

**WATER SUPPLY FEASIBILITY STUDY  
BUSINESSES AND RESIDENCES ON CANDLEWOOD HILL ROAD  
HADDAM (HIGGANUM), CONNECTICUT**

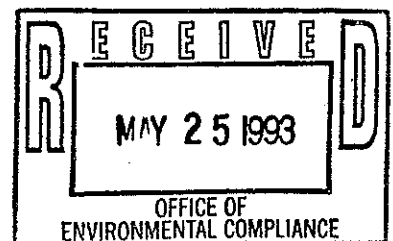
**SUBMITTED TO:**

**CONNECTICUT DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENVIRONMENTAL COMPLIANCE**

**24 WOLCOTT HILL ROAD  
WETHERSFIELD, CONNECTICUT**

**MAY 1993**

**METCALF & EDDY, INC.  
ONE RESEARCH PARKWAY  
MERIDEN, CONNECTICUT**



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BUSINESSES AND RESIDENCES ON CANDLEWOOD HILL ROAD  
HADDAM (HIGGANUM), CONNECTICUT**

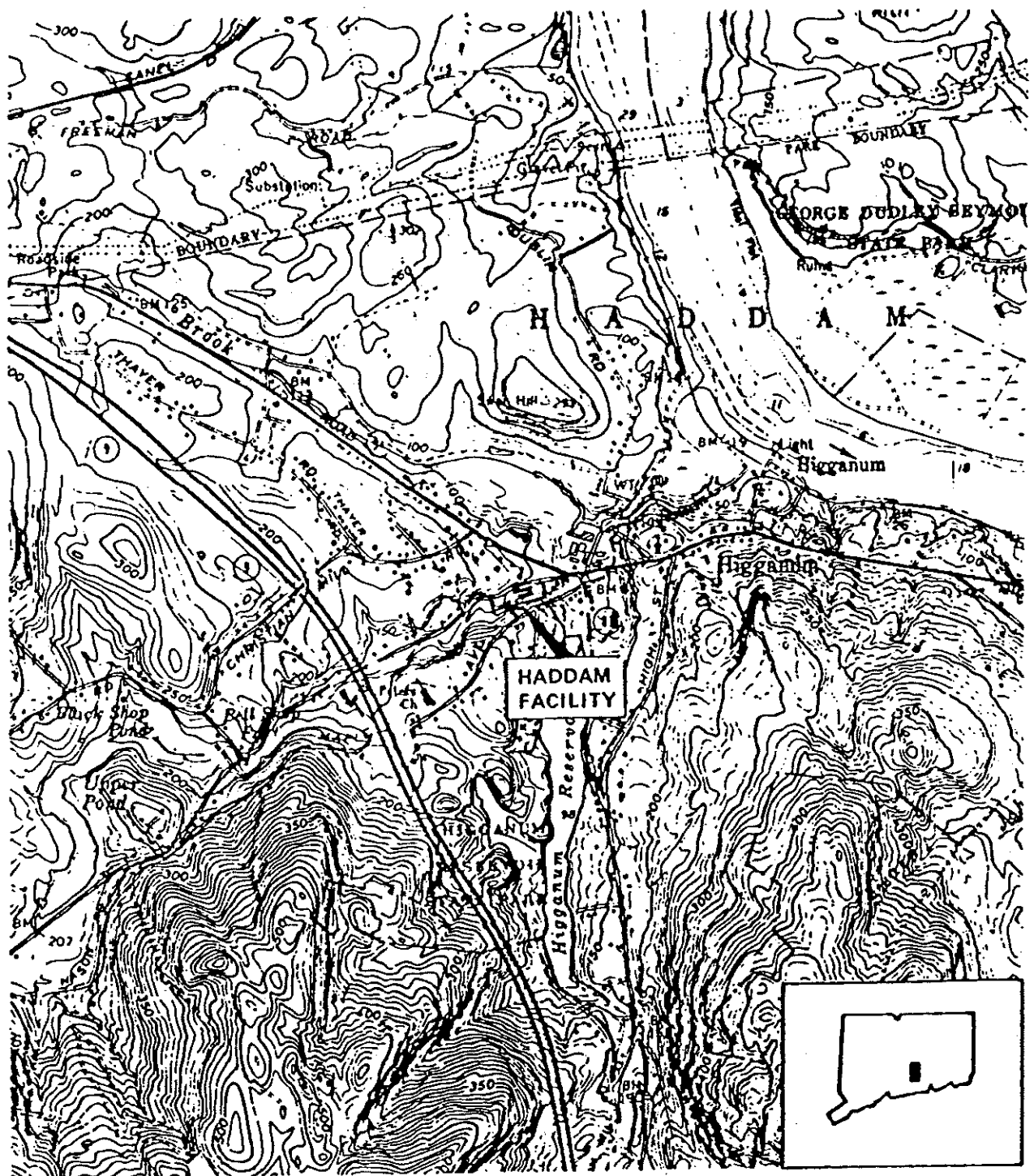
**INTRODUCTION**

Groundwater contamination by salt released from the ConnDOT salt storage and maintenance facilities at Haddam (Higganum) has been verified during previous testing. ConnDOT intends to supply alternative potable water to affected local drinking water supplies. The purpose of this feasibility study is to identify and evaluate the alternative for potable water supply remediation and to recommend a remediation plan for the businesses and residences on Candlewood Hill Road, which include the fire house, Rossi Realty (previously the oil company), an apartment, Farmers and Mechanics Savings Bank, and the Country Market.

**BACKGROUND INFORMATION**

The Haddam repair facility is located on Candlewood Hill Road, 400 feet west of the intersection of Routes 9A and 81 (see Figure F-36-1). Detailed test data collected on June 17, and September 30, 1986, suggested that residual salt from salt storage and handling operations (discontinued in 1973) were persistent in the groundwater local to the Haddam garage. Figure F-36-2 illustrates the detailed testing locations.

Volatile organics that were detected during the detailed study and are of regulatory concern are benzene and trichloroethylene. Benzene was found at trace levels, with the highest concentrations of 4 ug/l found in an on-site monitoring well (D-2). Benzene was also found on-site in well No. 3 at a concentration of 1 ug/l. The wells serving the fire house (D-80) and oil company (D-75) did not have benzene in them, indicating that off-site receptors were not being affected. Benzene detected at these low concentrations in the wells during detailed testing was more likely to originate from small surface spills while refueling or from pavement runoff rather than from an underground fuel tank leak.



