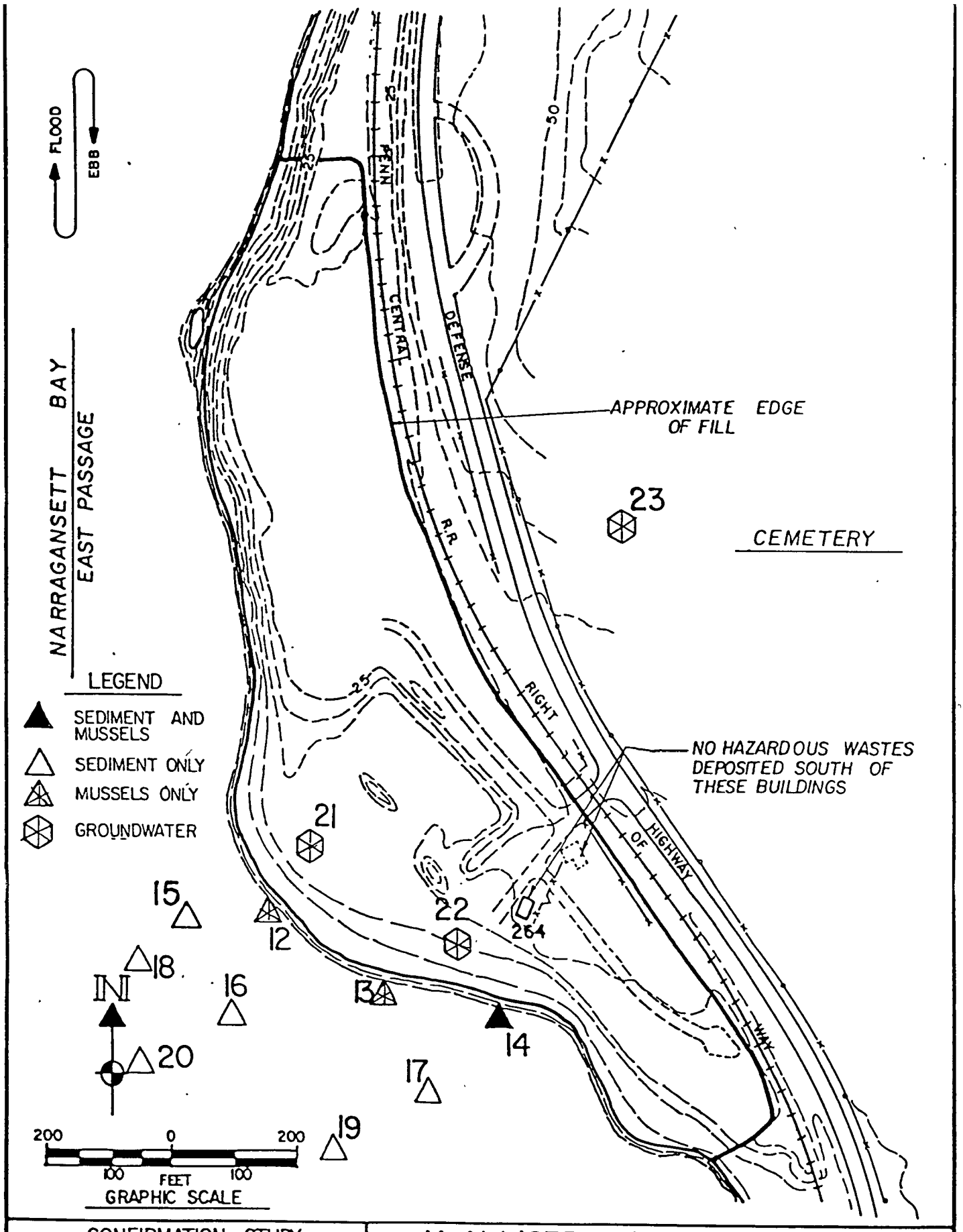
The samples collected in the characterization step at the McAllister Point Landfill (Site No. 01) are listed in Table 4. The general locations of the sample collection points are shown on Figure No. 3. The data establishing the location of each station is presented in Appendix A. The principal areas of interest for purposes of the sampling program in the characterization step were:

a. Repeat verification step mussel sampling at Stations 12 and 13 and extend mussel sampling south to Station 14 along the shoreline.

b. Extend sediment sampling south along the shoreline to Station 14 and out into the Bay at Stations 15 to 20.

c. Obtain a series of groundwater samples at upgradient well 23 and downgradient wells 21 and 22.

The shoreline is almost 2000 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed refuse deposits on the face of the landfill along the Bay. The shoreline is variable, ranging from shell and cobble beach areas to rip-rap, large rocks and exposed bedrock. A significant length of the beach has scattered deposits of metallic waste materials.



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER	McALLISTER POINT LANDFILL SITE NO 01 CHARACTERIZATION SAMPLING POINTS

YWC York Wastewater Consultants, Inc Stamford, Connecticut	LEA LOUREIRO ENGINEERING ASSOCIATES a professional corporation CONSULTING ENGINEERS AVON, CT.	MAR 13, 1985
		FIG NO 3

TABLE 4
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 01 - McALLISTER POINT LANDFILL

NO.	STA	TYPE	TIME	ANALYSIS FOR*
			9-11-84	
2959	20	Sediment (0-4)	9:20 AM	Metals, EP Toxic Metals, Cyanide
2960	18	Sediment (0-4)	9:30	Metals, EP Toxic Metals, Cyanide
2961	15	Sediment (0-4)	9:40	Metals, EP Toxic Metals, Cyanide
2962	16	Sediment (0-4)	9:50	Metals, EP Toxic Metals, Cyanide
2963	19	Sediment (0-4)	10:00	Metals, EP Toxic Metals, Cyanide
2964	17	Sediment (0-4)	10:20	Metals, EP Toxic Metals, Cyanide
2965	14	Sediment (0-4)	10:30	Metals, EP Toxic Metals, Cyanide
2976	14	Mussels	2:00 PM	Metals
2977	13	Mussels	2:30	Metals
2978	12	Mussels	3:00	Metals
			11-20-84	
6797	21	Groundwater	12:50 PM	Cyanide
6798	21	Groundwater	12:50	Metals
6799	21	Groundwater	12:50	pH, Chlorides
6800	22	Groundwater	12:15	Cyanide
6801	22	Groundwater	12:15	Metals
6802	22	Groundwater	12:15	pH, Chlorides
6803	23	Groundwater	3:25	Cyanide
6804	23	Groundwater	3:25	Metals
6805	23	Groundwater	3:25	pH, Chlorides
			12-17-84	
6843	23	Groundwater	1:50 PM	Cyanide
6844	23	Groundwater	1:50	Metals
6845	23	Groundwater	1:50	pH, Chlorides
6850	22	Groundwater	4:50	Cyanide
6851	22	Groundwater	4:50	Metals
6852	22	Groundwater	4:50	pH, Chlorides
			12-18-84	
6853	21	Groundwater	9:45 AM	Cyanide
6854	21	Groundwater	9:45	Metals
6855	21	Groundwater	9:45	pH, Chlorides

* Metals = Lead, copper, chromium, nickel

TABLE 4 (Cont'd)
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 01 - McALLISTER POINT LANDFILL

NO.	STA	TYPE	TIME	ANALYSIS FOR*
			1-07-85	
0631	23	Groundwater	8:25 AM	Cyanide
2	23	Groundwater	8:25 AM	PP, Metals
3	23	Groundwater	8:25 AM	pH, Chlorides
4	23	Groundwater	8:25 AM	PP - Vol. organics
5	23	Groundwater	8:25 AM	PP - Vol. organics
6	23	Groundwater	8:25 AM	PP - Acid/BN
7	23	Groundwater	8:25 AM	PP - Acid/BN
8	23	Groundwater	8:25 AM	Phenols
0639	21	Groundwater	4:20 PM	Cyanide
40	21	Groundwater	4:20 PM	PP, Metals
1	21	Groundwater	4:20 PM	pH, Chlorides
2	21	Groundwater	4:20 PM	PP - Vol. organics
3	21	Groundwater	4:20 PM	PP - Vol. organics
4	21	Groundwater	4:20 PM	PP - Acid/BN
5	21	Groundwater	4:20 PM	PP - Acid/BN
6	21	Groundwater	4:20 PM	Phenols
			1-08-85	
0647	22	Groundwater	10:00 AM	Cyanide
8	22	Groundwater	10:00 AM	PP, Metals
9	22	Groundwater	10:00 AM	pH, Chlorides
50	22	Groundwater	10:00 AM	PP - Vol. organics
1	22	Groundwater	10:00 AM	PP - Vol. organics
2	22	Groundwater	10:00 AM	PP - Acid/BN
3	22	Groundwater	10:00 AM	PP - Acid/BN
4	22	Groundwater	10:00 AM	Phenols
			1-28-85	
7001	23	Groundwater	8:50 AM	Cyanide
2	23	Groundwater	8:50 AM	Metals
3	23	Groundwater	8:50 AM	pH, Chlorides
21	22	Groundwater	2:30 PM	Cyanide
2	22	Groundwater	2:30 PM	Metals
3	22	Groundwater	2:30 PM	pH, Chlorides
4	21	Groundwater	2:50 PM	Cyanide
5	21	Groundwater	2:50 PM	Metals
6	21	Groundwater	2:50 PM	pH, Chlorides

* Metals = Lead, copper, chromium, nickel (when preceded by PP, the metals include all 13 priority pollutant metals)

PP = Priority Pollutants

The sediment sample at Station No. 14 was collected 50 feet off-shore in three to five feet of water. The other six samples (Station Nos. 15 to 20) were collected in ten to twenty feet of water. All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.

All mussel samples were collected in the intertidal zone at Station Nos. 12 and 13.

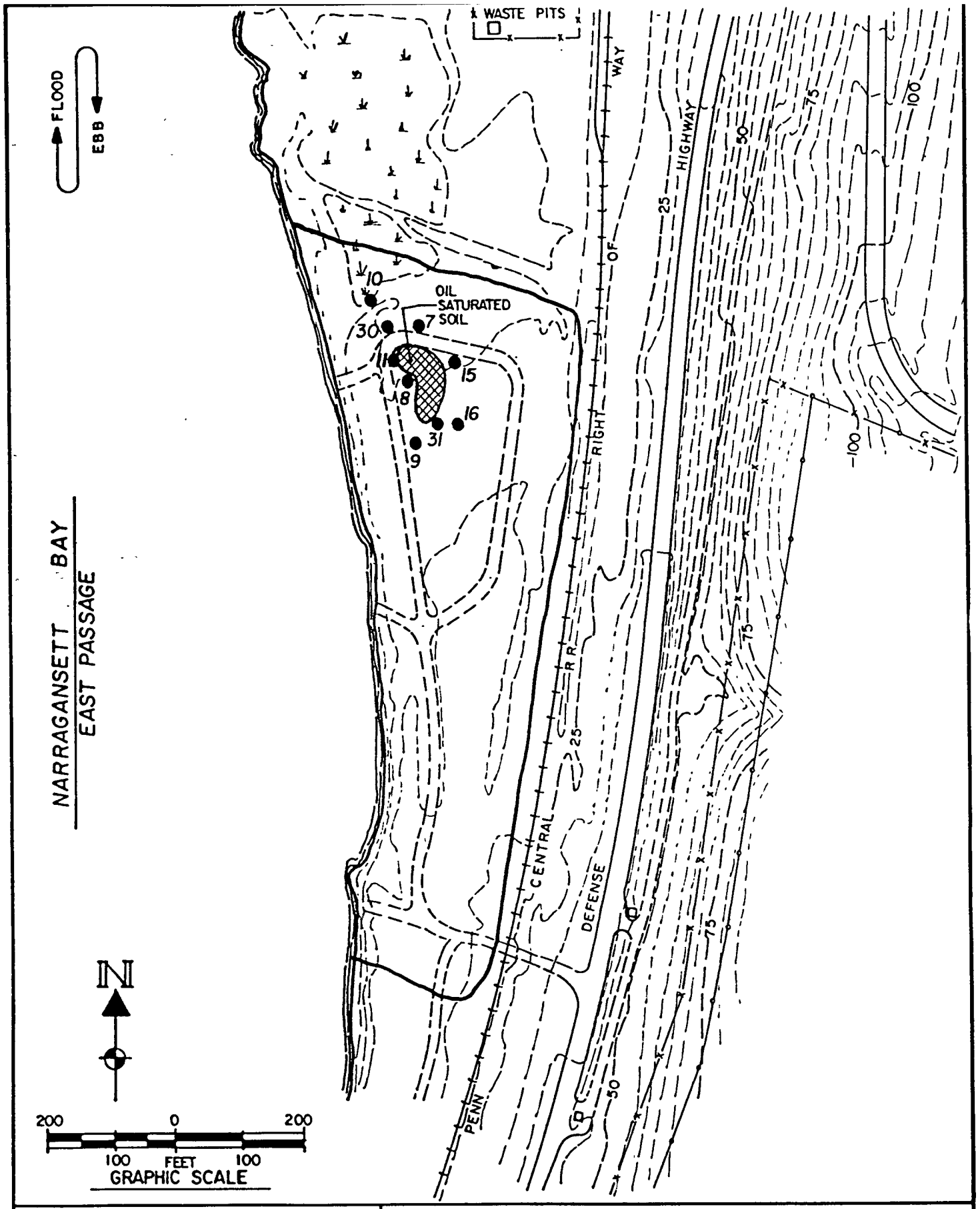
Monitoring wells were installed as summarized in Table 5. These wells were installed for the purpose of obtaining groundwater samples at the seaward edge of the landfill (Stations 21 and 22) and also at an upgradient well not affected by the landfill (Station 23). The wells were constructed as described in Section D.

10. Melville North Landfill Samples

The samples collected in the characterization step at the Melville North Landfill (Site No. 02) are listed in Table 6. The general locations of the sample collection points are shown on Figure No. 4. The data establishing the location of each station is presented in Figure No. 5. The principal areas of interest for purposes of the sampling program in the characterization step were the surface soils on the site.

The shoreline is more than 1000 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed piles of soil which contain oils. The shoreline has a cobble and shell beach with some large rock outcrops.

The only contaminants found in the verification step were the soil piles which were found to contain oil. The characterization step sampling was conducted to make field determinations of the extent to which the oil from these piles had contaminated the soil.



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MELVILLE NORTH LANDFILL
SITE NO 02
CHARACTERIZATION SAMPLING POINTS

YWC
York Wastewater Consultants, Inc
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
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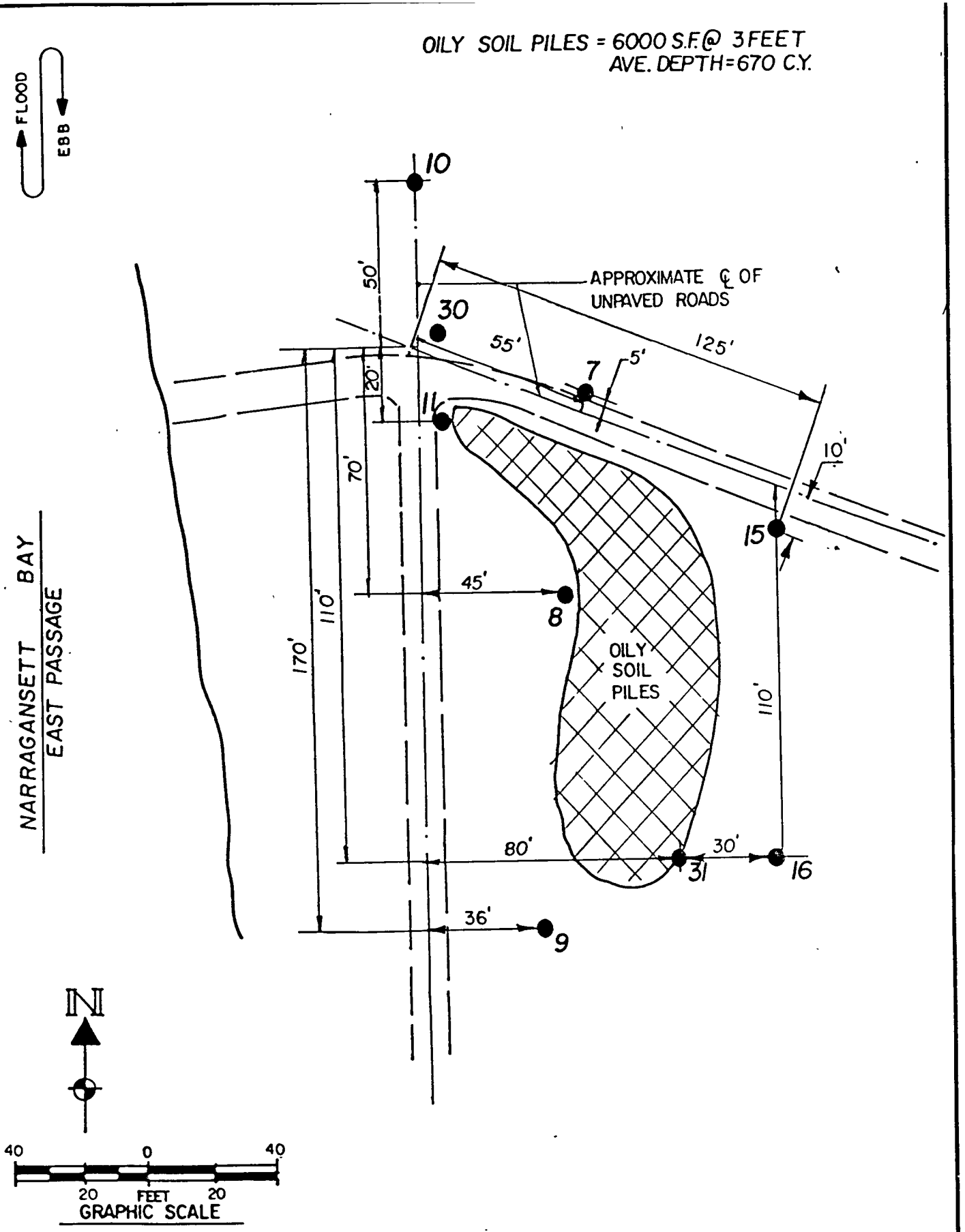
MAR. 13, 1985

FIG. NO. 4



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER	MELVILLE NORTH LANDFILL SITE NO. 02 SOIL SAMPLING LOCATIONS	
YWC York Wastewater Consultants, Inc Stamford, Connecticut	LEA LOUREIRO ENGINEERING ASSOCIATES a professional corporation CONSULTING ENGINEERS AVON, CT	MAR. 13, 1985
		FIG. NO. 5

TABLE 5

MONITORING WELLS

SITE NO. 01 - McALLISTER POINT LANDFILL

	Station No. 21	Station No. 22	Station No. 23
Location (See Exhibit A)	West edge of fill (downgradient)	West edge of fill (downgradient)	Cemetery east of fill (upgradient)
Well depth (feet)	43.0	30.3	40.0
Elevations (MLW):			
Ground surface	26.9	15.8	39.9
Top of well casing	28.15	17.84	40.35
Top of protective casing	28.43	18.30	40.57
Bottom of well	(-)16.1	(-)14.5	(-) 0.1
Lengths (feet):			
Casing	30	17	30
Screen	10	10	10

TABLE 6
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 02 - MELVILLE NORTH LANDFILL

NO.	STA	TYPE	DATE	FIELD OBSERVATIONS*
2957	31	Soil**	9-10-84	Appearance and odor
2958	08	Soil**	9-10-84	Appearance and odor
None	07	Soil	9-10-84	Appearance and odor
None	09	Soil	9-10-84	Appearance and odor
None	10	Soil	9-10-84	Appearance and odor
None	11	Soil	9-10-84	Appearance and odor
None	15	Soil	9-10-84	Appearance and odor
None	16	Soil	9-10-84	Appearance and odor
None	30	Soil	9-10-84	Appearance and odor

* Field observations were made at various depths down to three feet
** Sampled at three-foot depth (No analysis conducted)

11. Tank Farm One Samples

The samples collected in the characterization step at Tank Farm One (Site No. 07) are listed in Table 7. The general locations of the sample collection points are shown on Figure Nos. 6 and 7. The data establishing the locations of the monitoring wells is presented in Appendix B. The principal areas of interest for purposes of the sampling program in the characterization step were:

a. The groundwater at the site.

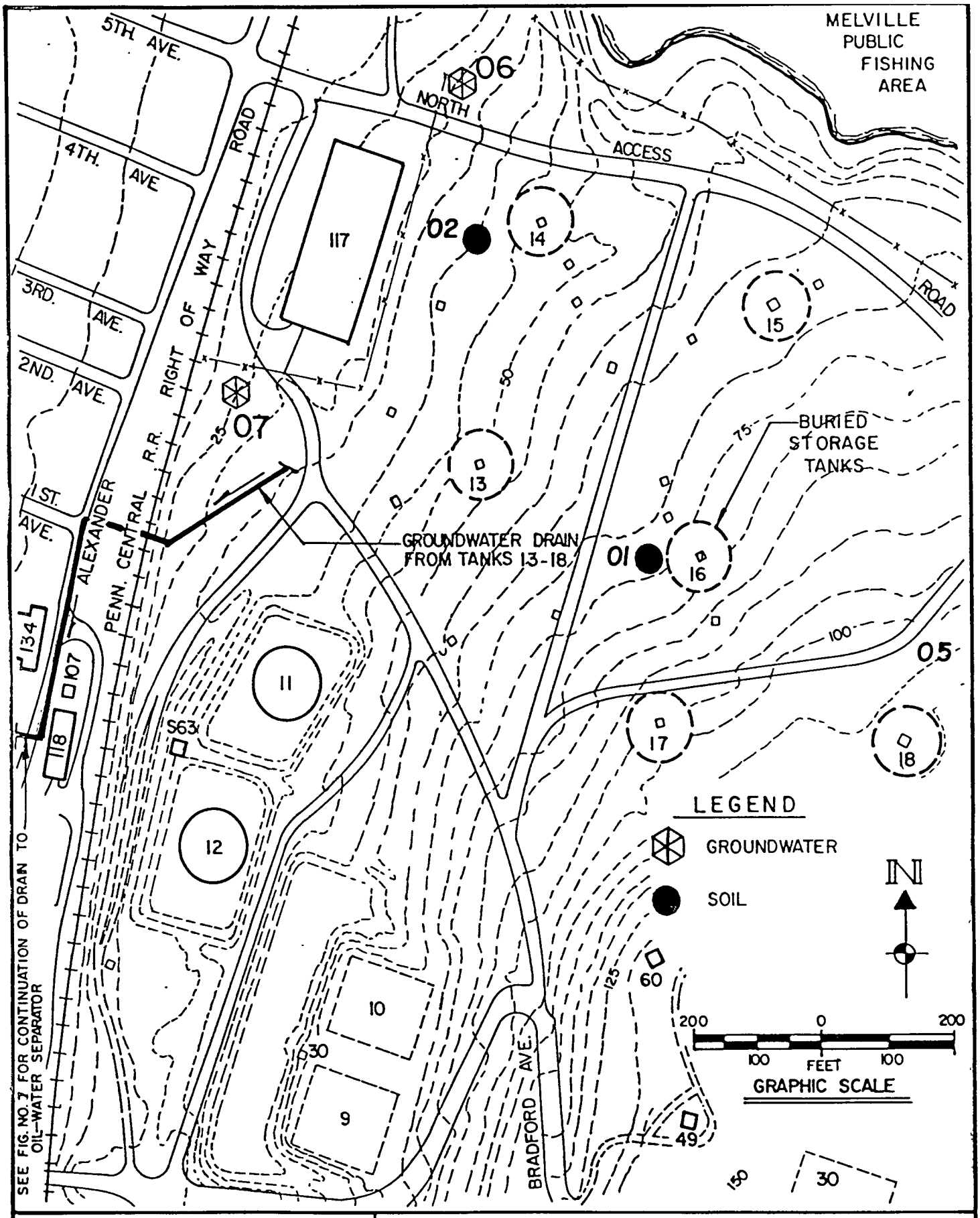
b. The soils on the site.

c. A comparison of the volatile organics in the soil and groundwater.

d. A comparison of the influent and effluent quality of the oil-water separator.

The soil samples were collected from a depth of three feet at three locations (Station Nos. 01, 02 and 05) where sludges from storage tanks had been disposed of in pits and covered.

Monitoring wells (Stations 06 and 07) were installed as summarized in Table 8. These wells were installed for the purpose of comparing the volatile organic characteristics of the groundwater with that of the soil samples. The wells were constructed as described in Section D. At Station 04, samples of groundwater were obtained from a groundwater collection system draining the area of fuel tank Nos. 13 to 18. This groundwater normally discharges through an oil-water separator to Narragansett Bay. The separator was by-passed for 15 minutes before sampling at Station 04. The oil-water separator effluent was sampled at Station 08.



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TANK FARM ONE
SITE NO 07
CHARACTERIZATION SAMPLING POINTS

YWC
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Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
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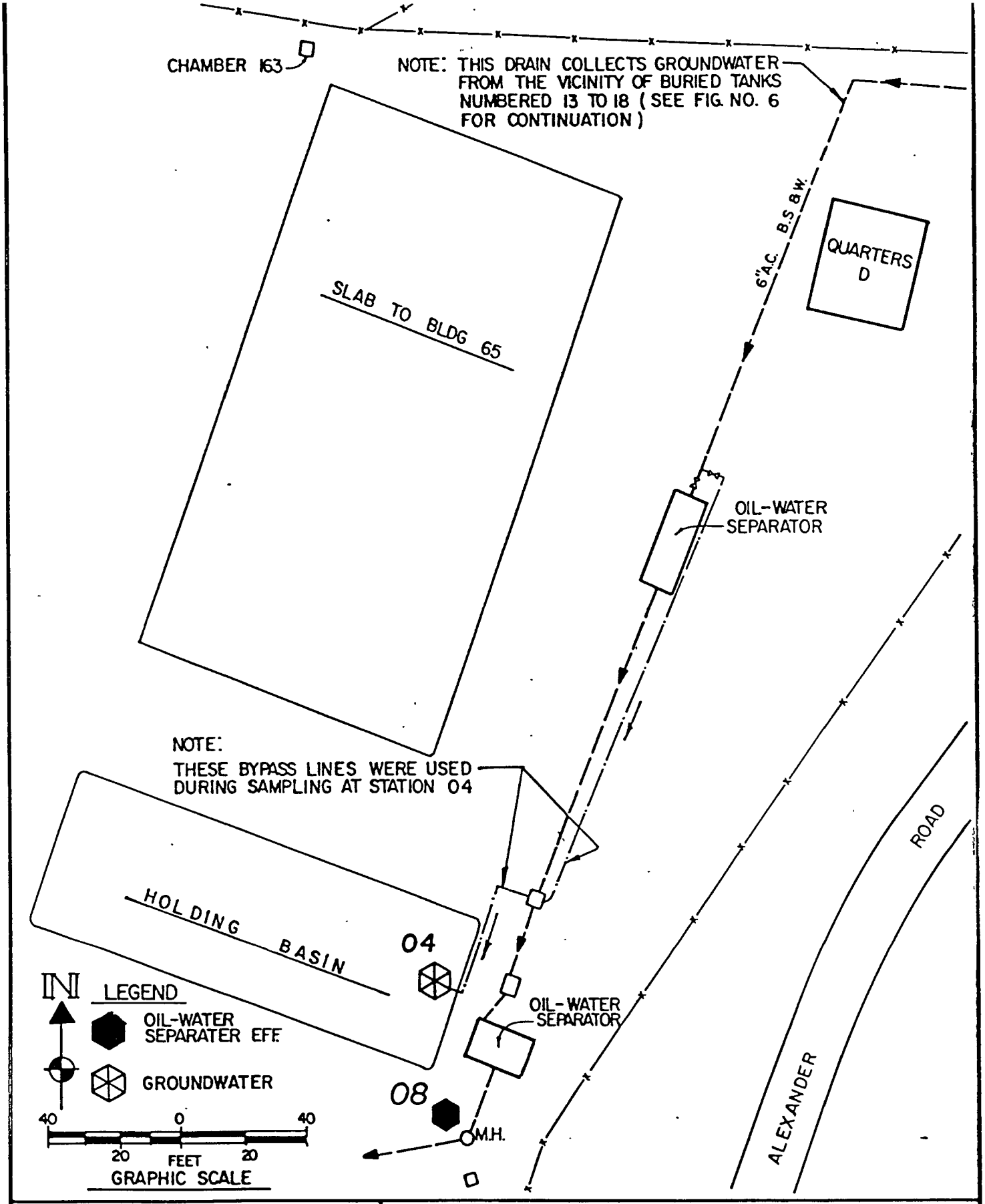
FIG. NO. 6



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TANK FARM ONE – OIL·WATER SEPARATOR SITE NO 07 CHARACTERIZATION SAMPLING POINTS

YWC
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Stamford, Connecticut

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MAR. 13, 1985

FIG. NO. 7

TABLE 7
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 07 - TANK FARM ONE

NO.	STA	TYPE	TIME	ANALYSIS FOR
			9-12-84	
2991	02	Soil	1:45 PM	*
2992	02	Soil	1:45	**
2993	01	Soil	2:15	*
2994	01	Soil	2:15	**
2995	05	Soil	2:45	*
2996	05	Soil	2:45	**
			11-21-84	
6811	07	Groundwater	8:30 AM	PBHC
6812	07	Groundwater	8:30	***
6813	06	Groundwater	8:55	PBHC
6814	06	Groundwater	8:55	***
6815	08	Oil-water Separator Effluent	9:15	PBHC
6816	08	Oil-water Separator Effluent	9:15	***
6817	04	Groundwater	9:25	PBHC
6818	04	Groundwater	9:25	***
			12-17-84	
6831	06	Groundwater	8:55 AM	PBHC
6832	06	Groundwater	8:55	***
6833	06	Groundwater	8:55	***
6834	07	Groundwater	9:20	PBHC
6835	07	Groundwater	9:20	***
6836	07	Groundwater	9:20	***
6837	08	Oil-water Separator Effluent	9:40	PBHC
6838	08	Oil-water Separator Effluent	9:40	***
6839	08	Oil-water Separator Effluent	9:40	***
6840	04	Groundwater	10:00	PBHC
6841	04	Groundwater	10:00	***
6842	04	Groundwater	10:00	***

* Characteristic fingerprint
** No analysis conducted
*** Characteristic fingerprint and BTX

TABLE 7 (Cont'd)
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 07 - TANK FARM ONE

NO.	STA	TYPE	TIME	ANALYSIS FOR
			1-07-85	
0661	06	Groundwater	11:00 AM	PBHC
2	06	Groundwater	11:00 AM	***
3	06	Groundwater	11:00 AM	***
4	07	Groundwater	11:20 AM	PBHC
5	07	Groundwater	11:20 AM	***
0672	07	Groundwater	11:20 AM	***
0666	08	Oil-water separator effluent	1:25 PM	PBHC
7	08	Oil-water separator effluent	1:25 PM	***
8	08	Oil-water separator effluent	1:25 PM	***
9	04	Groundwater	1:45 PM	PBHC
70	04	Groundwater	1:45 PM	***
1	04	Groundwater	1:45 PM	***
			1-28-85	
7004	08	Oil-water separator effluent	9:35 AM	PBHC
5	08	Oil-water separator effluent	9:35 AM	***
6	08	Oil-water separator effluent	9:35 AM	***
7	08	Oil-water separator effluent	9:35 AM	***
8	04	Groundwater	9:50 AM	PBHC
9	04	Groundwater	9:50 AM	***
10	04	Groundwater	9:50 AM	***
11	04	Groundwater	9:50 AM	***
7014	07	Groundwater	11:00 AM	PBHC
5	07	Groundwater	11:00 AM	***
6	07	Groundwater	11:00 AM	***
31	07	Groundwater	11:00 AM	***
7017	06	Groundwater	11:15 AM	PBHC
8	06	Groundwater	11:15 AM	***
9	06	Groundwater	11:15 AM	***
20	06	Groundwater	11:15 AM	***

* Characteristic fingerprint
** No analysis conducted
*** Characteristic fingerprint and BTX

TABLE 8

MONITORING WELLS

SITE NO. 07 - TANK FARM ONE

	Station No. 06	Station No. 07
Location (See Exhibit B)	Downgradient of buried oily deposits	Downgradient of buried oily deposits
Well depth (feet)	45.0	30.0
Elevations (MLW):		
Ground surface	27.0	22.1
Top of well casing	27.08	22.99
Top of protective casing	27.55	23.25
Bottom of well	(-)18.8	(-) 7.9
Lengths (feet):		
Casing	35	20
Screen	10	10

12. Tank Farm Four Samples

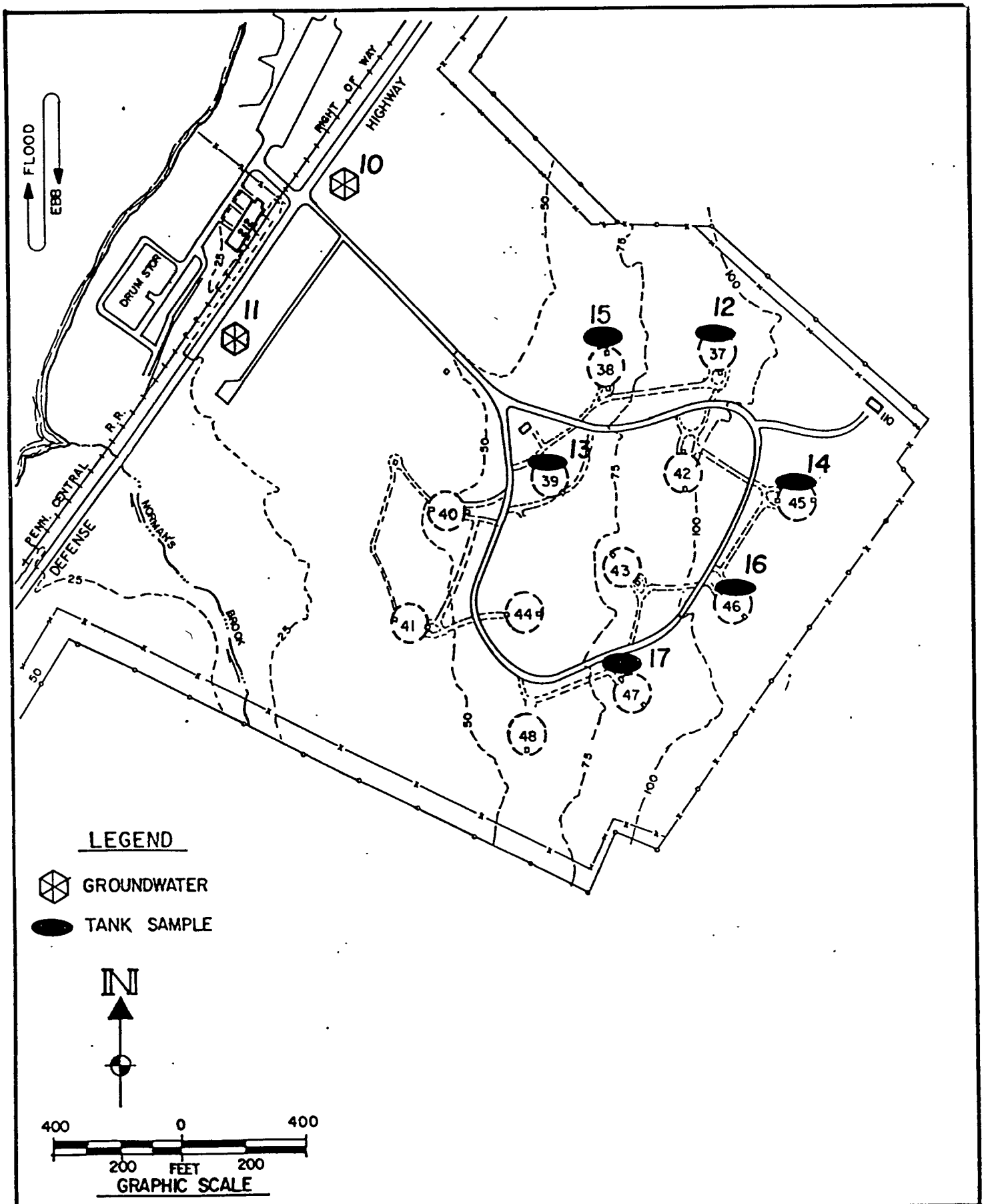
The samples collected in the characterization step at Tank Farm Four (Site No. 12) are listed in Table 9. The general locations of the sample collection points are shown on Figure No. 8. The data establishing the locations of the monitoring wells is presented in Appendix B. The principal areas of interest for purposes of the sampling program in the characterization step were:

a. Groundwater at the site.

b. The characteristics of the water in the inactive oil storage tanks.

Samples of water were collected from the bottom of six of the 12 inactive oil storage tanks (Stations 12 to 17); tank Nos. 37, 38, 39, 45, 46, and 47 were sampled. The purpose of the sampling was to determine the characteristics of the water for evaluation of methods of disposal when oil is removed from the tanks.

Monitoring wells (Stations 10 and 11) were installed as summarized in Table 10. These wells were installed to determine if previous disposal of tank cleanings by on-site burial is affecting groundwater quality.