SOURCE: USGS TOPOGRAPHIC MAPS  
HADDAM, CT., 1971  
MIDDLE HADDAM, CT., 1971



2000 0 2000  
SCALE IN FEET

FIGURE F-36-1. LOCATION PLAN - HADDAM (HIGGANUM) REPAIR FACILITY

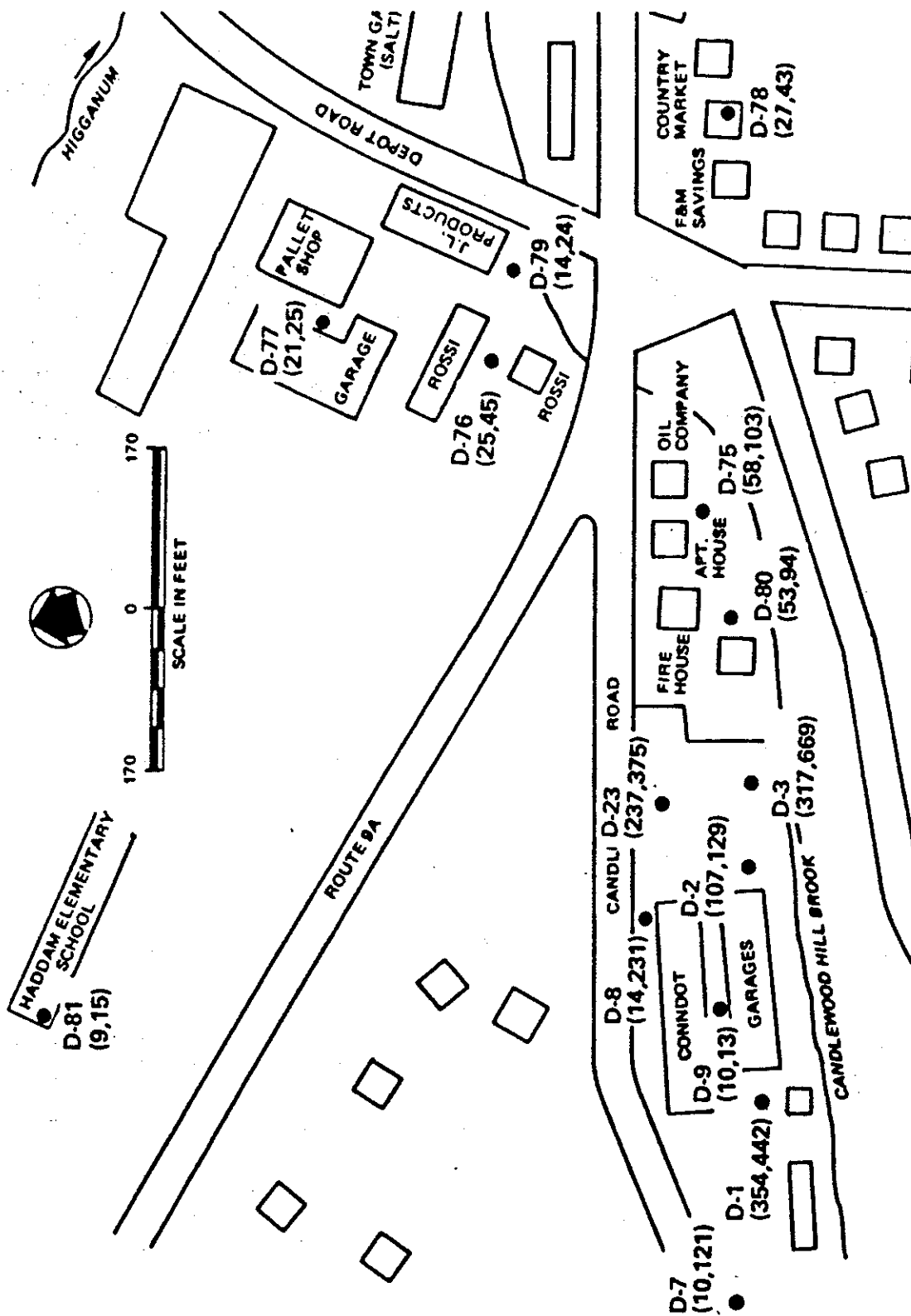


FIG. F-36-2 SODIUM AND CHLORIDE (Na, Cl) CONCENTRATION IN MG/L  
DETECTED DURING DETAILED TESTING

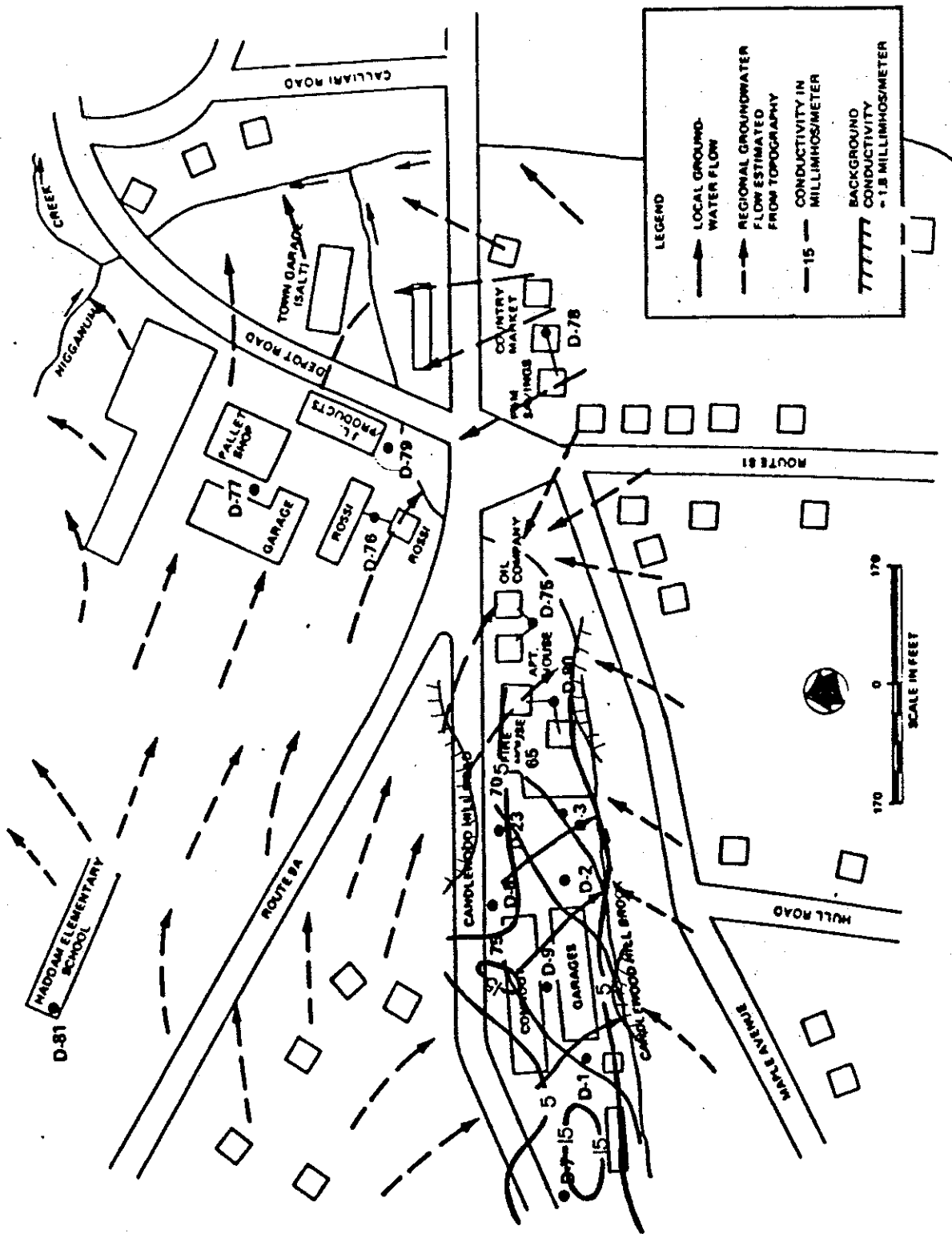


FIG. F-36-3 REGIONAL GROUNDWATER FLOW REGIME  
HADDAM (HIGGANUM) REPAIR FACILITY

Trichloroethylene (TCE) was detected in five off-site drinking water wells (D-75, 76, 77, 79, & 80). Trichloroethylene was not detected in any of the five on-site monitoring wells nor in two on-site drinking water supply wells although the depths of the on-site wells are shallow and may not be representative of the actual bedrock water quality. It could therefore be possible that the trichloroethylene found in the groundwater during detailed testing was not originating at the ConnDOT garage, although additional investigations would be required to confirm this fact. The TCE concentration detected in the five off-site drinking water wells were above the proposed federal MCL of 5 ug/l.

There are three private water supply wells down gradient from the Haddam site which produce sodium contaminated drinking water, most likely as a result of ConnDOT activities. These wells, one serving the fire house (Well No. 80) and the other serving Rossi Realty and an apartment (Well No. 75), are located east of the Haddam repair facility site. The third private well (No. 78) also located east of the facility, serves both the Farmers and Mechanics Savings bank and the Country Market.

The water table elevations obtained during the detailed testing suggested that the groundwater flows predominantly southeast into Candlewood Hill Brook. The EM survey conducted during the detailed testing indicated that the residual salt plume appears to extend beneath the Fire House and Rossi Realty. F&M Savings bank and the Country Market supply well may also be within the plume since the EM survey plume was not "closed off" in the direction of the well. Figure F-36-3 illustrates the location of the above wells in reference to the Haddam repair facility. Figure F-36-3 also shows terrain conductivity contours from the electromagnetic survey, described in Volume 2 of the Phase II detailed reports. Terrain conductivity partially reflects the concentration of ions such as sodium and chloride in groundwater, and can be used as an indicator of the approximate areal extent of salt contamination. Sodium and chloride concentrations in the three supply wells down gradient of the site were analyzed again in May 1991, to determine whether the salt contamination is still persistent in these wells. Table F-36-1 lists sodium and chloride water quality data collected during the 1986 detailed and the May 1991 testing.

**TABLE F-36-1. PRIVATE WELLS  
WATER QUALITY: SODIUM (Na) AND CHLORIDE (Cl)**

Private Well Nos.	Location	Sampling Date	Concentration (mg/l)	
			Sodium	Chloride
75	Rossi Realty (formerly oil company) & Apartment Supply Well	6/17/86	71	121
		9/03/86	45	84
		5/02/91	22	37
78	Country Market & F&M Savings	9/03/86	27	43
		5/07/91	36	66
80	Fire House	6/17/86	56	99
		9/03/86	50	88
		5/02/91	114	209

Sodium concentrations in two of the three wells tested have exceeded the established contaminant limits as shown in Table F-32-2. During May, 1991, concentrations of sodium in water collected from well Nos. 78 and 80 exceeded the ConnDOHS notification limit of 28 mg/L. Thus, there could be a health risk associated with consuming water from these wells.