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
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TANK FARM FOUR
SITE NO 12
CHARACTERIZATION SAMPLING POINTS

YWC
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Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
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MAR. 13, 1985

FIG. NO. 8

TABLE 9
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 12 - TANK FARM FOUR

NO.	STA	TYPE	TIME	ANALYSIS FOR
			9-12-84	
2979	13	Water - Tank 39	9:00 AM	*
2980	13	Water - Tank 39	9:05	*
2981	15	Water - Tank 38	9:45	*
2982	15	Water - Tank 38	9:50	*
2983	12	Water - Tank 37	10:00	*
2984	12	Water - Tank 37	10:05	*
2985	14	Water - Tank 45	10:30	*
2986	14	Water - Tank 45	10:35	*
2987	16	Water - Tank 46	11:00	*
2988	16	Water - Tank 46	11:05	*
2989	17	Water - Tank 47	11:30	*
2990	17	Water - Tank 47	11:35	*
			11-20-84	
6826	10	Groundwater	5:00 PM	PBHC
6827	10	Groundwater	5:00	Lead
6828	11	Groundwater	4:40	PBHC
6829	11	Groundwater	4:40	Lead
			12-17-84	
6846	10	Groundwater	3:25 PM	PBHC
6847	10	Groundwater	3:25	Lead
6848	11	Groundwater	4:25	PBHC
6849	11	Groundwater	4:25	Lead
			01-07-85	
0676	10	Groundwater	3:05 PM	PBHC
7	10	Groundwater	3:05 PM	Lead
8	11	Groundwater	4:50 PM	PBHC
9	11	Groundwater	4:50 PM	Lead
			01-28-85	
7027	10	Groundwater	4:00 PM	PBHC
8	10	Groundwater	4:00 PM	Lead
9	11	Groundwater	5:00 PM	PBHC
30	11	Groundwater	5:00 PM	Lead

NOTE: All water samples were collected at the bottom of the tank.

* Lead, petroleum based hydrocarbons, pH, total suspended solids, BOD, ammonia (the two bottles from each tank were mixed together before analysis)

TABLE 10

MONITORING WELLS

SITE NO. 12 - TANK FARM FOUR

	Station No. 10	Station No. 11
Location (See Exhibit B)	Downgradient of oil tanks	Downgradient of oil tanks
Well depth (feet)	25.0	31.5
Elevations (MLW):		
Ground surface	20.8	18.8
Top of well casing	22.07	19.63
Top of protective casing	22.32	20.44
Bottom of well	(-) 4.2	(-)12.4
Lengths (feet):		
Casing	16	20
Screen	10	10

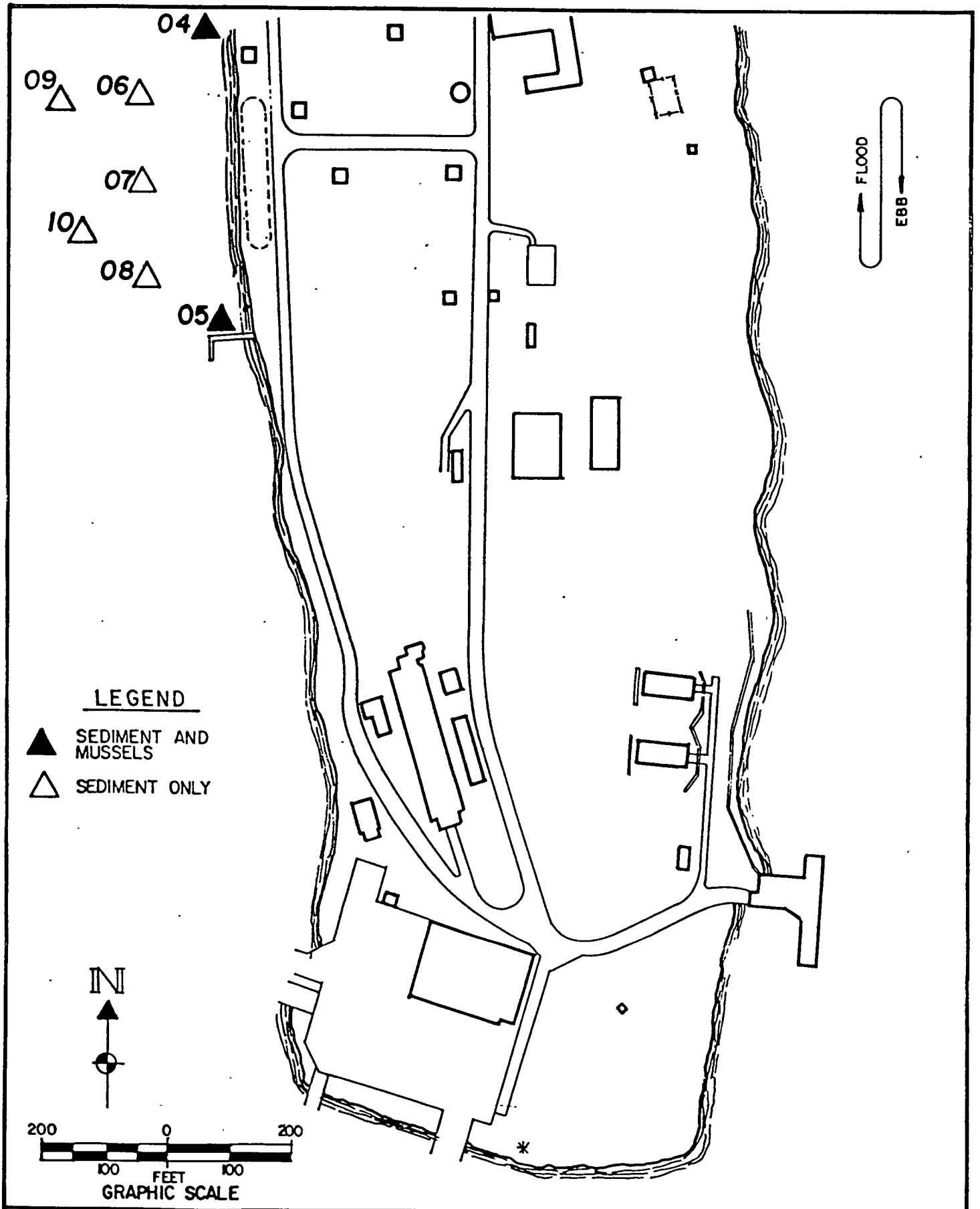
13. Gould Island Disposal Area Samples

The samples collected in the characterization step at the Gould Island Disposal Area (Site No. 14) are listed in Table 11. The general locations of the sample collection points are shown on Figure No. 9. The data establishing the locations of the sediment sampling stations is presented in Appendix B. The principal areas of interest for purposes of the sampling program in the verification step were in the marine environment at and near the shoreline of the disposal area.

The shoreline is about 300 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed deposits on the face of the fill area. The shoreline has a cobble and shell beach with some large rock outcrops and scattered deposits of metallic and other waste materials.

The seven sediment samples (Station Nos. 04 to 10) were collected in three to five feet of water in the near-shore samples (04 and 05) and in ten to thirty feet of water in the off-shore samples (06-10). All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.

All mussel samples were collected in the intertidal zone at Station Nos. 04 and 05.



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GOULD ISLAND DISPOSAL AREA
SITE NO 14
CHARACTERIZATION SAMPLING POINTS

YWC
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Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS AVON, CT

MAR. 13, 1985

FIG. NO. 9

TABLE 11
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 14 - GOULD ISLAND DISPOSAL AREA

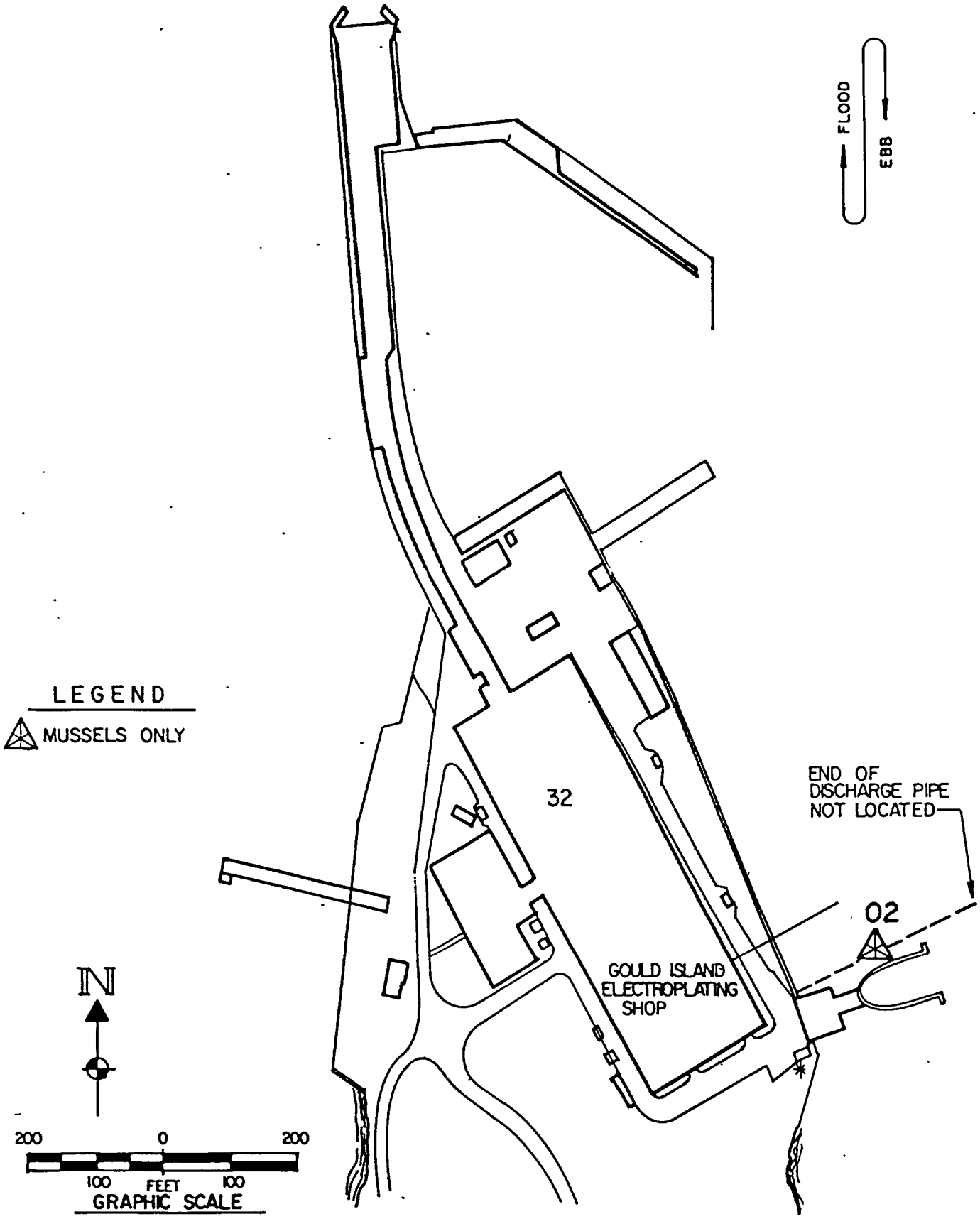
NO.	STA	TYPE	TIME	ANALYSIS FOR*
			9-11-84	
2966	08	Sediment (0-4)	1:20 PM	Metals, EP Toxic Metals, Cyanide
2967	10	Sediment (0-4)	1:40	Metals, EP Toxic Metals, Cyanide
2968	07	Sediment (0-4)	1:50	Metals, EP Toxic Metals, Cyanide
2969	09	Sediment (0-4)	2:05	Metals, EP Toxic Metals, Cyanide
2970	06	Sediment (0-4)	2:15	Metals, EP Toxic Metals, Cyanide
2971	04	Sediment (0-4)	2:30	Metals, EP Toxic Metals, Cyanide
2972	05	Sediment (0-4)	2:40	Metals, EP Toxic Metals, Cyanide
2973	04	Mussels	2:40	Metals
2974	05	Mussels	3:00	Metals

* Metals = Lead, copper, chromium, nickel

14. Gould Island Electroplating Shop Samples

The sample collected in the characterization step at the Gould Island Electroplating Shop (Site No. 17) is listed in Table 12. The location of the sample collection point is shown on Figure No. 10. The principal area of interest for purposes of the sampling program in the characterization step was in re-checking the contamination level at one mussel sampling station.

The mussel sample was collected in the intertidal zone at Station No. 02 located near the end of a pipe which may have carried electroplating wastewater discharges when the facility was active.



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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GOULD ISLAND ELECTROPLATING SHOP
SITE NO 17
CHARACTERIZATION SAMPLING POINTS

YWC
York Wastewater Consultants, Inc.
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985

FIG. NO. 10

TABLE 12
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP

NO.	STA	TYPE	TIME	ANALYSIS FOR*
			9-11-84	
2975	02	Mussels	4:00 PM	Metals

* Metals = Lead, Copper, Chromium, Nickel

15. Control Samples

The control samples collected in the characterization step (Station Nos. N1 and N2) are listed in Table 13. The locations of the sampling points are shown in Figure No. 2. The principal purpose of the control sampling program in the verification step was to obtain data on mussels at and near the shoreline of areas not affected by any of the six sites.

The control samples were collected at two sites in East Passage of Narragansett Bay - N1 north of Site 02 and N2 south of Site 14. The shoreline conditions were very similar to those at most of the site specific stations.

The mussel controls were repeated in the characterization step to account for temporal variations. For sediments, the control data from the verification step was used.

TABLE 13
CONTROL SAMPLES COLLECTED - CHARACTERIZATION STEP

NO.	STA	TYPE	TIME	ANALYSIS FOR*
			9-12-84	
2997	N1	Mussels	2:30 PM	Metals
2998	N2	Mussels	4:00	Metals

* Metals = Lead, Copper, Chromium, Nickel

C. LABORATORY ANALYSES

1. Basic Analytical References

Where applicable, all laboratory procedures were conducted in accordance with the following manuals or references:

a. Chemical Analysis of Water and Wastes, EPA-600/4-79-020, 1979 and updates;

b. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057, 1982 and updates;

c. Procedures for Handling and Chemical Analysis of Sediment and Water Samples, EPA/CE81-1, 1981;

d. Test Methods for Evaluating Solid Waste, EPA SW-846, 1980 and updates;

e. Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing, EPA 905/4-79-014, PB 294, 1979;

f. Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980;

The following sections present brief abstracts of the analytical methods used for the various types of analyses performed in this project.

2. Priority Pollutant Analyses

a. Miscellaneous

Groundwater and sediment samples were analyzed for priority pollutants. Metal concentrations were determined using the previously referenced methods.

Cyanides were analyzed according to Standard Methods for the Examination of Water and Wastewater, 15th Edition; APHA-AWWA-WPCF and Methods for Analysis of Water and Wastes, U.S. EPA 600/4-79-020.

Briefly, the cyanides were distilled from acid solution and absorbed into dilute sodium hydroxide. Cyanide was then determined colorimetrically using the pyridine-barbituric acid method.

Phenols were determined colorimetrically via the 4-aminoantipyrine method after distillation. References can be found in Procedures for Handling and Chemical Analysis of Sediment and Water Samples and in Standard Methods.

b. Volatiles

Groundwater samples for volatile organics (purgeables) were analyzed using GC/MS/DS according to EPA Method 624 for Purgeable Organics. The method uses the purge and trap technique to strip the volatiles from the water which are then adsorbed onto a support which is then thermally desorbed into the GC/MS/DS. The instrumentation used was a Tekmar Model LSC-2 Liquid Sample concentrator interfaced with a Hewlett-Packard 5995B GC/MS/DS.

Soil samples were analyzed using the dynamic headspace purging technique in accordance with reference (a) cited above. A sample is weighed into a 40 ml septum vial. The vial is then attached to the LSC-2 and then purged at 80°C. Volatiles are then identified and quantified by GC/MS/DS.

c. Base/Neutral and Acidic Organics

The remaining organic priority pollutants (Base/Neutrals, Acids) were analyzed according to EPA Method 625. For water samples the water is extracted with methylene chloride, the extract dried and then concentrated to 1 ml. Samples are then injected into the GC/MS/DS to identify and quantitate the target compounds present.

Soil samples were air dried and then soxhlet extracted for 16 hours using equal volumes of acetone and hexane. The solvent was then concentrated to 1 ml and analyzed by GC/MS/DS as above.

3. Metals Analyses

All metal concentrations were determined by flame atomic absorption

spectroscopy with the exception of arsenic, mercury, and selenium. Arsenic and selenium were determined via the hydride generation method while mercury was determined by the cold vapor technique.

Deuterium arc background correction was also used for arsenic and selenium.

Preliminary acid digestion and concentration steps varied depending on the types of samples analyzed. A brief description of the various methods (excluding mercury) is as follows:

a. Water Samples

All water samples were acidified with nitric acid and hydrochloric acid (except when silver was requested) and gently evaporated to ensure destruction of organic matter and to concentrate the sample.

After digestion, the samples were diluted volumetrically and the metal concentrations determined as previously stated.

b. Sediments

Samples were initially air dried and then weighed out into tared beakers. Samples were digested with nitric acid and hydrogen peroxide to ensure destruction of all organic matter.

After digestion, the samples were filtered and diluted volumetrically. Metals were then determined by atomic absorption.

c. Mussel Samples

The mussel samples were gathered and placed in a cooler and frozen with dry ice until arrival at the laboratory. Immediately thereafter, the samples were transferred to a freezer and maintained at -15°C until analysis. Depuration of the mussel samples was not carried out in this study.

The analysis for metals was conducted using standard procedures. The procedure involved air-drying the samples followed by cryogenic homogenation

of the entire mussel tissue of 10-15 mussels. The resulting prepared samples were then acid digested with a mixture of nitric acid and hydrogen peroxide, followed by perchloric acid to complete destruction and solubilization. The specific elements were then analyzed using atomic absorption techniques.

d. Mercury

All samples were analyzed using the following procedure:

Samples were measured into 300 ml BOD bottles. To these were added nitric acid, sulfuric acid, potassium permanganate and potassium persulfate. After digesting in an autoclave, the samples were run using the cold vapor procedure.

4. Petroleum-Based Hydrocarbons

Petroleum-based hydrocarbons were determined by the oil and grease method given in Standard Methods and Procedures for Handling and Chemical Analysis of Sediment and Water Samples except that prior to evaporation of the Freon, silica gel was added to adsorb fatty acids (polar materials). The solution was filtered, the Freon evaporated, and the residue weighed.

5. Quality Control/Quality Assurance

In order to verify the overall accuracy and precision of the methods, various quality control and quality assurance procedures were followed in each aspect of the laboratory routine. The specific procedures used are delineated in the following paragraphs. A summary of the QA/QC data can be found in Appendix D.

a. Atomic Absorption Spectroscopy (Metals Determinations)

The most critical aspect of metals determination by atomic absorption spectroscopy (A.A.S.) is the quality of the standards used. As such, fresh standards were prepared for each metal analyzed from certified stock

solutions[1]. Reagent grade chemicals were used in all analyses.

Also laboratory standards and blanks were run through all of the digestion procedures and used to check recoveries and the technique of the analysts.

Calibration of the instrumentation was checked before and after each metal determination and recorded in laboratory notebooks. In addition, duplicates and referenced environmental standards were analyzed to indicate the precision of the methods used.

A summary of this data is included in Appendix D.

b. Gas Chromatography (Pesticides and PCB's)

Referenced U.S. EPA procedures were used in all gas chromatography analyses. Instrument calibration was checked each day at various concentrations in order to obtain a good linear working range. Gases and solvents used were of ultra high purity and commercial standards were obtained for calibration (see Appendix D).

Known enviromental standards (obtained from Connecticut State Department of Health and U.S. EPA) were analyzed "blindly" to verify both analytical methods and accuracy. This data is summarized in Appendix D.

c. GC/MS Analysis

Samples for GC/MS analysis included volatile organics (EPA Method 624) and Base/Neutrals, Acids, and Pesticides (EPA Method 625). Initially, the instrument was calibrated at four levels for volatile organics and the samples analyzed. (Surrogate standards were added to each sample.) The same general calibration procedure was followed for the base/neutrals, acids and pesticides. Calibration was checked each day and internal standardization was used to quantify the compounds identified.

[1]Obtained from Scientific Products Division of American Hospital Supply Corporation.

6. Results of Analytical Tests on Samples Collected

The samples collected in the characterization step were analyzed and the results are shown in the laboratory reports in Appendix C. The results shown in Appendix C are also presented in tables in the text separately for each site in connection with the discussions of findings at each site.

D. MONITORING WELL INSTALLATION

1. General

Monitoring wells were installed at seven locations on three sites as follows:

Site 01 - Stations 21, 22, and 23

Site 07 - Stations 06 and 07

Site 12 - Stations 10 and 11

The purpose of and principal details on each of the wells is presented in Section B. This section covers the methods of installation and construction details. The well drillers logs are presented in Appendix E. Figure 11 shows the details of the monitoring wells. The data establishing the locations of the seven monitoring wells is presented in Exhibits A and B.

2. Drilling and Soil Sampling Methods

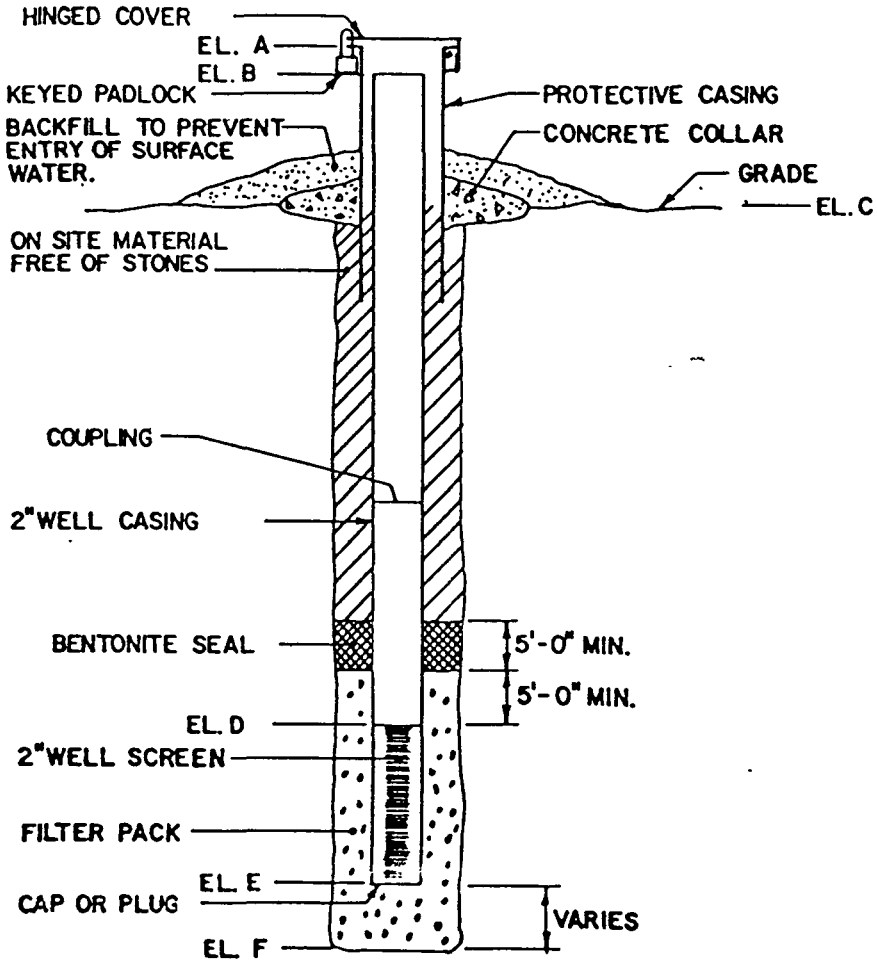
The wells were drilled with a hollow stem auger. A roller bit was used for hard material at Site 01, Stations 21 and 22. A three-foot rock core was taken at the bottom of the hole at Station 21.

The following was recorded on the well drillers log:

- Boring number
- Total depth
- Depth to groundwater
- Date of installation

At all depths where changes in the nature of the material were observed, a sample was obtained by use of a split spoon sampler. The following was recorded on the well drillers log:

- Depths at which the nature of the material changed
- Description of the material
- Number of blows required to drive the sampler six inches with a 140-pound hammer with fall of 30 inches



SITE NO.	01			07		12	
STA. NO.	21	22	23	06	07	10	11
EL. A	28.43	18.30	40.57	27.55	2325	22.32	19.63
EL. B	28.15	17.84	40.35	27.08	22.99	22.07	18.79
EL. C	26.9	15.8	39.9	27.0	22.1	208	19.1
EL. D	(-)1.05	0.84	10.35	(-)7.92	2.99	6.07	(-)1.21
EL. E	(-)10.85	(-)9.16	0.35	(-)17.92	(-) 7.01	(-) 3.93	(-)11.21
EL. F	(-)16.1	(-)14.5	(-)0.1	(-)18.	(-) 7.9	(-) 4.2	(-)12.4
DEPTH (FT)	43.0'	30.3'	40.0'	45.0'	30.0'	25.0'	31.5'
CASING (FT)	30.0'	17.0'	30.0'	35.0'	20.0'	16.0'	20.0'
SCREEN (FT)	*10.0'	10.0'	10.0'	* 10.0'	10.0'	* 10.0'	*10.0'

NOTE: ELEVATIONS ARE MLW

* THE SCREENS IN THESE WELLS WERE ENVELOPED IN NON-WOVEN FILTER FABRIC

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
PORTSMOUTH NAVAL SHIPYARD

MONITORING WELL DETAILS

YWC
York Wastewater Consultants, Inc
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS AVON, CT

MAR. 13, 1985

FIG. NO. 11

3. Well Installation

All wells were constructed of two-inch nominal diameter Schedule 80, Type 1 PVC including casing and screen. Each well was installed with a 10-foot length of screen near the bottom of the well and a casing extending above grade. The screens had a slot size of 0.12 inches and were provided with a bottom plug or cap. The annular space between the bore hole and screen and casing was filled with silica sand from the bottom of the well to at least five feet above the top of screen. In addition, some of the wells were enveloped in a non-woven filter fabric. The annular space above the silica sand was filled with a five-foot minimum depth of bentonite and the remaining space to grade was filled with stone-free on-site material. All materials placed in the annular space were well tamped.

A five-inch diameter protective steel casing was installed at the ground surface to enclose the top of the well casing. The protective casing was furnished with a hinged steel cap, with locking device, padlock, and keys. A six-inch thick, three-foot diameter concrete collar was placed around the protective casing and the collar was mounded over with about six inches of on-site material to insure that surface water drained away from the well. The wells were numbered and padlocked.

The wells were developed by pumping to waste using compressed air. The time for recovery of the wells after development is shown in Appendix E.

4. Groundwater Sampling

The procedures used for sampling of the monitoring wells are covered in Section B, which also presents the dates and times of sample collection. The groundwater level was measured prior to sampling of each well and these data are presented in Sections E, G, and H covering the findings at the three sites.

E. FINDINGS AT SITE NO. 01 McALLISTER POINT LANDFILL

1. General

A complete description of the McAllister Point Landfill site can be found in the verification step report. The site is located along the shoreline of Narragansett Bay and encompasses approximately six acres. The site is located on land which is being excessed by the Navy. Various unvegetated bare areas are evident throughout the surface of the landfill. Two leachate streams are evident; the one located near Station 12 (see Figure No. 3) exhibits significant flow except at high tide. The other located further north exhibits only slight flow in wet weather and no flow in dry weather. There is one area where water ponds on the surface in wet weather. There are some exposed waste deposits, particularly on the steep face north of Station 12.

The groundwater in areas close to the bay is often within just two or three feet of the surface. The groundwater moves in a westward direction and discharges into Narragansett Bay. This factor and the history of waste deposition into the low-lying coastal area indicate that the hydrogeology of the site is characterized by groundwater movement through the waste deposits in a general east to west direction. This was confirmed by the data in Table 14 showing water elevations in the monitoring wells, with a significant gradient toward the Bay. Some deviations from this general pattern may be present due to the non-homogenous nature of the deposits. The groundwater is not being utilized at NETC. Any wells in the area are upgradient from the site and beyond its influence.

2. Analytical Data on Samples Collected

The samples collected at the McAllister Point Landfill are summarized in Table 4 as previously discussed. The analyses were conducted for the parameters indicated in Table 4 and the detailed laboratory reports on the analyses are

TABLE 14

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 01 - McALLISTER POINT LANDFILL

Tidal Influence

Date	Time	Tide	Groundwater Elevation (MLW) Station No. 21	Station No. 22	Station No. 23
9-11-84	-	High	4.9		
9-13-84	-	High		6.8	
9-13-84	-	-			17.9
11-20-84	11:45 AM	Low		3.3	
11-20-84	12 noon	Low	3.7		
11-20-84	2:45 PM	Ebb			18.7
12-17-84	1:10 PM	Flood			19.4
12-17-84	3:45 PM	High		6.0	
12-18-84	7:45 AM	Low	3.8		
1-07-85	7:20 AM				22.5
1-07-85	3:30 PM		4.5		
1-08-85	9:20 AM			3.9	
1-28-85	8:15 AM				21.9
1-28-85	2:15 PM			3.1	
1-28-85	2:25 PM		3.8		
Ground surface elevation			26.9	15.8	39.9
Bottom of well elevation			(-)16.1	(-)14.5	(-) 0.1

included in Appendix C. A summary of these results is presented in Table 15 for the sediment samples, Table 16 for the mussel samples, and in Tables 17, 18, and 19 for the groundwater samples.

3. Evaluation of Available Data

The analytical data on samples collected in the verification step indicated that metals have accumulated in sediments and mussels near the McAllister Point Landfill. For this reason, additional sediment samples were collected further off-shore and additional mussel samples were collected in the intertidal zone to further define the extent of the contamination. In evaluating the characterization step data, control data collected in the verification step is used for comparison with sediment sample data but new control samples were collected for comparison with mussel sample data.

In general, the off-shore sediments sampled in the characterization step (Stations 15 to 20) were found to be less contaminated than the near-shore sediments (Stations 12 to 14) sampled in the characterization and verification steps. Elevated levels of lead, copper, and nickel were found in sediments close to shore (Stations 12, 13, and 14); the chromium concentrations at these stations were only slightly above the control sample concentrations. Lead and copper are being assimilated by mussels at rates higher than the controls at Stations 12 and 14 and to a lesser degree, at Station 13.

The concentrations of lead, copper, chromium, and nickel in sediments decrease with increased distance from shore. Stations 17 to 20 showed the lowest range of concentrations with Stations 15 and 16 showing intermediate values. The following summarizes these findings:

TABLE 15

SUMMARY OF SEDIMENT SAMPLE ANALYTICAL DATA
SITE NO. 01 - McALLISTER POINT LANDFILL (Sept., 1984)

(Results in ppm - dry weight basis except EP toxic leachate in mg/l)

Station No.	Lead* (Total)	Copper* (Total)	Chromium* (Total)	Nickel Total	Nickel EP Tox.	Cyanide (Total)
12**	900	1,455	17.5	64	-	-
13**	327	655	14.8	55.5	-	-
14	267	890	22.0	86.6	<0.20	<0.005
15	78.2	63.4	14.3	20.3	<0.20	<0.005
16	44.0	33.2	12.7	17.2	0.35	<0.005
17	21.5	20.8	8.7	11.5	0.71	<0.005
17 (Dup.)	30.8	27.9	12.5	14.2	0.66	<0.005
18	34.9	22.8	17.1	16.9	0.20	<0.005
19	33.6	25.4	14.8	17.8	0.35	<0.005
20	32.3	16.6	14.3	14.2	<0.20	<0.005
N-1**	27.5	18.3	11.5	21.3	-	0.031
N-2**	6.8	10.3	8.0	11.3	-	0.027

If Verification ** was so high why didn't we pursue in Characterization?

Dup Samples > 50% Is Data of value?

* The EP toxic values for these metals were less than the following values for Stations 14 to 20:

Lead - EP toxic leachate <0.2 mg/l
Copper - EP toxic leachate <0.20 mg/l
Chromium - EP toxic leachate <0.10 mg/l

does total give true picture or should EP tox be what we are looking for?

** Data for Stations 12 and 13 and for the control stations is from the verification step.

TABLE 16

SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 01 - McALLISTER POINT LANDFILL (Sept., 1984)

(All results in ppm - dry weight basis)

Station No.	Lead	Copper	Chromium	Nickel
12	19.9	20.6	3.5	6.6
13	7.5	9.2	1.0	4.0
14	19.7	14.1	1.4	4.4
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2 (Dup.)	5.2	5.4	1.4	4.9

50%

TABLE 17

SUMMARY OF ROUTINE GROUNDWATER SAMPLE ~~ANALYTICAL DATA~~

SITE NO. 01 - McALLISTER POINT LANDFILL (Nov., 1984 to Jan., 1985)

(All results in mg/l, except pH)

Station No. & Date	Cn	Pb	Cu	Cr	Ni	pH	Cl
Sta. 21							
11-20-84	0.006	0.80	0.73	0.17	0.25	6.82	3.3
12-18-84	<0.005	0.34	0.22	0.04	0.06	7.01	340
1-07-85	0.008	<0.04	0.07	<0.02	<0.04	6.98	795
1-28-85	<0.005	1.58	0.95	0.22	0.30	6.41	624
Sta. 22							
11-20-84	0.006	1.00	1.04	0.11	0.19	6.43	2.2
12-17-84	0.006	0.76	0.59	0.07	0.10	6.57	1.3
1-08-85	0.013	0.14	0.16	0.04	<0.04	6.49	50.4
1-28-85	<0.005	0.70	0.55	0.07	0.12	6.54	108
Sta. 23							
11-20-84	0.005	0.10	0.06	0.09	0.19	5.95	3.8
12-17-84	<0.005	0.08	0.06	0.05	0.08	5.84	1.6
1-07-85	<0.005	<0.04	<0.04	<0.02	<0.04	5.87	2.8
1-28-85	0.009	<0,04	0.11	0.04	0.07	6.18	3.6

why so low?

TABLE 18

SUMMARY OF ORGANICS, PESTICIDES, AND PCB PRIORITY POLLUTANT ANALYTICAL DATA ON GROUNDWATER
SITE NO. 01 - McALLISTER POINT LANDFILL (Jan., 1985)

(All results in ug/l)

Parameter	Station No. 21	Station No. 22	Station No. 23
VOLATILE ORGANICS			
Acrolein	<100	<100	<100
Acrylonitrile	<100	<100	<100
All other volatile organics	<10	<10	<10
BASE NEUTRAL EXTRACTABLE ORGANICS			
Butyl benzyl phthalate	<10	<10	366
Bis (2-ethyl hexyl) phthalate	17	64	931
Di-n-octyl phthalate	19	62	553
All other base neutral extractable organics	<10	<10	<10
ACID EXTRACTABLE ORGANICS			
4,6-Dinitro-O-Cresol	<250	<250	<250
2,4-Dinitrophenol	<250	<250	<250
All other acid extractable organics	<25	<25	<25
PESTICIDES			
Alpha BHC	<0.005	<0.005	<0.005
Beta BHC	<0.005	<0.005	<0.005
Gamma BHC	<0.005	<0.005	<0.005
Delta BHC	<0.005	<0.005	<0.005
Heptachlor	<0.01	<0.005	<0.005
Aldrin	<0.005	0.015	<0.015
4,4' DDE	<0.005	<0.005	<0.005
Dieldrin	<0.005	<0.005	<0.005
4,4' DDD	<0.025	<0.005	<0.005
Endrin Aldehyde	<0.01	<0.01	<0.01
4,4' DDT	<0.025	<0.025	<0.025
Chlordane	<0.02	<0.02	<0.02
Endosulfan I	<0.01	<0.01	<0.01
Endosulfan II	<0.005	<0.005	<0.005
Endosulfan Sulfate	<0.025	<0.025	<0.025
Endrin	<0.005	<0.005	<0.005
Heptachlor Epoxide	<0.025	<0.025	<0.025
Toxaphene	<0.2	<0.2	<0.2
PCB (seven forms)	<0.2	<0.2	<0.2

TABLE 19

SUMMARY OF METALS, CYANIDE, AND PHENOL PRIORITY POLLUTANT ANALYTICAL ANALYTICAL DATA ON GROUNDWATER
SITE NO. 01 - McALLISTER POINT LANDFILL (Jan., 1985)

(All results in ug/l)

Parameter	Station No. 21	Station No. 22	Station No. 23
Antimony	<100	<100	<100
Arsenic	<2	<2	<2
Beryllium	<10	<10	<10
Cadmium	<4	<4	<4
Chromium	<20	40	<20
Copper	72	158	<40
Lead	<40	140	<40
Mercury	0.7	<0.2	0.8
Nickel	<40	<40	<40
Selenium	<2	<2	<2
Silver	<40	<40	<40
Thallium	<100	<100	<100
Zinc	200	500	82
Cyanide	8	13	<5
Phenols	21	13	7

	Range of Concentrations (ppm) in Sediments			
	Lead	Copper	Chromium	Nickel
Near-shore samples (Stations 12 to 14)	267 - 900	655 - 1,455	14 - 22	55 - 87
Off-shore (Stations 15 and 16)	44 - 78	33 - 63	12 - 14	17 - 20
Out to 400' from shore (Stations 17 to 20)	21 - 35	17 - 21	9 - 17	11 - 18
Controls (Stations N-1 and N-2)	7 - 28	10 - 18	8 - 12	11 - 21

These data indicate that lead and copper concentrations in sediments at Stations 12 to 16 are significantly higher than the controls. Elevated nickel concentrations are restricted to the near-shore stations (12 to 14). None of the chromium concentrations is significantly higher that the controls. These findings are consistent with the data on mussels which showed elevated concentrations of lead, copper, and nickel in those locations where the sediments were high in these metals.

Lead was found in mussels at Stations 12 to 14 at levels up to four times that found in controls, copper at two to three times the controls, chromium at the same level as the controls, and nickel at one to 1.5 times the controls.

The sediment samples collected in the characterization step were analyzed to determine EP toxicity levels in accordance with the procedure in SW-846. This was done to approximate how readily the metals would be released from the sediment. In all cases, the EP toxic leachate concentration was far below the level at which the sediment would be defined as a hazardous waste.