#### **ALTERNATIVE IDENTIFICATION**

To address the private well contamination, several alternative solutions are available and would depend to a certain extent on the number of water supply wells requiring replacement. These alternatives range from treatment of the existing water supply to providing water from a new source including the potential of developing a community water supply system. Other alternatives, such as condemnation and purchase of the property, are available, however these are not as attractive from an institutional point of view. As the most efficient/cost effective solution to providing replacement water supplies will be greatly influenced by the number of replacement supplies required, a fact unable to be determined due to limited data, it is recommended that deep bedrock monitoring wells be installed on site and further investigation be conducted to determine the source of TCE contamination, and thus the limits of the Department's responsibility in this matter.

# DRAFT

FIELD INVESTIGATION REPORT  
FOR THE HIGGANUM SITE #25  
HIGGANUM, CONNECTICUT

Prepared by  
Fred C. Hart Associates, Inc.  
Albany, New York  
and  
Meriden, Connecticut

for

Connecticut Department of Transportation  
24 Wolcott Hill Road  
Wethersfield, Connecticut 01609

June 25, 1987



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## EXECUTIVE SUMMARY

A Phase II field investigation was conducted by Fred C. Hart Associates, Inc., (HART) on behalf of the Connecticut Department of Transportation (DOT) at the Higganum DOT garage site on Candlewood Hill Road. The field investigation was designed to assess the environmental impacts of past landfilling practices in the western portion of the site. Reported disposal activities included burial of four to five drums of pesticides and approximately 2,000 gallons of joint sealer. Field activities included extensive test pits excavation, drilling test borings, and installing five groundwater monitoring wells. A total of four soil samples, one from a test pit and three from test borings, were collected and analyzed. Groundwater samples collected from two upgradient and two downgradient monitor wells were also analyzed.

The results of all field investigation activities conducted at the Higganum site indicate that the four or five drums reportedly buried at the site are not present. Two empty rusted drums were encountered in the fill area at separate locations. Trace concentrations of pesticides were detected in the residue on one drum. Analytical results from one soil sample and one groundwater sample indicate the presence of several base/neutral and acid extractable (BNA) compounds. It appears that the tar-like substance buried in the fill area is the source of this contamination. As such, the presence of this large mass of tar in the landfill is adversely affecting environmental quality in the study area. A single finding of benzene in an upgradient groundwater monitor well is not believed to be attributable to past DOT waste disposal practices in the landfill.

Based on the results of the HART Phase II field investigation conducted at the Higganum site, it is recommended that the large mass of tar buried at

the site be removed and properly disposed of. Semi-annual groundwater monitoring at the site is also recommended to determine if groundwater quality improves subsequent to tar removal. Groundwater monitoring would be accomplished through the collection and analyses of samples from the existing HART-installed monitor wells.

## 1.0 INTRODUCTION

The Higganum site is one of 37 sites currently under investigation by Fred C. Hart Associates, Inc., (HART) as part of a state-wide program being conducted for the Connecticut Department of Transportation (DOT). This program was developed to evaluate potential environmental impacts associated with possible hazardous waste disposal at each of the 37 DOT facilities, and to determine the need for remedial measures at each site.