Four sets of samples were collected from the three monitoring wells (Stations 21, 22, and 23). One set of samples was examined for priority pollutants and all sets were tested for lead, copper, chromium, nickel, pH value, cyanides, and chlorides. Samples from the two wells located in the landfill (Stations 21 and 22) showed concentrations of lead and copper

significantly higher than in the upgradient well (Station 23). However, none of the concentrations at Stations 21 and 22 were exceedingly high by comparison to levels which might be allowed in an industrial wastewater effluent discharge. There was also an indication of slightly elevated phenol concentrations. The results do not indicate that the landfill is a continuing major source of environmental contamination. This is shown in the following comparisons:

	Wells downgradient of landfill (Stations 21 and 22)	Well upgradient of landfill
Cyanide	<0.005 to 0.013	<0.005 to 0.009
Lead	<0.04 to 1.58	<0.04 to 0.10
Copper	0.07 to 1.04	<0.04 to 0.11
Chromium	<0.02 to 0.22	<0.02 to 0.09
Nickel	<0.04 to 0.30	<0.04 to 0.19
pH	6.41 to 7.01	5.84 to 6.18
Chlorides	1.3 to 795	1.6 to 3.8
Phthalates	<10 to 64	366 to 931
Mercury	<0.0002 to 0.0007	0.0008
Zinc	0.2 to 0.5	0.082
Phenols	0.013 to 0.021	0.007
All other priority pollutants	None above detection limit	

The results on phtholates are unexpected since the upgradient well showed a much higher concentration than the downgradient wells.

4. Location of Contaminant Sources and Actual/Potential Migration

The groundwater sampling program did not reveal any serious source(s) of environmental contamination from the landfill. Although there may be some leaching of metals, the concentration levels of metals in the groundwater within the landfill site are too low for the landfill to be considered a significant contaminant source.

Although the groundwater samples did not pinpoint the groundwater as a pathway for carrying contaminants into the Bay, it is evident that contaminants have in the past, or are continuing to be released from the landfill because the sediment and mussel sampling data indicate elevated concentrations of some

metals (lead and copper). The most likely pathway for this is, or was, the groundwater passing under or through the fill.

5. Toxicity Data and Standards/Criteria for Contaminants Found

Specific standards or criteria for heavy metals in mussels and in marine sediments have not been established. The assessment of the severity of the contamination detected is, therefore, subjective and must be made by comparison to data on mussels and sediments obtained at control stations. These comparisons have been presented previously; they indicate that mussels and sediments close to shore have been affected by copper, lead, and nickel. There are no established limits for metals concentrations in foods such as mussels. However, the levels found in the mussels were, at most, four times the levels found in the controls.

Toxicity data for the contaminants found was presented in Section J of the verificaton step report.

The data on groundwater contaminants in the downgradient wells can be compared with effluent limitations which are allowed for existing point source discharges or the metal finishing industry under 40 CFR 433.13:

	Average Effluent Limitation for BPT* (mg/l)	Range of Contaminants in Downgradient Wells (mg/l)
Copper	2.07	0.07 to 1.04
Lead	0.43	<0.04 to 1.58
Nickel	2.38	<0.04 to 0.30
Cyanide	0.65	<0.005 to 0.013
pH	6 - 9	6.41 to 7.01

The comparison indicates that the effects of the discharge of this quality of groundwater into the Bay are about the same or less severe than equivalent volumes of discharges from metal finishing industries which are very common in the Narragansett Bay area.

* Best Practicable Control Technology

6. Recommendations

The following remedial actions are recommended for Site 01 - McAllister Point Landfill:

- Provide additional fill on the surface of the landfill to eliminate all low areas and promote better drainage of surface water off the site.
- Provide an impervious clay cap and loam to promote growth of grass.
- Remove visible metallic debris from the landfill to the low water mark.
- Rip-rap the seaward face of the landfill to 10 feet above mean high water.
- Conduct additional sampling and analysis as follows:
    - Quarterly for one year, obtain groundwater and mussel samples (including controls) and analyze for lead, copper, and nickel; on the first set of groundwater samples, recheck the phthalates to resolve the apparent anomaly in the January 28, 1985 results.
    - Annually for five years, obtain groundwater and mussel samples (including controls) and analyze for lead, copper, and nickel.

F. FINDINGS AT SITE NO. 02 MELLVILLE NORTH LANDFILL

1. General

A description of the Melville North Landfill site can be found in the verification step report.

The site is situated in the Melville North area in a low-lying wetland type area along the shoreline of Narragansett Bay, as shown in Figure No. 4. Surface drainage and groundwater flow from the site is directly into the bay. The area is also subject to periodic flooding and lies within the 100 year flood plain. There are several areas which accumulate water and appear to be wet even in dry weather.

This site has been sold by the Government and is now in private ownership. It has an area of about 10 acres.

There are several mounds of oil-soaked soil which appeared to have been trucked to the site and dumped. These oil contaminated mounds could be the oil sludge material obtained from the tank farms during tank cleaning operations, or the results of cleanup operations following oil spills.

The groundwater in areas close to the bay is often within just two or three feet of the surface. Due to the low-lying configuration of the site, groundwater levels are very shallow and in fact portions of the site, particularly on the north and east sides are very wet. The groundwater moves in a westward direction and discharges into Narragansett Bay. This factor and the history of waste deposition into the low-lying coastal area indicate that the hydrogeology of the site is characterized by groundwater movement through the waste deposits in a general east to west direction. Some deviations from this general pattern may be present due to the non-homogeneous nature of the deposits. There was no evidence of any direct leachate discharges into the Bay. The groundwater is not being utilized at NETC. Any wells in the area are

upgradient from the site and beyond its influence.

2. Field Observations on Samples Collected

The samples collected at the Melville North Landfill are summarized in Table 6 as previously discussed. No analyses were conducted on the two samples submitted to the laboratory. Field observations were made on the soil as excavations were made down to a depth of three feet. A summary of these observations is shown in Table 20.

3. Evaluation of Available Data

The analytical data on samples collected in the verification step indicated that there is no significant accumulation of metals or PCBs in sediment or mussels collected at the marine sampling points, but a sample of the oily soil piles indicated the presence of lead and very high concentrations of petroleum based hydrocarbons. No PCBs were found in the soil. For this reason, the characterization step was limited to defining the extent of the oil contamination from the oily soil piles found in the north part of the site. The extent of these piles is shown in Figure No. 5. None of the test holes showed any significant travel of oil laterally away from the piles. Some of the holes showed accumulations of waste bituminous paving material. These investigations indicate that the oily material has not migrated laterally away from the surface piles of the soil. Some downward migration may have occurred under the piles, but there was no indication of this at Stations 08, 11, and 31 adjacent to the piles.

4. Location of Contaminant Sources and Actual/Potential Migration

The only known potential contaminants which could be carried off-site are contained in the oily soil deposits piled in one area on the site. If there are other sources, their effects on the environment, if any, were not detected. The location and extent of these deposits are shown on Figure No. 5. The volume of these piles is estimated to be 670 cubic yards.

TABLE 20

SUMMARY OF FIELD OBSERVATIONS ON SOIL EXCAVATIONS
SITE NO. 02 - MELVILLE NORTH LANDFILL (Sept., 1984)

Station No.	Observations
07	No evidence of oil contamination down to three-foot depth.
08	Broken paving materials on surface and at several levels down to three feet deep; no evidence of oil contamination.
09	Overgrown area; no surface contamination and no evidence of oil contamination down to three feet deep.
10	Broken paving materials on surface and intermittently down to 18-inch depth; no evidence of oil contamination.
11	Broken paving materials on surface and intermittently down to three-foot depth; no evidence of oil contamination.
15	No evidence of oil contamination down to three-foot depth.
16	Overgrown area; no surface contamination and no evidence of oil contamination down to three feet deep.
30	Broken paving materials on surface and intermittently down to 18-inch depth; no evidence of oil contamination.
31	Broken paving materials on surface and intermittently down to three-foot depth; no evidence of oil contamination.

5. Toxicity Data and Standards Criteria for Contaminants Found

Petroleum based hydrocarbons and lead were found in the oily soil piles on the north part of the site. These materials are undesirable in the marine environment and food chain but the studies did not reveal significant movement of these contaminants out of the fill area. There are no specific standards or criteria for lead or petroleum based hydrocarbons in the marine environment or in the food chain. However, a discussion of toxicity data for these contaminants was presented in Section J of the verification step report.

6. Recommendations

The following remedial actions are recommended for Site 02 - Melville North Landfill:

- Remove the oily soil piles to the limits shown on Figure No. 5 and dispose of the material as oil spill clean-up material.
- Regrade the site to eliminate low areas and promote better drainage of surface water off the site.
- Provide an impervious clay cap and loam to promote growth of grass.

G. FINDINGS AT SITE NO. 07 TANK FARM ONE

1. General

A description of Tank Farm One can be found in the verification step report. The existing site is in active use as a tank farm. It is owned by the Navy but it is operated by a contractor. Disposal of tank sediments on the site in the past was a cause for concern on this site, although the practice has been discontinued and there is no visible surface evidence of the past tank sediment disposal practices. The site is located well above flood elevation so that any pollutants released from buried tank sediments could escape the site only by migration with the groundwater flow. Two new monitoring wells were installed to evaluate the possibility that these deposits are affecting groundwater quality.

When the tanks were installed, groundwater drains were placed around each tank. These were individually valved and piped to a common drain. This drain was later extended to the west where an oil separator is provided to remove oil if present before release of the water to Narragansett Bay. This drain was also utilized to obtain a groundwater sample for analysis in the verification step. The oil-water spparator effluent was also sampled.

Previous reports indicate that portions of the tank farm sub-surface strata drain northward into the Melville Public Fishing Area, with other areas draining toward Narragansett Bay. A report by the U.S. Army indicated that the general groundwater movement is in a northwesterly direction which is why the new monitoring wells were located as shown on Figure No. 6

The general groundwater elevation is high at Tank Farm One and constant use is made of the tank underdrainage system mentioned previously to reduce the uplift forces on the oil storage tanks. The groundwater elevations at the two monitoring wells are shown in Table 21. In general, the groundwater levels are three to four feet below the ground surface and with a significant gradient toward the Bay.

TABLE 21

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 7 - TANK FARM ONE

Date	Time	Tide	Groundwater Elevation (MLW) Station No. 06	Station No. 07
9-13-84	-	High	0.0	6.1
11-21-84	7:30 AM	Ebb	23.6	
11-21-84	7:55 AM	Ebb		18.2
12-17-84	7:45 AM	Low	24.0	
12-17-84	8:30 AM	Low		18.4
1-07-85	9:10 AM		24.3	
1-07-85	10:15 AM			18.7
1-28-85	10:10 AM			18.3
1-28-85	10:25 AM		24.0	
Ground surface elevation			27.0	22.1
Bottom of well elevation			(-)18.0	(-) 7.9

2. Analytical Data on Samples Collected

The samples collected at the Tank Farm One site are summarized in Table 7 as previously discussed. The analyses were conducted for the parameters indicated in Table 7 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 22 for the gas chromatographic scans on soil samples, groundwater samples, and oil-water separator effluent samples. Table 23 presents a summary of PBHC and BTX analyses on groundwater samples and oil-water separator effluent samples.

3. Evaluation of Available Data

The analytical data on all samples collected in the verification step indicated the presence of oil or gasoline contaminants in the soil and groundwater at Tank Farm One. This was based on the oil and grease concentrations in soil samples and the BTX concentrations in groundwater samples. Although some lead was found in the soil samples, the concentrations were relatively low and no lead was found in groundwater.

To further evaluate the site, samples of soil from old tank sediment burial locations (Stations Nos. 01, 02, and 05) were subjected to chromatographic scans to establish the type(s) of oil present. These scans were compared with scans of a series of four groundwater samples about one month apart collected from the groundwater drainage system (Station No. 04) and the two monitoring wells. A similar series of samples was collected from the oil-water separator effluent (Station No. 08) for comparison with the influent (Station No. 04). Samples from Stations 04, 06, 07, and 08 were also examined for benzene, toluene, and xylene (BTX), which is indicative of the presence of light petroleum products, such as gasoline.

The results indicate that the petroleum products found in the soils from the old burial locations are weathered materials similar to No. 6 or Bunker C fuel

TABLE 22

SUMMARY OF GAS CHROMATOGRAPHIC SCANS OF SAMPLES
OF SOIL, GROUNDWATER, AND OIL WATER SEPARATOR EFFLUENT
SITE 07 - TANK FARM ONE (Sept., 1984 to Jan., 1985)

Station No.	Sample of	Date	Summary of Scan
01 02 05	Soil Soil Soil	9-12-84 9-12-84 9-12-84	All samples contained a weathered petroleum based oil with a pattern similar to a No. 6 or Bunker C Fuel.
04	Groundwater	11-21-84 12-17-84 1-07-85 1-28-85	All samples contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C_8 to C_{13} range which indicate a weathered gasoline product.
08	Oil-water separator effluent	11-21-84 12-17-84	All samples contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C_8 to C_{13} range which indicate a weathered gasoline product.
08	Water separator effluent	1-07-85 1-28-85	Insufficient levels to fingerprint " " " "
06	Groundwater (monitoring well)	11-21-84 12-17-84 1-07-85 1-28-85	Insufficient levels to fingerprint " " " " " " " " " " " "
07	Groundwater (monitoring well)	11-21-84 12-17-84 1-07-85 1-28-85	Insufficient levels to fingerprint " " " " " " " " " " " "

TABLE 23

SUMMARY OF PBHC AND BTX ANALYTICAL DATA ON SAMPLES OF GROUNDWATER AND OIL-WATER SEPARATOR EFFLUENT SITE 07 - TANK FARM ONE (Nov., 1984 to Jan., 1985)

Station No.		Date	Petroleum Hydrocarbons mg/l (ppm)	Benzene ug/l (ppb)	Toluene ug/l (ppb)	Xylene (ug/l (ppg)
04	Groundwater (influent to oil-water separator	11-21-84	<1.0	150	160	28
		12-17-84	2.6	140	190	39
		1-07-85	<1.0	167	198	351
		1-28-85	<1.0	88	65	520
08	Oil-water separator effluent	11-21-84	8.6	20	120	80
		12-17-84	5.0	30	110	74
		1-07-85	3.3	<10	<10	<10
		1-28-85	<1.0	10	<10	22
06	Groundwater monitoring well	11-21-84	<1.0	<10	<10	<10
		12-17-84	6.3	<10	<10	<10
		1-07-85	2.1	<10	<10	<10
		1-28-85	<1.0	<10	<10	<10
07	Groundwater monitoring well	11-21-84	<1.0	<10	<10	<10
		12-17-84	3.8	<10	<10	<10
		1-07-85	3.1	<10	<10	<10
		1-28-85	<1.0	<10	<10	<10

oil. The petroleum products found in all other samples were significantly different and were indicative of weathered gasoline. No evidence was found to indicate that oil from previous disposal practices is entering the groundwater.

There are some petroleum-based hydrocarbons and BTX present in the groundwater underdrainage system and the oil-water separator is generally performing well in limiting these discharges to the Bay. No BTX was found in either groundwater monitoring well (Stations 06 and 07).

4. Recommendations

The results of the studies indicate that some light petroleum products have entered the groundwater but not from previous waste disposal practices. Consequently, the site does not require further study, investigation, or remedial action under th NACIP program.

H. FINDINGS AT SITE NO. 12 TANK FARM FOUR

1. General

A description of Tank Farm Four can be found in the verification step report. The site is no longer used as a tank farm. The tanks are filled, or partially filled with water and/or oil and are reported to contain any sediments or oil residues remaining when the tanks were emptied upon deactivation of the tank farm. Several tanks still contain a significant oil inventory. No further waste disposal activities have taken place since deactivation and there is no visible surface evidence of the past tank sediment disposal practices. The site is located well above flood elevation so that any pollutants released from buried tank sediments could escape only by migration with the groundwater flow. Two new monitoring wells were installed to evaluate the possibility that previous waste disposal practices might be affecting groundwater quality. These wells are located downgradient of the existing tanks and oil burial locations near the tanks. The groundwater elevations at the two monitoring wells are shown in Table 24. These show a gradient toward the south indicating that groundwater movement is toward Norman's Brook and the Bay.

Samples were also collected from six of the twelve tanks to determine the characteristics of the water fraction for evaluation of methods of disposal when oil is removed from the tanks.

2. Analytical Data on Samples Collected

The samples collected at the Tank Farm Four Site are summarized in Table 9 as previously discussed. The analyses were conducted for the parameters indicated in Table 9 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results on groundwater is presented in Table 25 and for water in the oil tanks in Table 26.

TABLE 24

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 12 - TANK FARM FOUR

Date	Time	Tide	Groundwater Elevation (MLW) Station No. 10	Station No. 11
9-12-84	-	-	9.8	
9-12-84	-	Low		4.1
11-20-84	4:05 PM	High	11.6	
11-20-84	4:12 PM	High		6.9
12-17-84	2:30 PM	High	15.3	
12-17-84	2:50 PM	High		8.2
1-07-85	2:00 PM		15.1	
1-07-85	2:25 PM			9.7
1-28-85	3:15 PM		13.3	
1-28-85	3:25 PM			8.7
Ground surface elevation			20.8	19.1
Bottom of well elevation			(-) 4.2	(-)12.4

TABLE 25

SUMMARY OF ANALYTICAL DATA ON SAMPLES OF GROUNDWATER
SITE NO. 12 - TANK FARM FOUR (Nov., 1984 to Jan., 1985)

Station No.	Date	Lead mg/l (ppm)	Petroleum-based Hydrocarbons mg/l (ppm)
10	11-20-84	0.04	<1.0
	12-17-84	<0.04	3.3
	1-07-85	<0.04	2.7
	1-28-85	<0.04	<1.0
11	11-20-84	0.06	1.9
	12-17-84	<0.04	12.3
	1-07-85	0.10	3.6
	1-28-85	<0.04	2.3

TABLE 26

SUMMARY OF ANALYTICAL DATA ON SAMPLES OF BOTTOM WATER
FROM INACTIVE OIL STORAGE TANKS
SITE NO. 12 - TANK FARM FOUR (Sept., 1984)

Tank No.	Station No.	pH	Lead	Total Suspended Solids	Ammonia-Nitrogen	Biochemical Oxygen Demand (5-day)	Petroleum-Based Hydrocarbons
37	12	7.17	<0.04	79.2	0.76	46	7.5
38	15	7.60	<0.04	25.6	0.89	12	4.0
39	13	7.85	<0.04	7.2	0.74	3	7.3
45	14	7.40	<0.04	99.6	0.48	20	14.2
46	16	7.50	<0.04	29.2	0.67	17	21.9
47	17	7.60	<0.04	37.6	0.48	7	36.7

3. Evaluation of Available Data

The analytical data on samples collected indicate that there is some petroleum-based hydrocarbon contamination in the groundwater. No significant concentrations of lead were found. Since the direction of groundwater movement is toward Norman's Brook and the Bay, no water supplies could be affected by this contamination and any impact or beneficial uses of the groundwater or the Bay would be practically non-detectable.

The pollutants found in the bottom water of the oil storage tanks are such that the waters could be discharged to a sanitary sewer during oil removal operations if necessary. A temporary oil-water separator would be desirable to avoid the possibility of a discharge of oil to the sewer system.

4. Location of Contaminant Sources and Actual/Potential Migration

The only possible contaminant sources are the old burial locations for tank bottom cleaning and leaks from the inactive tank. The results of studies at Tank Farm One practically rule out the old burial locations as contaminant sources. The more likely source of PBHC in the groundwater is leaking tanks but even this contamination is minimal and has little, if any, environmental impact.