The focus of the HART investigation at the Higganum site was on a former disposal area located on the western one-third acre of the DOT property. Previous reports suggested that four to five drums containing pesticides and approximately 2,000 gallons of tar may have been disposed of in the landfill. The HART investigation was limited in scope to past disposal practices associated with the landfill. Any environmental impacts associated with current activities, including storage areas, floor drains, tanks, etc. have been addressed under a separate study.

Information obtained by HART during the early portions of Phase I activities, including reports of the burial of pesticides and road tar in the disposal area, resulted in categorizing this site as one of seven sites which was considered to represent a "high" risk of causing environmental degradation as a result of past hazardous waste disposal practices. A site-specific work plan entitled "Field Investigation Work Plan for the Higganum Site #25, Higganum, Connecticut" was submitted to the DOT in November 1985 to serve as a guide for Phase II activities. A supplement to the work plan was submitted in June 1986.

The remainder of this report describes the procedures, results, findings, and an evaluation of the significances of the hazardous substance inventory and the groundwater investigation conducted during Phase II field activities.

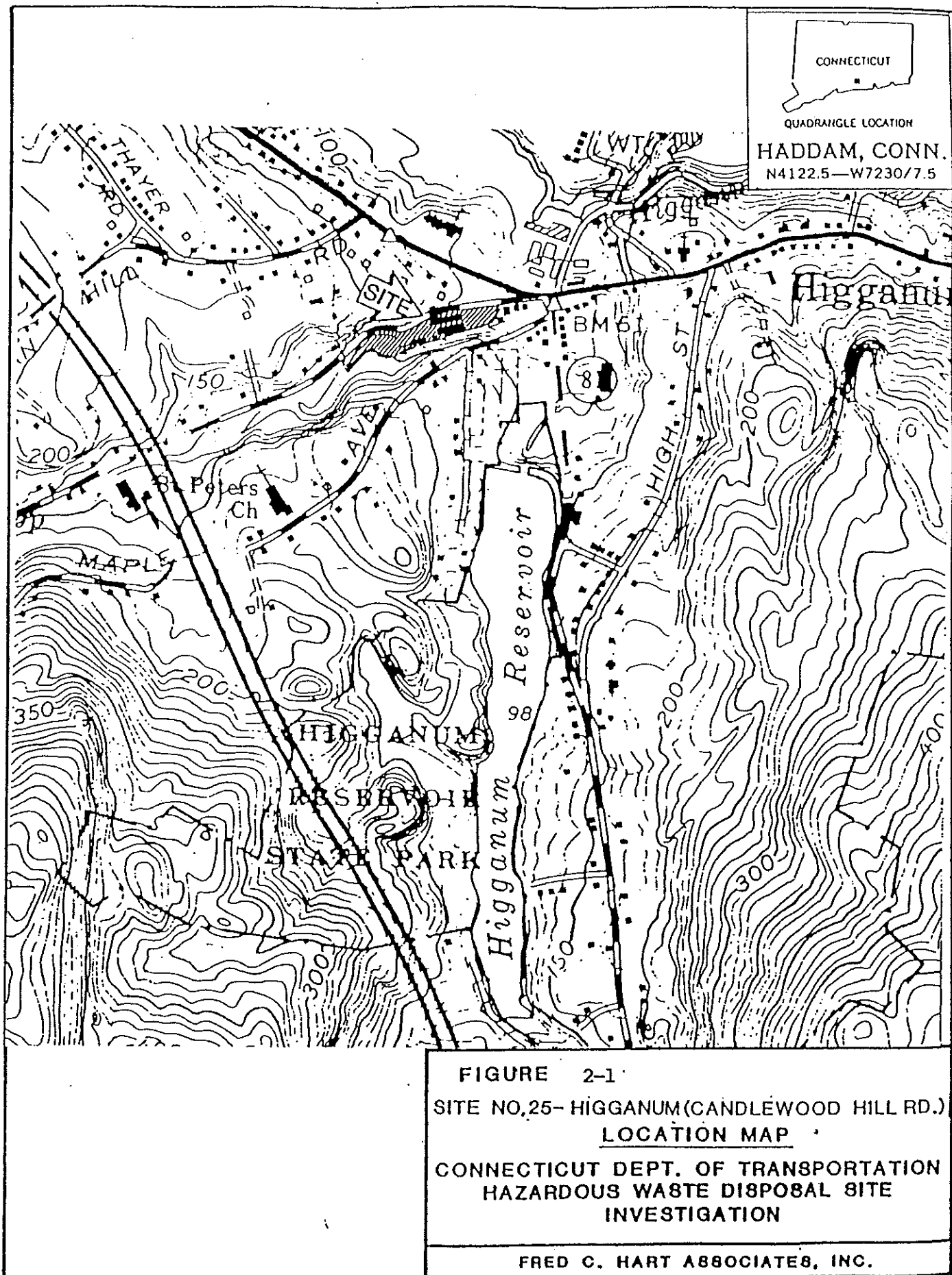
## 2.0 BACKGROUND

The Higganum site is located west of the intersection of Routes 81 and 9A in Haddam County, Connecticut (Figure 2-1). This site is bounded by Candlewood Hill Road to the north and Candlewood Hill Brook to the south. Candlewood Hill Brook flows east, discharging into Ponset Brook approximately 1,000 feet downstream of the site. Ponset Brook is an outlet of Higganum Reservoir and eventually discharges into the Connecticut River.

A level disposal area consisting of 10 to 15 feet of artificial fill material occupies approximately one-third acre at the western extent of the site. This portion of the site is approximately 100 feet above mean sea level. The facility's water supply well, reported to be about 200 feet deep, is located in the western-most corner of the site. Connecticut Department of Transportation maintenance garages and storage areas are east and downhill of the fill area (Figure 2-2).

Background information indicates that four to five drums of 2,4-D and 2,4,5-TP were buried within the disposal area in 1975. It is estimated that 2,000 gallons of joint sealer were also buried at this location. A tar-like substance oozing from the disposal area was sampled by the Connecticut Department of Environmental Protection in June 1983. Analysis of this sample reportedly indicated elevated concentrations of benzene, ethylbenzene, toluene, and xylene.

In May 1985, HART conducted a metal detection survey which correlated high metallic readings with areas of alleged drum burial. HART obtained a water sample from Candlewood Hill Brook at a location downgradient of the disposal area in June 1985. This sample was analyzed for volatiles, hydrocarbon screening, and pesticide/herbicide screening; no contaminants were detected.





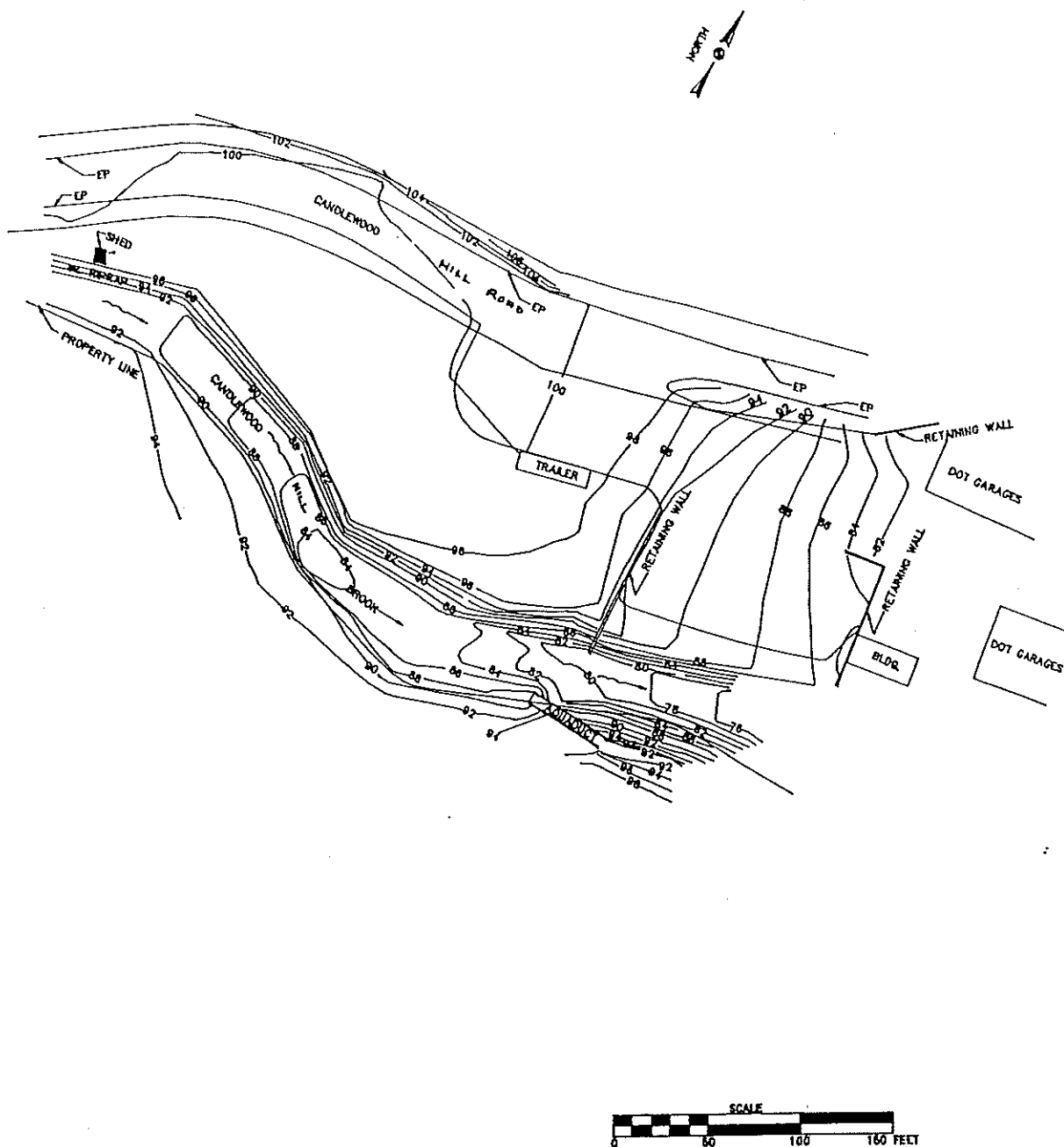


FIGURE 2-2

SITE NO. 25 HIGGANUM

SITE MAP

CONNECTICUT DEPT. OF TRANSPORTATION  
HAZARDOUS WASTE DISPOSAL SITE  
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

### 3.0 FIELD INVESTIGATION

#### 3.1 Hazardous Substance Inventory

##### 3.1.1 Purpose/Approach

Based on reports of joint sealer and drum burial and the results of the metal detection survey, a hazardous substance inventory (HSI) consisting of test pit excavation was designed by HART to accomplish the following goals:

- 1) visual examination and, if necessary, sampling of subsurface materials;
- 2) determination of the location, number, condition, and contents of any buried drums;
- 3) accurate characterization of drums contents;
- 4) determination of the location, nature, and quantity of the tar-like material; and
- 5) determination of the extent of soil contamination.

The HSI would also allow for the excavation, overpacking, staging, and subsequent disposal of any on-site drums and, if possible, the tar-like substance.

##### 3.1.2 Procedure

HART initiated the HSI at the Higganum site on February 6, 1986. New England Pollution Control Company, Inc. (NEPCCO) of Norwalk, Connecticut provided equipment and personnel for test pit excavation, drum removal, and overpacking. All field activities were supervised by on-site HART personnel.

A total of four test pits were excavated at anticipated drum burial locations as indicated by background information, metal detection surveys and DOT employee interviews. Test pit TP-25-2 was located approximately 130 feet east of the pump house at a location of metallic anomaly. Test pits TP-25-1 and TP-25-3 were adjacent to each other at an area of reported drum burial near the eastern edge of the disposal area. Excavation of these three test pits took place of February 6 and February 7, 1986. Test pit TP-25-1A,

excavated on March 27, 1986 was adjacent to TP-25-3 and is bordered by a debris pile, a paved area, and a storage area.

A fifth test pit (TP-25-4) was excavated on June 25, 1986 in the southeastern portion of the disposal area. This location was selected due to the presence of a tar-like substance at the surface. The excavation at this location took place on June 25, 1986 in an attempt to determine the horizontal and vertical extent of the "tar" lens. Test pit locations are shown on Figure 3-1.