5. Toxicity Data and Standards/Criteria for Contaminants Found

Petroleum-based hydrocarbons were found in small amounts in the groundwater monitoring wells on the west part of the site. These materials are undesirable in the marine environment, in water supplies, and in the food chain but the studies did not reveal significant movement of these contaminants through the ground. There are no specific standards or criteria for petroleum-based hydrocarbons in water supplies or in the food chain. However, a discussion of toxicity data for these contaminants was presented in Section J of the verification step report.

6. Recommendations

The following remedial actions are recommended for Site 12 - Tank Farm Four:

- Remove all oil and water from the existing storage tanks and refill with clean water.
- Conduct additional sampling and analysis as follows:
  - Quarterly for one year, obtain groundwater samples and analyze for PBHC
  - Annually for five years, obtain groundwater samples and analyze for PBHC.

I. FINDINGS AT SITE NO. 14 GOULD ISLAND DISPOSAL AREA

1. General

A description of the Gould Island Disposal Area can be found in the verification step report. The site is located along the shoreline of Narragansett Bay on the west side of Gould Island. The disposal area is situated along an embankment which drops down steeply to a beach area. The length of the landfill along the shoreline is about 200 yards. The extent of the waste deposits inland to the east is not known but is probably not more than 100 yards at any point. The site is not in use and is on land being excessed by the Government.

Most of the site is vegetated. However, waste deposits are exposed at many locations particularly at the lower levels where the wastes come into direct contact with the waters of Narragansett Bay at high tide. Surface runoff from the site is directly into the Bay. There are no significant areas where ponding in surface water occurs over the fill area.

The shoreline contains accumulations of waste materials such as metal scrap, wood, pipes, rusted out drums, concrete blocks, and oil tanks.

The landfill site is so steeply sloped that there is no question that groundwater moves in a westward direction and discharges into Narragansett Bay. The groundwater recharge area on the island is so small that no significant groundwater flow can be anticipated except in very wet seasons. These factors and the history of waste deposition onto the steep embankment along the coastal area indicate that the hydrogeology of the site is characterized by groundwater movement in very thin layers toward the Bay. There was no evidence of any direct leachate discharges into the Bay. The groundwater is not being utilized at NETC and there are no known wells on the Island.

2. Analytical Data on Samples Collected

The samples collected at the Gould Island Disposal Area site are summarized in Table 11 as previously discussed. The analyses were conducted for the parameters indicated in Table 11 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results on sediment samples is presented in Table 27, and for mussels in Table 28.

3. Evaluation of Available Data

The analytical data on samples collected in the verification step indicated that metals have accumulated in sediments and mussels near the Gould Island Disposal Area. For this reason, additional sediment samples were collected north and south of the verification step stations, as well as further off-shore, and additional mussel samples were collected in the intertidal zone to further define the extent of the contamination. In evaluating the characterization step data, control data collected in the verification step was used for comparison with sediment sample data but new control samples were collected for comparison with mussel sample data.

In general, the off-shore sediments sampled in the characterization step (Stations 06 to 10) were found to be less contaminated than the near-shore sediments (Stations 01 to 05) sampled in the characterization and verification steps. Elevated levels of lead and copper were found in sediments close to shore (Stations 01, 02, 03,and 05); the chromium and nickel concentrations at these stations were only slightly above the control sample concentrations, but even some of these concentrations were less than some of the controls. Lead and copper are being assimilated by mussels at rates higher than the controls at Stations 04 and 05, and to a lesser degree at Station 02.

The concentrations of lead, copper, chromium, and nickel in sediments decrease with increased distance from shore. All of the values for these metals

TABLE 27

SUMMARY OF SEDIMENT SAMPLE ANALYTICAL DATA
SITE NO. 14 - GOULD ISLAND DISPOSAL AREA (Sept., 1984)
(All results in ppm - dry weight basis except EP toxic leachate in mg/l)

Station No.	Lead* (Total)	Copper* (Total)	Chromium* (Total)	Nickel Total	Nickel E.P. Tox.	Cyanide Total
01**	70.0	134.0	8.0	14.3	-	-
02**	310.0	242.0	17.8	29.3	-	-
03**	270.0	292.0	15.0	29.0	-	-
04	15.2	14.1	5.3	8.3	0.3	<0.005
05	163	136	11.7	29.2	<0.20	<0.005
05 (Dupl)	-	-	-	-	<0.20	<0.005
06	28.4	19.8	10.8	10.4	<0.20	<0.005
06 (Dupl)	25.4	15.1	9.0	8.3	<0.20	-
07	14.8	8.8	9.2	7.7	<0.20	<0.005
08	27.2	19.8	11.1	10.1	<0.20	<0.005
09	17.3	11.9	9.7	7.9	0.9	<0.005
10	20.9	13.4	15.4	9.7	<0.20	<0.005
N-1**	27.5	18.3	11.5	21.3	-	0.031
N-2**	6.8	10.3	8.0	11.3	-	0.027

* The EP toxic values for these metals were less than the following values for Stations 04 to 10:

Lead - EP toxic leachate <0.2 mg/l
Copper - EP toxic leachate <0.20 mg/l
Chromium - EP toxic leachate <0.10 mg/l

** Data for Stations 01, 02, and 03 and for the control stations is from the verification step.

TABLE 28

SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 14 - GOULD ISLAND DISPOSAL AREA (Sept., 1984)
(All results in ppm - dry weight basis)

Station No.	Lead	Copper	Chromium	Nickel
04	17.9	14.2	3.4	10.1
05	13.2	11.7	1.7	4.7
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2 (Dupl)	5.2	5.4	1.4	4.9

for Station Nos. 04, 06, 07, 08, 09, and 10 (one near-shore and all off-shore stations) were comparable to those found at the control stations. The following summarizes these findings:

	Range of Concentrations (ppm) in Sediments			
	Lead	Copper	Chromium	Nickel
Near-shore samples, (Stations 01 - 05 including verification step)	15 - 310	14 - 492	5 - 18	8 - 29
Off-shore samples (Stations 06 - 10)	15 - 28	9 - 20	9 - 15	8 - 10
Controls (Stations N-1 and N-2)	7 - 28	10 - 18	8 - 12	11 - 21

These data indicate that lead and copper concentrations in sediments at near-shore stations are significantly higher than the controls, although Station 04 was free of any elevated metals concentrations. None of the chromium and nickel concentrations is significantly higher than the controls. Lead was found in mussels at Stations 04 and 05 at levels up to four times that found in the controls, but the copper, chromium, and nickel concentrations were comparable to the controls.

The sediment samples collected in the characterization step were analyzed to determine EP toxicity levels in accordance with the procedure in SW-846. This was done to approximate how readily the metals would be released from the sediment. In all cases, the EP toxic leachate concentration was far below the level at which the sediment would be defined as a hazardous waste.

4. Location of Contaminant Sources and Acuual/Potential Migration

It is evident that contaminants have, in the past, or are continuing to be released from the landfill because the sediment and mussel sampling data indicate elevated concentrations of some metals (lead and copper). The most likely pathways for this are, or were, the groundwater passing under or through the fill or surface water passing over exposed deposits.

5. Toxicity Data and Standards/Criteria for Contaminants Found

Specific standards or criteria for heavy metals in mussels and in marine sediments have not been established. The assessment of the severity of the contamination detected is, therefore, subjective and must be made by comparison to data on mussels and sediments obtained at control stations. These comparisons have been presented previously; they indicate that mussels and sediments close to shore have been affected by copper and lead. There are no established limits for metals concentrations in foods such as mussels. However, the levels found in the mussels were, at most, four times the levels found in the controls.

Toxicity data for the contaminants found was presented in Section J of the verification step report.

6. Recommendations

The following remedial actions are recommended for Site 14 - Gould Island Disposal Area:

- Remove visible metallic debris from the face of the landfill.
- Provide cover on the exposed face of the landfill.
- Provide an impervious clay cap and loam to promote growth of grass.
- Rip-rap the seaward face of the landfill to 10 feet above mean high water.
- Conduct additional sampling and analysis as follows:
    - Quarterly for one year, obtain mussel samples (including controls) and analyze for lead and copper.
    - Annually for five years, obtain mussel samples (including controls) and analyze for lead and copper.

J. FINDINGS AT SITE NO. 17 GOULD ISLAND ELECTROPLATING SHOP

1. General

A complete description of the Gould Island Electroplating Shop site can be found in the verification step report. The site is located at Building 32 and there are two wastewater discharge lines extending into Narragansett Bay on the east side of Gould Island. The electroplating shop is not in use and the property is on land to be retained by the Navy. There are no wastewater discharges from the two discharge pipes with the possible exception of roof drainage. The end of the discharge pipe at Station 01 (Figure No. 10) was located at the time of verification step sample collection. The end of the other pipe could not be located because of silt and vegetation accumulations over the pipe.

The analytical data on samples collected in the verification step indicated that slightly elevated concentrations of copper are present in mussels collected from the vicinity of one of the discharge pipes. For this reason, another sample of mussels was collected at Station 02 in the characterization step.

2. Analytical Data on Samples Collected

The samples collected in the characterization step at the Gould Island Electroplating Shop site are summarized in Table 12 as previously discussed. The analyses were conducted for the parameters indicated in Table 12 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 29.

3. Evaluation of Available Data

The analytical data on samples collected indicate that metals in mussels are comparable to the controls.

4. Recommendations

No further studies or remedial actions are needed at this site because the levels of contaminants found are not significantly high.

TABLE 29

SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP (Sept., 1984)
(All results in ppm - dry weight basis)

Station No.	Lead	Copper	Chromium	Nickel
02	5.0	6.6	1.0	3.9
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2 (Dupl)	5.2	5.4	1.4	4.9

APPENDIX A

LOCATION PLAN - SAMPLING STATIONS

SITE 01 - McALLISTER POINT LANDFILL

APPENDIX B

LOCATION PLANS - SAMPLING STATIONS

SITES 07, 12, 14 - TANK FARMS ONE & FOUR
GOULD ISLAND DISPOSAL AREA

APPENDIX C

YWC LABORATORY REPORTS

YORK LABORATORIES DIVISION

YWC

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE December 3, 1984

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, Connecticut 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of sixty (60) days from receipt of this report, unless other arrangements are desired.

Naturally, as in the past, our staff will be pleased to quote on any future requirements you may have. In addition to the service provided, we also offer the following:

- Hazardous Waste Analyses
- Product Evaluation/R&D
- Water and Wastewater Analyses
- Air and Process Gas Analyses
- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,

Robert Q. Bradley
Vice President

December 3, 1984

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on September 13, 1984. The analyses involved heavy metals and other conventional parameters on various matrices.

The results of the analyses are shown in the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared By:

Robert Q. Bradley
Vice President

RQB:cg

TABLE 1
61910-000
LEA/U.S. NAVY
WATERS FROM TANK BOTTOMS
SEPTEMBER 12, 1984

(All Results Listed in mg/l)

Sample Identification	pH	Lead	Total Suspended Solids	Ammonia-Nitrogen	Biochemical Oxygen Demand (5 Day)	Petroleum Based Hydrocarbons
12-13-TK	7.85	<0.04	7.2	0.74	3	7.3
12-13-TK						
12-15-TK	7.60	<0.04	25.6	0.89	12	4.0
12-15-TK						
12-12-TK	7.17	<0.04	79.2	0.76	46	7.5
12-12-TK						
12-14-TK	7.40	<0.04	99.6	0.48	20	14.2
12-14-TK						
12-16-TK	7.50	<0.04	29.2	0.67	17	21.9
12-16-TK						
12-17-TK	7.60	<0.04	37.6	0.48	7	36.7
12-17-TK						

TABLE 2
61910-000
LEA/U.S. NAVY
SEDIMENTS (EP LEACHATES)
SEPTEMBER 11, 1984

E.P. Toxicity Leachate

(All Results in mg/l)

Sample Identification	Lead	Copper	Chromium	Nickel
01-20-SD	<0.2	<0.20	<0.10	<0.20
01-18-SD	<0.2	<0.20	<0.10	0.20
01-15-SD	<0.2	<0.20	<0.10	<0.20
01-16-SD	<0.2	<0.20	<0.10	0.35
01-19-SD	<0.2	<0.20	<0.10	0.35
01-17-SD	<0.2	<0.20	<0.10	0.71
01-17-SD (Duplicate)	<0.2	<0.20	<0.10	0.66
01-14-SD	<0.2	<0.20	<0.10	<0.20
14-08-SD	<0.2	<0.20	<0.10	<0.20
14-10-SD	<0.2	<0.20	<0.10	<0.20
14-07-SD	<0.2	<0.20	<0.10	<0.20
14-09-SD	<0.2	<0.20	<0.10	0.90
14-06-SD	<0.2	<0.20	<0.10	<0.20
14-06-SD (Duplicate)	<0.2	<0.20	<0.10	<0.20
14-04-SD	<0.2	<0.20	<0.10	0.30
14-05-SD	<0.2	<0.20	<0.10	<0.20

TABLE 3
61910-000
LEA/U.S. NAVY
SEDIMENTS
TOTAL METALS AND TOTAL CYANIDE
SEPTEMBER 11, 1984

Total Metals and Total Cyanide
Results in ug/g on Dried Basis

Sample Identification	Lead	Copper	Chromium	Nickel	Cyanide	% Moisture
01-20-SD	32.3	16.6	14.3	14.2	<0.005	72.70
01-18-SD	34.9	22.8	17.1	16.9	<0.005	69.96
01-15-SD	78.2	63.4	14.3	20.3	<0.005	67.62
01-16-SD	44.0	33.2	12.7	17.2	<0.005	62.27
01-19-SD	33.6	25.4	14.8	17.8	<0.005	68.46
01-17-SD	21.5	20.8	8.7	11.5	<0.005	70.24
01-17-SD (Duplicate)	30.8	27.9	12.5	14.2	--	--
01-14-SD	267	890	22.0	86.6	<0.005	74.98
01-14-SD (Duplicate)	--	--	--	--	<0.005	--
14-08-SD	27.2	19.8	11.1	10.1	<0.005	64.23
14-10-SD	20.9	13.4	15.4	9.7	<0.005	65.69
14-07-SD	14.8	8.8	9.2	7.7	<0.005	72.45
14-09-SD	17.3	11.9	9.7	7.9	<0.005	55.41
14-06-SD	28.4	19.8	10.8	10.4	<0.005	64.16
14-06-SD (Duplicate)	25.4	15.1	9.0	8.3	--	--
14-04-SD	15.2	14.1	5.3	8.3	<0.005	76.77
14-05-SD	163	136	11.7	29.2	<0.005	74.44
14-05-SD (Duplicate)	--	--	--	--	<0.005	--

TABLE 4
61910-000
LEA/U.S. NAVY
METALS IN MUSSELS (DRY TISSUE BASIS)
SEPTEMBER 11 - 12, 1984

All Results in ug/g (ppm)

LEA Desig.	Lead	Copper	Chromium	Nickel	% Solids
01-14-MS	19.7	14.1	1.4	4.4	19.2
01-13-MS	7.5	9.2	1.0	4.0	21.3
01-12-MS	19.9	20.6	3.5	6.6	23.6
14-04-MS	17.9	14.2	3.4	10.1	16.3
14-05-MS	13.2	11.7	1.7	4.7	20.8
17-02-MS	5.0	6.6	1.0	3.9	17.4
N1-01-MS	4.9	6.8	1.1	4.9	19.0
N2-01-MS	3.8	8.2	2.8	5.1	21.0
N2-01-MS*	5.2	5.4	1.4	4.9	21.0

*Duplicate

TABLE 5
61910-000
LEA/U.S. NAVY
FINGERPRINTING OF OILS
SEPTEMBER 12, 1984

Sample Identification	Results
07-01-SLA 07-02-SLA 07-05-SLA	Gas chromatographic scans indicated that the samples contain a weathered petroleum based oil with a pattern similar to a No. 6 Bunker C Fuel.

YORK LABORATORIES DIVISION

YMC

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE January 25, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

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- Product Evaluation/R&D
- Water and Wastewater Analyses
- Air and Process Gas Analyses
- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,

Robert Q. Bradley
Vice President

January 15, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on November 21, 1984. The analyses involved heavy metals and other conventional parameters on groundwater samples.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

Table 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 11/21/84

Tank Farm One
Site 07

Sample I.D.	Petroleum Hydrocarbons mg/l (ppm)	Benzene ug/l (ppb)	Toluene ug/l (ppb)	Xylene ug/l (ppb)	Finger-print
07-07-GWA 1184	<1.0	--	--	--	--
07-07-GWB 1184	--	<10	<10	<10	*
07-06-GWB 1184	<1.0	--	--	--	--
07-06-GWB 1184	--	<10	<10	<10	*
07-08-SPA 1184	8.6	--	--	--	--
07-08-SPB 1184	--	20	120	80	**
07-04-GWA 1184	<1.0	--	--	--	--
07-04-GWB 1184		150	160	28	**

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C_8 to C_{13} range which indicate a weathered gasoline product.

Table 2.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 11/20/84

Tank Farm Four
Site 12

Sample Identification	Petroelum Hydrocarbons mg/l (ppm)	Lead mg/l (ppm)
12-11-GWA-1184	1.9	--
12-11 GWB 1184	--	0.06
12-10-GWA 1184	<1.0	--
12-10-GWB 1184	--	0.04

TABLE 3.0
61910-000
LEA/U.S. NAVY - NEWPORT

SAMPLES
11/20/84

McAllister Point Landfill
Site 01

Sample Identification	Cyanide mg/l (ppm)	Lead mg/l (ppm)	Copper mg/l (ppm)	Chromium mg/l (ppm)	Nickel mg/l (ppm)	pH	Chloride mg/l (ppm)
01-22-GWA 1184	0.006	--	--	--	--	--	--
01-22-GWB 1184	--	1.0	1.04	0.11	0.19	--	--
01-22-GWC 1184	--	--	--	--	--	6.43	2.2
01-21-GWA 1184	0.006	--	--	--	--	--	--
01-21-GWB 1184	--	0.8	0.73	0.17	0.25	--	--
01-21-GWC 1184	--	--	--	--	--	6.82	3.3
01-23-GWA 1184	0.005	--	--	--	--	--	--
01-23-GWB 1184	--	0.1	0.06	0.09	0.19	--	--
01-23-GWC 1184	--	--	--	--	--	5.95	3.8

YORK LABORATORIES DIVISION

YWC

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE January 25, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

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- Product Evaluation/R&D
- Water and Wastewater Analyses
- Air and Process Gas Analyses
- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,

Robert Q. Bradley
Vice President

January 15, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on December 18, 1984.

The result of the analyses are shown in the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

TABLE 1.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm One
Site 07

Sample Identification	Benzene ug/l (ppb)	Toluene ug/l (ppb)	Xylenes ug/l (ppb)	Hydrocarbon Fingerprint
07-06-GWB 1284 07-06-GWC 1284	<10	<10	<10	Insufficient Levels to Fingerprint
07-07-GWB 1284 07-07-GWC 1284	<10	<10	<10	Insufficient Levels to Fingerprint
07-08-SPB 1284 07-08-SPC 1284	30	110	74	*
07-04-GWB 1284 07-04-GWC 1284	140	190	39	*

*Gas Chromatographic Scans indicated these samples contain a weathered hydrocarbon with a pattern similar to gasoline.

A preponderance of C_8 through C_{13} hydrocarbons was present which is indicative of a weathered gasoline.

Samples labeled GWB and SPB were used for screening.

Samples labeled GWC and SPC were used for analysis of BTX and Hydrocarbon Fingerprint.

TABLE 2.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm One
Site 07

Sample Identification	Petroleum Based Hydrocarbons mg/l (ppm)
07-06-GWA 1284	6.3
07-07-GWA 1284	3.8
07-08-SPA 1284	5.0
07-04-GWA 1284	2.6

TABLE 3.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm Four
Site 12

Sample Identification	Lead mg/l (ppm)	Petroleum Based Hydrocarbons mg/l (ppm)
12-10-GWA-1284	--	3.3
12-10-GWB-1284	<0.04	--
12-11-GWA-1284	--	12.3
12-11-GWB-1284	<0.04	--

TABLE 4.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84 and 12/18/84

McAllister Point Landfill
Site 01

Sample Identification	Cyanide mg/l (ppm)	Lead mg/l (ppm)	Copper mg/l (ppm)	Chromium mg/l (ppm)	Nickel mg/l (ppm)	pH	Chloride mg/l (ppm)
01-23-GWA 1284	<0.005	--	--	--	--	--	--
01-23-GWB 1284	--	0.08	0.06	0.05	0.08	--	--
01-23-GWC 1284	--	--	--	--	--	5.84	1.6
01-22-GWA 1284	0.006	--	--	--	--	--	--
01-22-GWB 1284	--	0.76	0.59	0.07	0.10	--	--
01-22-GWC 1284	--	--	--	--	--	6.57	1.3
01-21-GWA 1284	<0.005	--	--	--	--	--	--
01-21-GWB 1284	--	0.34	0.22	0.04	0.06	--	--
01-21-GWC 1284	--	--	--	--	--	7.01	340

YORK LABORATORIES DIVISION

YWC

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE February 13, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

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- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,

Robert Q. Bradley
Vice President

February 13, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on January 9, 1985. The samples were prepared and analyzed in accordance with Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980, and EPA Methods 624, 625.1 and 608. The results are listed on the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

TABLE 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 1/07/85

Tank Farm One
Site 07

Sample I.D.	Petroleum Hydrocarbons mg/l (ppm)	Benzene ug/l (ppb)	Toluene ug/l (ppb)	Xylene ug/l (ppb)	Finger-print
07-06-GWA 010785	2.1	--	--	--	--
07-06-GWB 010785	--	<10	<10	<10	*
07-07-GWA 010785	3.1	--	--	--	--
07-07-GWB 010785	--	<10	<10	<10	*
07-08-GWA 010785	3.3	--	--	--	--
07-08-GWB 010785	--	<10	<10	<10	*
07-04-GWA 010785	<1.0	--	--	--	--
07-04-GWB 010785	--	167	198	351	**

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C_8 to C_{13} range which indicate a weathered gasoline product.

TABLE 2.0
61910-000
LEA/U.S. NAVY NEWPORT

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

	Sample Identification		
Parameter	Station 23	Station 21	Station 22
Antimony	<100	<100	<100
Arsenic	<2	<2	<2
Beryllium	<10	<10	<10
Cadmium	<4	<4	<4
Chromium	<20	<20	40
Copper	<40	72	158
Lead	<40	<40	140
Mercury	0.8	0.7	<0.2
Nickel	<40	<40	<40
Selenium	<2	<2	<2
Silver	<40	<40	<40
Thallium	<100	<100	<100
Zinc	82	200	500
Cyanide	<5	8	13
Phenols	7	21	13
Chloride	2,760	795,000	50,400
pH	5.87	6.98	6.49

TABLE 3.0
61910-000
LEA/U.S. NAVY-NEWPORT
VOLATILE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

	Sample Identification		
Compound	Station 23	Station 21	Station 22
chloromethane	<10	<10	<10
bromomethane	<10	<10	<10
vinyl chloride	<10	<10	<10
chloroethane	<10	<10	<10
methylene chloride	<10	<10	<10
trichlorofluoromethane	<10	<10	<10
acrolein	<100	<100	<100
acrylonitrile	<100	<100	<100
1,1-dichloroethene	<10	<10	<10
1,1-dichloroethane	<10	<10	<10
trans-1,2-dichloroethene	<10	<10	<10
chloroform	<10	<10	<10
1,2-dichloroethane	<10	<10	<10
1,1,1-trichloroethane	<10	<10	<10
carbon tetrachloride	<10	<10	<10
bromodichloromethane	<10	<10	<10
2-chloroethylvinyl ether	<10	<10	<10
1,2-dichloropropane	<10	<10	<10
trans-1,3-dichloropropene	<10	<10	<10
trichloroethylene	<10	<10	<10
benzene	<10	<10	<10
cis-1,3-dichloropropene	<10	<10	<10
dibromochloromethane	<10	<10	<10
1,1,2-trichloroethane	<10	<10	<10
bromoform	<10	<10	<10
tetrachloroethylene	<10	<10	<10
1,1,2-2-tetrachloroethane	<10	<10	<10
toluene	<10	<10	<10
chlorobenzene	<10	<10	<10
ethyl benzene	<10	<10	<10

TABLE 4.0
61910-000
LEA/U.S. NAVY NEWPORT
BASE/NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85
McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

Compound	Sample Identification		
	Station 23	Station 21	Station 22
n-nitrosodimethyl amine	<10	<10	<10
bis (2-chloroethyl) ether	<10	<10	<10
1,3-dichlorobenzene	<10	<10	<10
1,4-dichlorobenzene	<10	<10	<10
1,2-dichlorobenzene	<10	<10	<10
bis (2-chloroisopropyl) ether	<10	<10	<10
hexachloroethane	<10	<10	<10
n-nitroso-di-n propylamine	<10	<10	<10
nitrobenzene	<10	<10	<10
isophorone	<10	<10	<10
bis (2-chloroethoxy) methane	<10	<10	<10
1,2,4-trichlorobenzene	<10	<10	<10
naphthalene	<10	<10	<10
hexachlorobutadiene	<10	<10	<10
hexachlorocyclopentadiene	<10	<10	<10
2-chloronaphthalene	<10	<10	<10
dimethyl phthalate	<10	<10	<10
acenaphthylene	<10	<10	<10
2,6-dinitrotoluene	<10	<10	<10
acenaphthene	<10	<10	<10
2,4-dinitrotoluene	<10	<10	<10
diethyl phthalate	<10	<10	<10
fluorene	<10	<10	<10
4-chlorophenyl-phenyl ether	<10	<10	<10
4-bromophenyl phenyl ether	<10	<10	<10
hexachlorobenzene	<10	<10	<10
phenanthrene	<10	<10	<10
anthracene	<10	<10	<10
di-n-butyl phthalate	<10	<10	<10
fluoranthene	<10	<10	<10
benzidine	<10	<10	<10
pyrene	<10	<10	<10
butyl benzyl phthalate	366	<10	<10
3,3'dichlorobenzidine	<10	<10	<10
chrysene	<10	<10	<10
benzo (a) anthracene	<10	<10	<10
bis (2-ethyl hexyl) phthalate	931	17	64
di-n-octyl phthalate	553	19	62
benzo (b) fluoranthene	<10	<10	<10
benzo (k) fluoranthene	<10	<10	<10
benzo (a) pyrene	<10	<10	<10
benzo (g,h,i) perylene	<10	<10	<10
dibenzo (a,h) anthracene	<10	<10	<10
Indeno (1,2,3,c,d) pyrene	<10	<10	<10
n-nitrosodiphenylamine	<10	<10	<10

TABLE 5.0
61910-000
LEA/U.S. NAVY NEWPORT
ACID EXTRACTABLE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

	Sample Identification		
Compound	Station 23	Station 21	Station 22
phenol	<25	<25	<25
2-chlorophenol	<25	<25	<25
2-nitrophenol	<25	<25	<25
2,4-dimethylphenol	<25	<25	<25
2,4-dichlorophenol	<25	<25	<25
4-chloro-3-methyl phenol	<25	<25	<25
2,4,6-trichlorophenol	<25	<25	<25
2,4-dinitrophenol	<250	<250	<250
4-nitrophenol	<25	<25	<25
2-methyl-4,6-dinitrophenol	<250	<250	<250
pentachlorophenol	<25	<25	<25

TABLE 6.0
61910-000
LEA/U.S. NAVY NEWPORT
PESTICIDES AND PCB's

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

	Sample Identification		
Compound	Station 23	Station 21	Station 22
alpha BHC	<0.005	<0.005	<0.005
beta BHC	<0.005	<0.005	<0.005
gamma BHC	<0.005	<0.005	<0.005
delta BHC	<0.005	<0.005	<0.005
Heptachlor	<0.01	<0.005	<0.005
Aldrin	<0.005	0.015	0.015
4,4' DDE	<0.005	<0.005	<0.005
Dieldrin	<0.005	<0.005	<0.005
4,4' DDD	<0.025	<0.005	<0.005
Endrin Aldehyde	<0.01	<0.01	<0.01
4,4' DDT	<0.025	<0.025	<0.025
Chlordane	<0.02	<0.02	<0.02
Endosulfan I	<0.01	<0.01	<0.01
Endosulfan II	<0.005	<0.005	<0.005
Endosulfan Sulfate	<0.025	<0.025	<0.025
Endrin	<0.005	<0.005	<0.005
Heptachlor Epoxide	<0.025	<0.025	<0.025
Toxaphene	<0.2	<0.2	<0.2
PCB - 1016	<0.2	<0.2	<0.2
PCB - 1221	<0.2	<0.2	<0.2
PCB - 1232	<0.2	<0.2	<0.2
PCB - 1242	<0.2	<0.2	<0.2
PCB - 1248	<0.2	<0.2	<0.2
PCB - 1254	<0.2	<0.2	<0.2
PCB - 1260	<0.2	<0.2	<0.2

TABLE 7.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples - 01/07/85

Tank Farm Four
Site 12

Sample Identification	Petroleum Hydrocarbons mg/l (ppm)	Lead mg/l (ppm)
12-10-GWA-010785	2.7	---
12-10-GWB-010785	---	<0.04
12-11-GWA-010785	3.6	---
12-11-GWB-010785	---	0.10

YORK LABORATORIES DIVISION

YWC

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE February 13, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of sixty (60) days from receipt of this report, unless other arrangements are desired.

Naturally, as in the past, our staff will be pleased to quote on any future requirements you may have. In addition to the service provided, we also offer the following:

- Hazardous Waste Analyses
- Product Evaluation/R&D
- Water and Wastewater Analyses
- Air and Process Gas Analyses
- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,

Robert Q. Bradley
Vice President

February 13, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on January 30, 1985. The samples were prepared and analyzed in accordance with Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980 and EPA Method 624.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

Table 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 1/28/85

Tank Farm One
Site 07

Sample I.D.	Petroleum Hydrocarbons mg/l (ppm)	Benzene ug/l (ppb)	Toluene ug/l (ppb)	Xylene ug/l (ppb)	Finger-print
07-08-SPA-0185B	<1.0	--	--	--	--
07-08-SPB-0185B	--	10	<10	22	*
07-04-GWA-0185B	<1.0	--	--	--	--
07-04-GWB-0185B	--	88	65	520	**
07-07-GWA-0185B	<1.0	--	--	--	--
07-07-GWB-0185B	--	<10	<10	<10	*
07-06-GWA-0185B	<1.0	--	--	--	--
07-06-GWB-0185B	--	<10	<10	<10	*

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C_8 to C_{13} range which indicate a weathered gasoline product.

TABLE 2.0
61910-000
LEA/U.S. NAVY - NEWPORT

Samples 1/28/85

Tank Farm Four
Site 12

Sample Identification	Lead mg/l (ppm)	Petroleum Based Hydrocarbons mg/l (ppm)
12-10-GWA-0185B	--	<1.0
12-10-GWB-0185B	<0.04	--
12-11-GWA-0185B	--	2.3
12-11-GWB-0185B	<0.04	--

TABLE 3.0
61910-000
LEA/U.S. NAVY

Samples - 1/28/85

McAllister Point Landfill
Site 01

Sample Identification	Cyanide mg/l (ppm)	Lead mg/l (ppm)	Copper mg/l (ppm)	Chromium mg/l (ppm)	Nickel mg/l (ppm)	pH	Chloride mg/l (ppm)
01-23-GWA 0185B	0.009	--	--	--	--	--	--
01-23-GWB 0185B	--	<0.04	0.11	0.04	0.07	--	--
01-23-GWC 0185B	--	--	--	--	--	6.18	3.6
01-22-GWA 0185B	<0.005	--	--	--	--	--	--
01-22-GWB 0185B	--	0.7	0.55	0.07	0.12	--	--
01-22-GWC 0185B	--	--	--	--	--	6.54	108
01-21-GWA 0185B	<0.005	--	--	--	--	--	--
01-21-GWB 0185B	--	1.58	0.95	0.22	0.30	--	--
01-21-GWC 0185B	--	--	--	--	--	6.41	624

APPENDIX D

QA/QC SUMMARY

APPENDIX D - QA/QC SUMMARY

Note: x = Arithmetic Mean
S = Standard Deviation

Metal Recoveries - Soils and Sediments

Cadmium:

Target Value		0.50 mg/l
Standard Values	1.	0.52
	2.	0.53
	3.	0.48
	4.	0.47
	5.	0.50
	6.	0.51
	7.	0.47
	8.	0.52
	9.	0.49
	10.	0.47

$x \pm S = 0.49 \pm 0.02$
Recovery = 98.0%

Lead:

Target Value		1.0
Standard Values	1.	1.5
	2.	1.1
	3.	0.9
	4.	0.9
	5.	0.9
	6.	1.0
	7.	1.0
	8.	0.9
	9.	0.9
	10.	1.0

$x \pm S = 1.01 \pm 0.18$
Recovery = 101.0%

Chromium:

Target Value		1.00
Standard Values	1.	1.01
	2.	0.96
	3.	0.96
	4.	0.90
	5.	0.92
	6.	0.94
	7.	0.91
	8.	0.92
	9.	0.97
	10.	0.94

$x \pm S = 0.94 \pm 0.03$
Recovery = 94.0%

Nickel:

Target Value		1.00
Standard Values	1.	0.98
	2.	0.97
	3.	0.93
	4.	0.94
	5.	0.94
	6.	0.92
	7.	0.96
	8.	0.91
	9.	0.86
	10.	0.88

$x \pm S = 0.93 \pm 0.04$
Recovery = 93%

Trace Metals In Fish

U.S. EPA Sample No. 1, Serial No. 0639

Metal	Target Value (mg/kg)	95% Confidence Level	Experimental Value
Lead	0.26	MDL - 0.62	0.30
Chromium	0.58	MDL - 1.34	0.56
Cadmium	0.16	MDL - 0.32	0.19
Nickel	0.54	MDL - 1.10	0.67

APPENDIX D - QA/QC SUMMARY

Note: x = Arithmetic Mean
S = Standard Deviation

Inorganic Analyses: Aqueous Samples

pH:

Target Value	6.87	
Standard Values	1.	6.95
	2.	6.93
	3.	6.89

x ± S = 6.92 ± 0.03
Recovery = 100.7%

Chloride:

Target Value	110 mg/l	
Standard Values	1.	108
	2.	120
	3.	118

x ± S = 115 ± 6.43
Recovery = 104.5%

Cyanide:

Target Value	0.05 mg/l	
Standard Values	1.	0.046
	2.	0.040
	3.	0.052

x ± S = 0.046 ± 0.006
Recovery = 92.0%

Petroleum Based Hydrocarbons:

Target Value	15.0 mg/l	
Standard Values	1.	12.3
	2.	11.4
	3.	17.3

x ± S = 13.7 ± 3.18
Recovery = 91.3%

Ammonia-Nitrogen:

Target Value	2.00 mg/l	
Standard Values	1.	1.85
	2.	1.97
	3.	2.05

x ± S = 1.96 ± 0.10
Recovery = 98.0%

Total Suspended Solids:

Target Value	25.0 mg/l	
Standard Values	1.	17.3
	2.	22.8
	3.	19.9

x ± S = 20.0 ± 2.75
Recovery = 80.0%

Biochemical Oxygen Demand:
(5-Day)

Target Value	150 mg/l	
Standard Values	1.	136
	2.	148
	3.	155

x ± S = 146 ± 1.73
Recovery = 97.3%

APPENDIX D - QA/QC SUMMARY

Note: x = Arithmetic Mean
S = Standard Deviation

Metal Analyses - Aqueous Samples

Parameter	Target Values (ug/l)	Replicate Values (ug/l) #1	#2	#3	x ± s	Recovery
Antimony	625	528	562	---	545 ± 24.0	87.2%
Arsenic	25	20	18	---	19 ± 1.4	76.0%
Beryllium	500	480	470	---	475 ± 7.1	95.0%
Cadmium	625	560	570	---	565 ± 7.1	90.4%
Chromium	500	506	450	---	478 ± 39.6	95.6%
Copper	500	480	470	---	475 ± 7.1	95.0%
Lead	500	480	500	500	493 ± 11.5	98.6%
Nickel	500	498	560	546	535 ± 32.5	107.0%
Selenium	25	25	23	---	24 ± 1.4	96.0%
Thallium	500	560	540	500	533 ± 30.6	106.6%
Zinc	500	520	536	494	517 ± 21.2	103.4%

APPENDIX D - QA/QC SUMMARY

Volatile Priority Pollutants - Aqueous Samples

Compound	Target Value	Result	% Recovery
Methylene Chloride	399 ug/l	360 ug/l	90.2
1,1,1-Trichlorethane	405 ug/l	381 ug/l	94.1
Tetrachloroethene	486 ug/l	482 ug/l	99.2
Toluene	261 ug/l	266 ug/l	101.9
Benzene	250 ug/l	244 ug/l	97.6%
Xylene	400 ug/l	387 ug/l	96.8%

BASE/NEUTRAL/ACIDIC ORGANICS RECOVERY DATA ON LABELED QC SAMPLES

Compound	Actual Mean Percent Recovery	Theoretical Mean Recovery
naphthalene	77	73
hexachlorobutadiene	56	64
diethyl phthalate	100	118
chrysene	88	102
phenol	63	42
2,4-dimethylphenol	68	70
Aroclor 1248	75	88

Theoretical mean percent recovery values were taken from "Prescision and Accuracy in the Determination of Organics in Water by Fused Silica Capillary Column Gas Chromatography/Mass Spectrometry and Packed Column Gas Chromatography/Mass/Spectrometry". J. W. Elchelberger, E. G. Kerns, P. Olynyk, and W. L. Budde, Anal. Chem., 1983, 55, 1471-1479.

APPENDIX E

WELL DRILLER'S LOGS

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport , RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. B- 21 Site No. 01

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	dump fill, fabric, iron, bricks, some fine-crs.sand, tr. fine-crs.gravel, occasional cobbles		
38.0			
40.0	**		
	rock core 40-43' rec.35"	30/0"*	
43.0			
		*300#	

BORING NO.