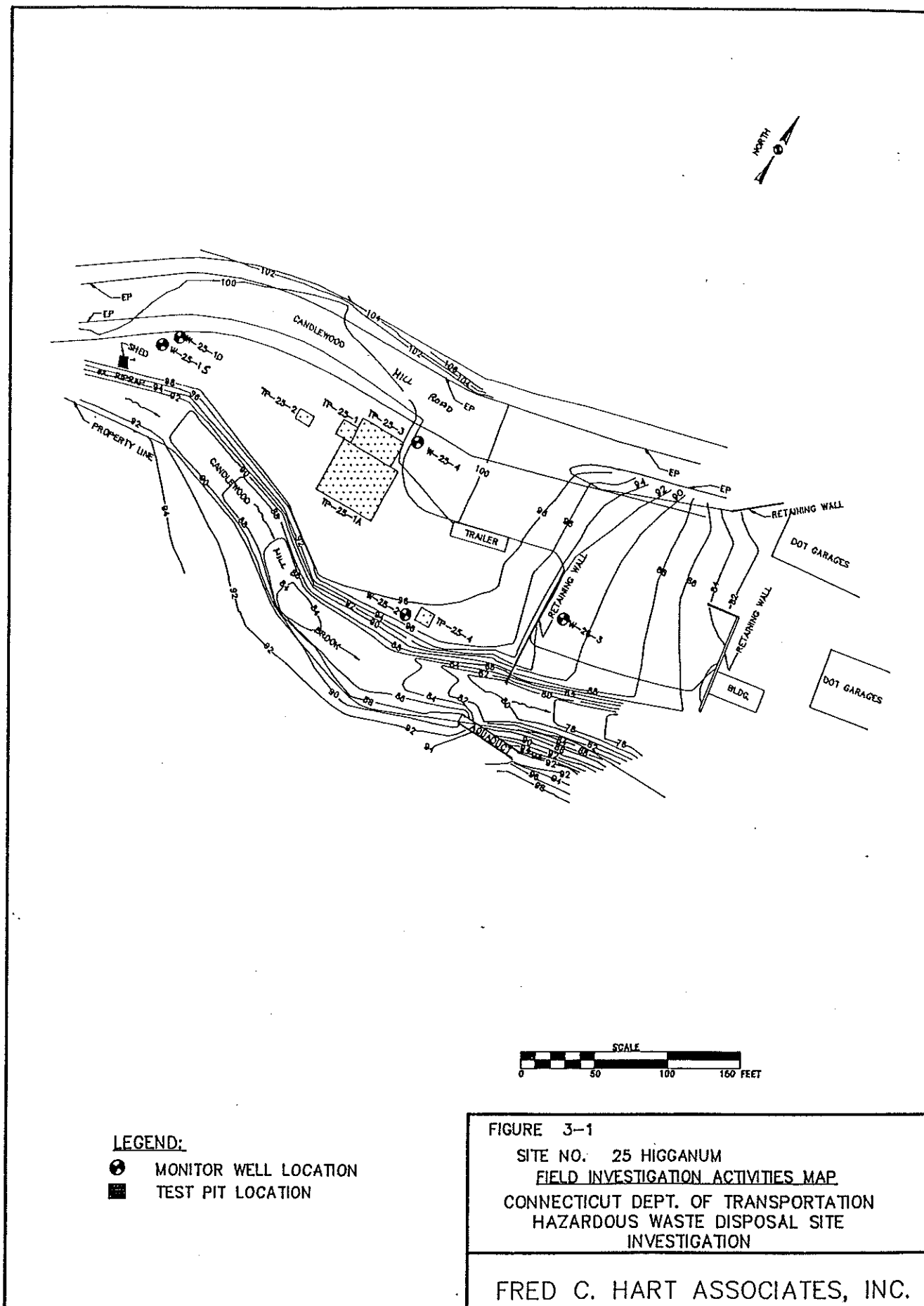
HART's on-site geologist prepared geologic logs of all test pits. These logs include information as follows:

1. location, extent, and depth of excavation;
2. characteristics of geologic materials encountered;
3. depth at which changes in geologic materials occurred; and
4. detailed descriptions of any foreign materials (drums, tar, scrap metal, etc.) which were encountered.

Excavation continued at each location until either the causes of the metallic anomalies were determined or HART's on-site geologist determined that natural, undisturbed material was encountered.

Upon encountering drums, the location, condition and contents of the drums were described in detail by HART personnel. Any drum contents samples or samples of underlying soils were obtained by HART personnel using a clean, stainless-steel trowel. Samples were placed in laboratory-supplied jars and stored on ice for transport to York Wastewater Consultants, Inc. (YWC) of North Haven, Ct. The drums were then removed, overpacked in 85-gallon salvage drums, and secured in a polyethylene-lined, bermed staging area.

Each test pit was backfilled upon completion of excavation, sampling, and logging; no excavation was left open overnight. The excavation limits were then marked with wooden stakes and locations were plotted with respect to



<sup>1</sup> Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

Feet  
Below Grade

0

2

4

6

8

10

12

14

16

Sandy Fill

Sand, little  
gravel

12" PVC  
1" steel casing  
7 7/8" borehole

Protective steel casing  
with backing cap

cement cap  
ground surface

bentonite-cement slurry

2" diameter, threaded,  
flush joint, schedule  
40 PVC riser pipe

bentonite pellet seal

12.87' top of PVC  
9/11/86

crushed silica sand  
pack

2" diameter, manufactured  
10 slot (0.010")  
schedule 40 PVC  
well screen  
well plug



FRED C. HART ASSOCIATES, INC.

Page 1 of 2

## TEST BORING LOG

BORING NO.

W-25-1D

PROJECT NO./NAME

CONDOT/MOOLC

LOCATION

HIGGANUM

DRILLING CONTRACTOR/DRILLER

GENERAL BORING/JOE DAVIER

HART GEOLOGIST/OFFICE

ELIZABETH BARRETT/MERIDEN

DRILLING EQUIPMENT/METHOD

HSA-8" carbide fingers/3" and 6" casing - drushoe 4" - diamond

SIZE/TYPE OF BIT

SAMPLING METHOD

2.0' SS, NX core

START/FINISH DATE

7/28-8/4/86

WELL INSTALLED?

CASING MAT./DIA.

SCREEN:

YES ☒ NO ☐

2" PVC

TYPE MMWF

MAT. PVC

LENGTH 35'

DIA. 2"

SLOT SIZE 10

ELEVATION OF (FT. ABOVE M.B.L.)

GROUND SURFACE

TOP OF WELL CASING

TOP &amp; BOTTOM SCREEN

GW SURFACE

DATE

99.9

102.28

31.9 - 33.8 by

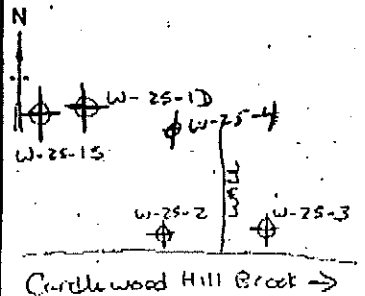
10.1' by

7/28/86

REMARKS:

4 1/2" x 7 5/8" HSA (0-10') / NX core (10.8-13.6') / 3" casing (0-34') / 6" casing (0-10.7') / 4" casing (10.7-13.6')

BORING/WELL LOCATION SKETCH MAP



## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
SS#1 1.5'	7-12-21-27			SAND; f-c; and silt; little fine gravel; little pebbles; asphalt chips in upper 2.0'; dark brown-red; dry; fill	FILL		
SS#2 1.3'	2-2-7-15			SAND; f-c; little fine lenses of silt, sand, and clay; little gravel and cobbles; asphalt layer from 6.0-7.0'; brown; dry; fill	FILL		
SS#3 1.1'	13-20-23-1045"			upper 0.3' - SAND; f-c; few cobbles; dark brown; possibly fill; wet lower 0.8' - SAND; m-c; cobbles; trace clay; org. brown; few angular fragments of pegmatite; wet	POSSIBLE FILL WEATHERED BOULDER		
NX 1.2'	3.75min 3.0min 2.75min	40%		upper 0.9' - coarse grained gneiss and plagioclase; composed of quartz; mica; and K-feldspar lower 0.3' - fine grained amphibolite and gneiss; banded	BOULDER		
SS#4 0.6'	13-15-16-18			Upper 0.3' - SAND; coarse with some cobbles and gravels; orange-brown; wet; possibly cuttings Lower 0.3' - SAND; m-f; micaceous; rd-black gray; wet	NATURAL MATERIAL		

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

## FRED C. HART ASSOCIATES, INC.

BORING NO.

W-25-1D

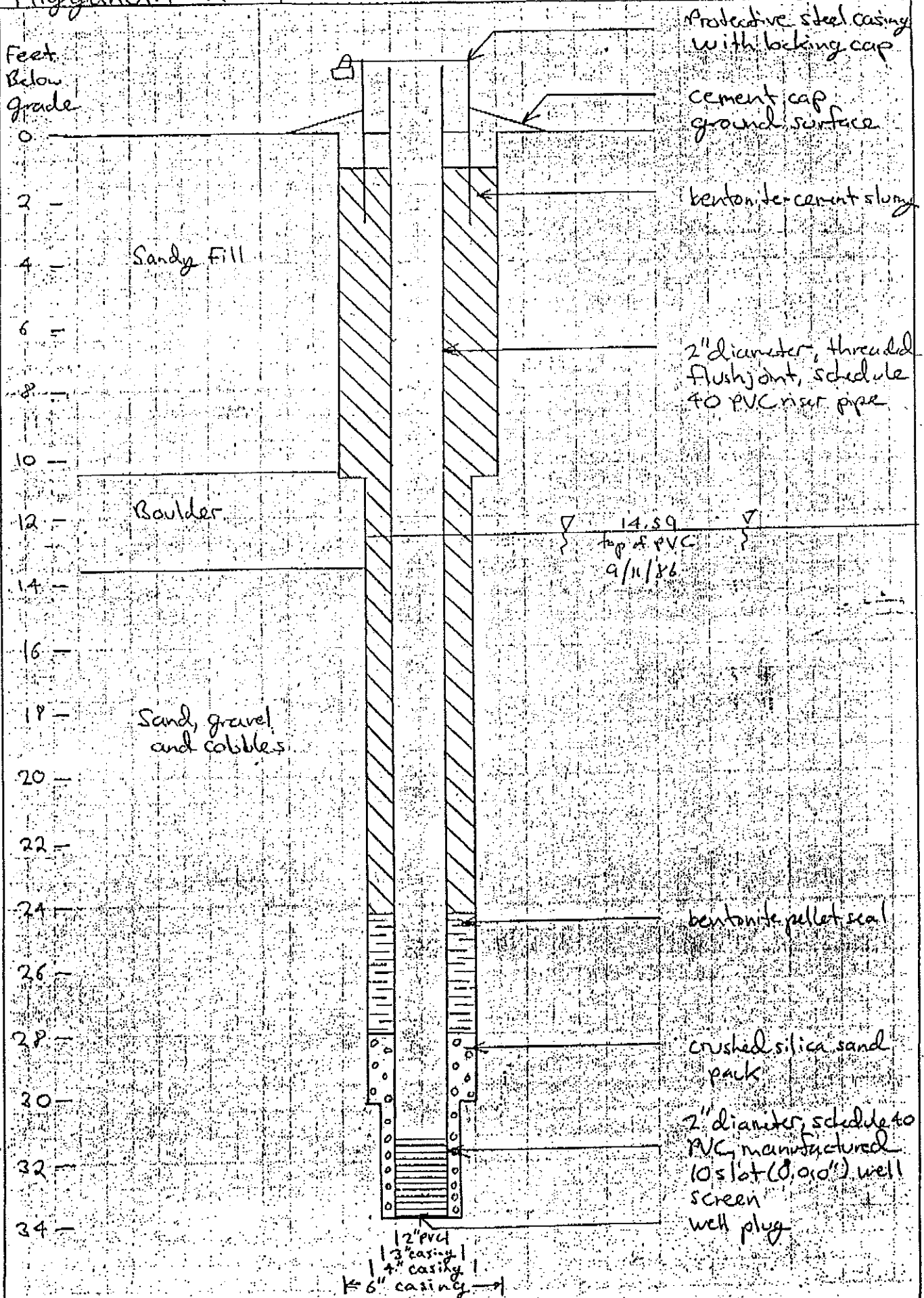
## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESIST- ANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
20	SS#5	1.18'	18-23- 27-29	Upper 0.2' - SAND; coarse; few gravels and cobbles; some clay; brown; plastic; wet Middle 0.33' - SAND; M-f; brown; wet Lower 0.41' - SAND; M-f; few cobbles and gravels; wet			
27							
25	SS#6	1.2'	55-70- 65-90	Upper 0.6' - SAND; M-c; few cobbles + gravels; little clay; red- brown; wet Middle 0.3' - SAND; coarse; mottled white/rust/brown; wet; probably disintegrated cobble Lower 0.3' - SAND; fine; some clay; brown-red; plastic; wet			
30	SS#7	1.3'	55-65- 70-65	Upper 0.18' - SAND; med; trace gravel; wet; brown Middle 0.12' - SAND; med; black; wet Middle 0.15' - SAND; med; brown; wet Lower 0.95' - SAND; coarse; few pebbles + gravels; brown-red; wet			
32	SS#8	0.55'	100/4"	Upper 0.25' - SAND; very coarse; little pebbles and gravels; brown; wet Lower 0.3' - SAND; very coarse; little pebbles and gravels; some clay; brown; wet	WEATHERED BEDROCK (refusal at 33.8')		



Higganum 25

W-25-1D (W-25-1)





## FRED C. HART ASSOCIATES, INC.

Page 1 of 2

## TEST BORING LOG

BORING NO.

W-25-2

PROJECT NO./NAME

Conn. Det.

LOCATION

Higganum

DRILLING CONTRACTOR/DRILLER

General Borings of Connecticut / Joe Denner

HART GEOLOGIST/OFFICE

Elizabeth, E. Barrett

DRILLING EQUIPMENT/METHOD

MOBILE BSS / HOLLAND STEEL ALYER

SIZE/TYPE OF BIT

HSA-8" carbide fingers

SAMPLING METHOD

SPLIT SPOON

START/FINISH DATE

7-31-86

WELL INSTALLED?

CASING MAT./DIA.

SCREEN:

TYPE MACHINE

SLOTTED MAT.