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER	B
	**blk.silt,some fine-crs.sand, some fine gravel,cobbles, till		
	ROLLER BIT REFUSAL @	40'	
	BOTTOM OF BORING 43.0 WATER AT HIGH TIDE @	22'	
	2" WELL INSTALLED @	38'	
	10' wrapped screen 30' riser ~~sandpack~~ Bentonite seal 5' protector & cement		
	~~DATE: 9/11/84~~ DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport, RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. B-22 Site No. 01

LINE & STA.
OFFSET
GR. ELEV.

BORING NO.
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	cement, wood,bricks, iron, some fine-crs gravel,soke silt, some fine-med.sand		
		3-3-2	
		5-4-5	
15.0	blk.silt,tr.fine sand,some fine gravel,cobbles, possible till	60/4"	
30.3			
	BOTTOM OF BORING 30.3		
	WATER @ HIGH TIDE @ 9'		
	2" WELL INSTALLED @ 25'		
	10' unwrapped screen		
	17' riser		
	sandpack		
	Bentonite seal		
	Protector & cement		
	DATE: 9/13/84		
	DRILLER: FAULKNER		

A	STRATUM DESCRIPTION	BLOWS PER	B

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

Trio Printers # 1127

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. B- 23 (relocated to cemetery)

LINE & STA.
OFFSET
GR. ELEV.

BORING NO.

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
2.0	**		
	gr/br.silt,some fine sand & fine-crs.gravel,shale frags.		
7.0		47-60/5"	
	gr/br.silt,weathered shale, shale frags.		
		60/6"	
		60/3"	
		auger	
		auger	
35.0			
	weathered shalestone		
40.0			
	**br.fine-med.sand, silt,some fine-med.	some gravel	

A	STRATUM DESCRIPTION	BLOWS PER____	B
	BOTTOM OF BORING 40.0		
	WATER AT 22' @ 0 hrs.		
	2" WELL INSTALLED @	40'	
	10' unwrapped screen		
	30' riser		
	sandpack		
	Bentonite seal		
	Protector & cement		
	DATE: 9/13/84		
	DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport, RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. 0.6 SITE NO. 07

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.2	topsoil		
	gr/br.silt,some fine-med.sand, shale frags.,some fine-crs.gravel		
		9-14-17	
7.0			
	gr.silt, some shale frags.	60/4"	
		60/2"	
		60/3"	
27.0		60/1"	
	gr.silt,shale frags., shale, cobbles,till	auger	
45.0		60/1"	

BORING NO.
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER	B
	BOTTOM OF BORING 45.0		
	WATER AT HIGH TIDE @ 27'		
	2" WELL INSTALLED AT 45'		
	10' wrapped screen 35' riser sandpakc Bentonite seal protector & cement		

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = O.D. SPLIT SPOON
5. GWT = GROUND WATER

DATE: 9/13/84
DRILLER: FAULKNER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

Trio Printers # 1127

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport, RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. 0.7 SITE NO. 07

LINE & STA.
OFFSET
GR. ELEV.

BORING NO.

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.2	TOPSOIL		
1.5	** drk.br.silt,some fine sand,fine-crs. gravel		
4.0			
	gr/br.silt,fine-med. sand,tr.crs.gravel	15-18-22	
		15-18-15	
16.0		15-36-60/5	
	gr.silt,some shale frags.,occasional cobbles		
		60/2"	
30.0		60/1"	
	BOTTOM OF BORING 30.0 WATER AT HIGH TIDE 16'		
	2" WELL INSTALLED @ 30' 10' unwrapped screen 20' riser sandpack ~~Bentonite seal~~ protector & cement DATE: 9/13/84 DRILLER: FAULKNER		

A	STRATUM DESCRIPTION	BLOWS PER	B

Trio Printers # 1127

1. COL. A ~~strata depth~~
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Newport, RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. B-10 SITE NO.12

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.5	TOPSOIL		
3.0	br.fine-crs.sand, some fine-crs.gravel		
	gr/br.silt, fine sand,some weathered shalestone, gr. fine-crs.sand layers	26-30-36	
		26-60/6"	
13.0			
	gr/br.silt,some fine-med.sand,some fine gravel	31-37-35	
17.0			
	gr.silt, some fine sand,some fine gravel		
25.0			
	BOTTOM OF BORING 25.0 WATER AT 11' @ 0 hrs.		
	2" WELL INSTALLED @ 25' 10' wrapped screen 16' riser samdpack bentonite seal protector & cement DATE: 9/12/84 DRILLER: FAULKNER		

BORING NO. B-11 SITE NO. 12

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
1.0	**		
4.0	drk.br.fine-crs.sand, silt,tr.fine-crs. gravel		
	br.& gr.silt, with layers fine-med.sand, tr.crs.gravel	27-60/6"	
		19-27-47	
17.0		60/3"	
	gr.silt, with very fine sand layers, tr clay layers		
31.5		8-12-19* *300#	
	**gr/br.fine-crs. sand,shalestone,boulders,fill		
	BOTTOM OF BORING 31.5' WATER AT LOW TIDE @ 15' 2" WELL INSTALLED @ 30'		
	10' wrapped screen 20' riser sandpack bentonite seal protector & cement		

Trio Printers # 1127

DATE: 9/12/84
DRILLER: FAULKNER

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOCIATES INC.
DRILLING CONTRACTORS: TEST BORINGS • ROCK EXPLORATION • WATER EXPLORATION • SOIL & ROCK ANCHORS

USN, NETC - Confirmation Study on Hazardous Waste Sites

at Newport, R.I. September 14, 1984

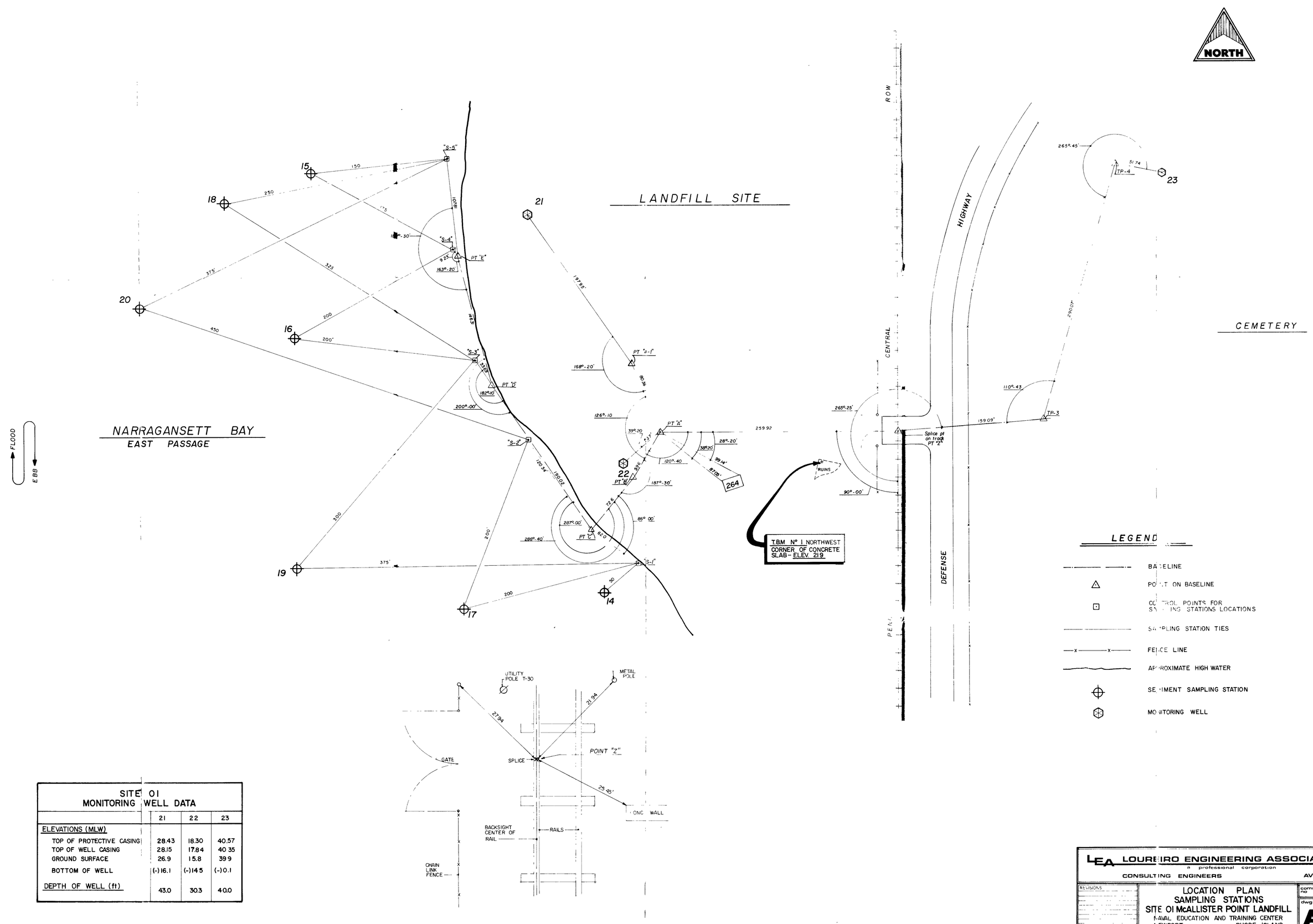
The development of the 7 wells was accomplished by ejecting water from the wells with a compressed air line to the bottom of the well. Well recoveries were approximately as follows:

Site & Station	Recovery (2"± D. well)
01 - B21	20
01 - B22	50
01 - B23	60
07 - B06	40
07 - B07	55
12 - B10	35
12 - B11	35

* 10' of pipe = 1.6 gallons

Clarence Welti, PhD, P.E.

P.O. BOX 397 •• GLASTONBURY, CONNECTICUT 06033 •• (203) 633-4623



SITE 01 MONITORING WELL DATA	21	22	23
ELEVATIONS (MLW)			
TOP OF PROTECTIVE CASING	28.43	18.30	40.57
TOP OF WELL CASING	28.15	17.84	40.35
GROUND SURFACE	26.9	15.8	39.9
BOTTOM OF WELL	(-)16.1	(-)14.5	(-)0.1
DEPTH OF WELL (ft)	43.0	30.3	40.0

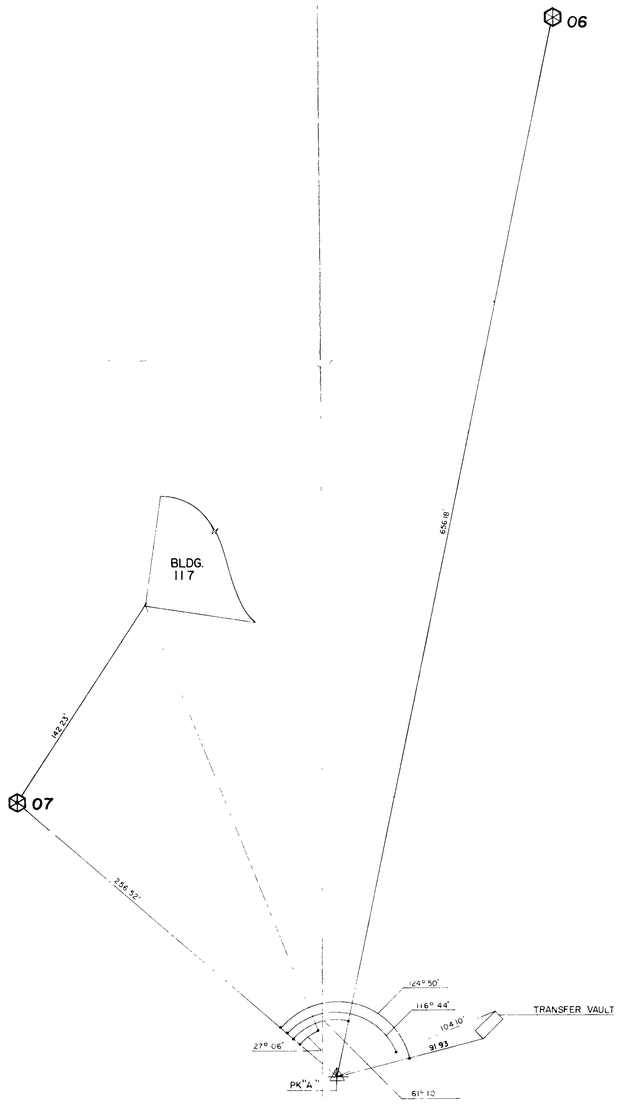
LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS — AVON CT.

REVISIONS

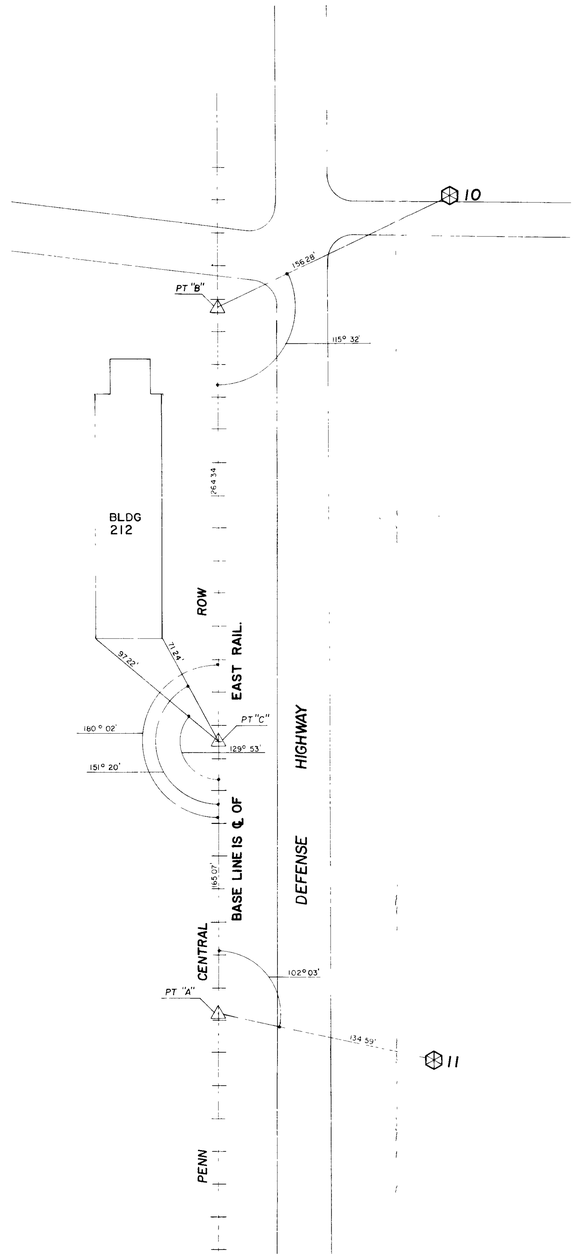
LOCATION PLAN
SAMPLING STATIONS
SITE 01 McALLISTER POINT LANDFILL
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

comm no. 502-10
dwg. no. A-1
by CAJ, JJL | app JL | scale 1" = 40' | date MAR 13, 1985

000012AB01X

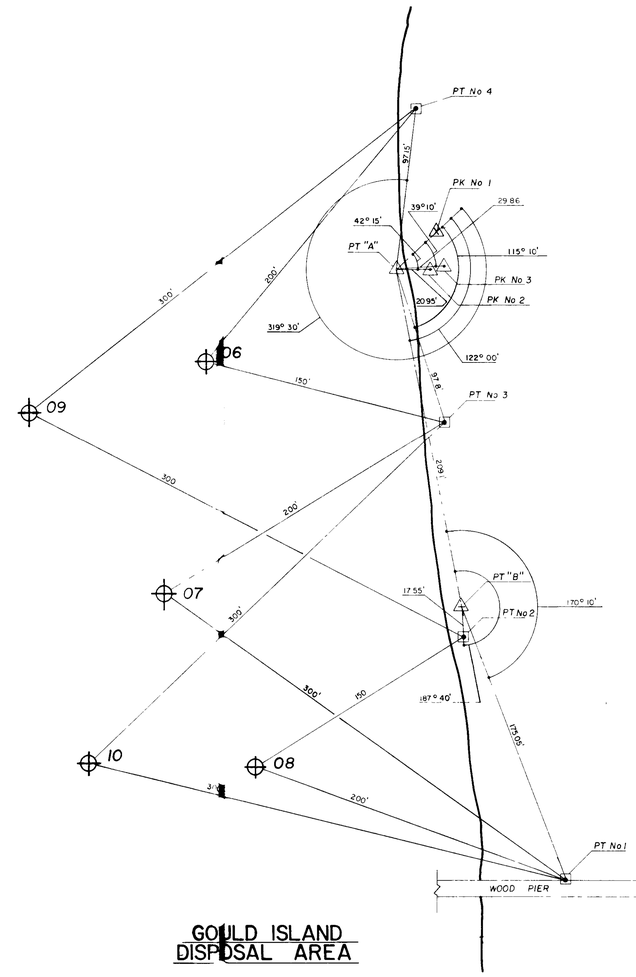


TANK FARM ONE



TANK FARM FOUR

POINTS "A", "B", & "C" ARE AT SPLICES IN EAST RAIL



GOULD ISLAND
DISPOSAL AREA

LEGEND

- BASELINE
- POINT ON BASELINE
- CONTROL POINTS FOR SAMPLING STATIONS LOCATIONS
- SAMPLING STATION TIES
- FENCE LINE
- APPROXIMATE HIGH WATER
- SEDIMENT SAMPLING STATION
- MONITORING WELL

SITE 07 MONITORING WELL DATA	06	07
ELEVATIONS (MLW)		
TOP OF PROTECTIVE CASING	27.55	23.25
TOP OF WELL CASING	27.08	22.99
GROUND SURFACE	27.0	22.1
BOTTOM OF WELL	(-)18.0	(-)7.9
DEPTH OF WELL (ft.)	45	30

BM ELEVATION (MLW) = 8.45 AT BM-2B BRASS PIN ON TOP OF CONCRETE WALL, SOUTHEAST CORNER OF SMALL BOAT BASIN, WEST OF LAGOON ROAD 950'± WEST OF POINT "A".

SITE 12 MONITORING WELL DATA	10	11
ELEVATIONS (MLW)		
TOP OF PROTECTIVE CASING	22.32	19.63
TOP OF WELL CASING	22.07	18.79
GROUND SURFACE	20.8	19.[illegible]
BOTTOM OF WELL	(-)4.2	(-)12.4
DEPTH OF WELL (ft.)	25	31.5

BM ELEVATION (MLW) = 4.5 AT BM 4-5 DRILLED HOLE IN NORTHEAST CORNER OF CONCRETE HEADWALL AT NORMAN BROOK, ON EAST SIDE OF DEFENSE HIGHWAY 700'± SOUTH OF POINT "C".

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS — AVON CT.

LOCATION PLAN-SAMPLING STATIONS
SITES 07, 12, 14-TANK FARMS ONE & FOUR, GOULD ISLAND DISPOSAL AREA
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

comm no 502-10
dwg. no B-1
by [illegible] | app [illegible] | scale [illegible] : 40 | date MAR 13, 1985