LENGTH

DIA. 5.0'

SLOT SIZE 10

ELEVATION OF:

GROUND SURFACE

TOP OF WELL CASING

TOP &amp; BOTTOM SCREEN

GW SURFACE

DATE

FT. ABOVE M.S.L.)

98.0

100.33

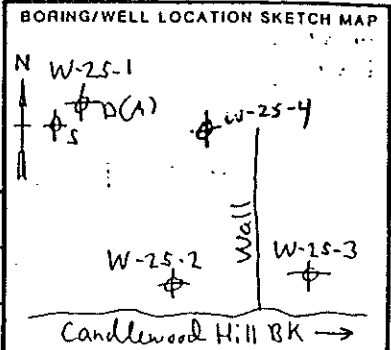
13.5-18.5 by

11.4 by

7-31-86

REMARKS:

4 1/8 x 7 5/8 HSA to 15' / 6" casing to 15' / 4" casing to 19'



## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
0	SS#1	1.0	5 10 10 9	Sand, m-f, little cobbles and gravels, trace clay, asphalt chips in lowermost 1.0 inch; mottled red to brown; dry in upper 8.0' below lower 4.0'	Fill		
5	SS#2	1.5	6 12 11 8	Upper 6.0" - Sand, coarse, little pebbles and cobbles; trace asphalt chips; brown; friable; dry Lower 12.0" - Blacktop, chips and powder; black; dry	Fill		
10	SS#3	1.7	6 3 4 5	Upper 12.0" - Sand, m-f, black-brown; wet; possibly stained from overlying blacktop Lower 8.4" - Sand, fine, some clay; black-brown; wet; possibly stained from overlying blacktop	Fill		
15	SS#4	2.1	3 3 4 3	Upper 18.0" - Sand, coarse, little cobbles and gravels, trace asphalt chips; black; wet Middle 3.6" - Sand, fine, with silt and clay stringers; trace asphalt chips; laminated brown and black Lower 3.6" - Sand, medium, trace silt and clay; brown; wet	Fill 14.5 PVC 9/11/86		
20							

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Implying Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core



# FRED C. HART ASSOCIATES, INC.

BORING NO.

W-25-2

## LOG OF TEST BORING

DEPTH (FT)

SAMPLE NO. AND TYPE

RECOVERY (FT)

PENETRATION RESIST-  
ANCE BLOWS/FT

DESCRIPTION

REMARKS

WELL CONST.

GRAPHIC  
LITHO LOG

14

SS#5 1.6

31  
34  
29  
32

Upper 7.2" - Sand, M-C, trace clay; brown, wet  
Lower 12.0" - Cobble, medium, some coarse sand;  
mottled brown, orange, pink, green; disintegrated  
bedrock; wet

FILL

16

SS#6 2.0

29  
18  
19  
24

Upper 13.2" - Sand, coarse, little pebbles and  
gravels; dark brown; wet  
Lower 10.8" - Cobble, some fine sand, trace clay;  
brown to red; disintegrated bedrock zone; wet

NATURAL MATERIAL  
(AT ~ 13 FT)

18

Feet  
Below Grade

0

2

4

6

8

10

12

14

16

18

20

Sand, gravel  
and cobble  
fill

Blacktop

Sand fill

Sand, gravel  
and weathered  
cobble

Protective steel casing  
with locking cap

cement caps  
ground surface

bentonite-cement  
slurry

2" diameter, threaded,  
Flush joint, schedule  
40 PVC riser pipe

bentonite-pellet seal

crushed silica sand  
pack

2" diameter,  
manufactured 10 slot  
(0.010") schedule  
40 PVC well screen

well plug

14.50 top of PVC  
9/11/86

2" PVC  
4" casing  
6" casing



## FRED C. HART ASSOCIATES, INC.

## ROCK CORE LOG

BORING NO.

W-25-3

PROJECT NO./NAME

CONN DOT

LOCATION

HIGGANUM

HART GEOLOGIST/OFFICE

ELIZABETH BARRETT

START/FINISH DATE

7-30-86

DRILLING CONTRACTOR

GENERAL PERINGS

DRILLING EQUIPMENT

MOBIL B53

DRILLER

JOE DUNER

CORE BIT SIZE

NX 2 3/8 OD 2 1/4 ID

WATER SOURCE

DOT SUPPLY WELL

WELL INSTALLED?

YES ☒NO ☐

T.D.-BOREHOLE

19.8'

NO. OF CORE RUNS

2

THICKNESS AND TYPE OF OVERBURDEN

10' Fill - medium sand

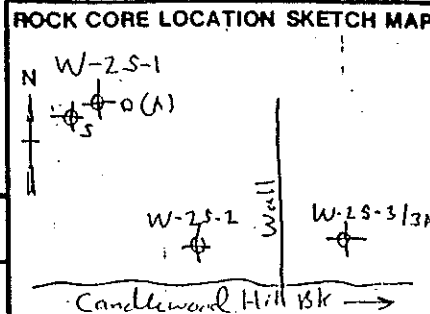
GROUNDWATER OBSERVATION

At \_\_\_ Ft. \_\_\_ Date \_\_\_ Time

At \_\_\_ Ft. \_\_\_ Date \_\_\_ Time

At \_\_\_ Ft. \_\_\_ Date \_\_\_ Time

REMARKS:



DEPTH	RUN NO.	CORE TIME	RECOVERY	% RECOVERY	ROD	ROCK CORE DESCRIPTION	CRACKS				REMARKS
							ANGLE	COND.	SPACING	GRAPHIC LOG.	
10		7 min				Upper 6.0" - PEGMATITE, coarse-grained composed of K-feldspar, plagioclase, quartz, muscovite and garnets; white to pink to gray Middle 7.8" - Calc-silicate, composed of pyroxene, quartz, pyrite; dark green Lower 3.6" - PEGMATITE, same as upper interval in this run	0	W	1"		W - weathered Low recovery due to rapid drop in drilling at 11.5 ft. weathered bedrock probably pulverized during drilling and lost; bedrock
12	1	1.5 min	1.3'	26%	45%		45%	W	4"		
14		7.6 min									
		1.75 min					0%	W	1"		
		2.6 min				PEGMATITE, same as in Run #1					Most of core barrel fell into hole; driller drilled to 19.8, but measured 17.4 in hole so 2.4 in the barrel bedrock
16	1	1.5 min									
	2	1.5 min	0.2'	4%	0						
18		1.5 min									
		1.5 min				eob 19.75 ft ↑					
20		1.6 min									



## FRED C. HART ASSOCIATES, INC.

Page 1 of 2

## TEST BORING LOG

BORING NO.  
W-25-3

PROJECT NO./NAME

CONDOT P6001 03

DRILLING CONTRACTOR/DRILLER

General Boring of CT / Joe Doner

HART GEOLOGIST/OFFICE

Elizabeth Barrett / Meriden

DRILLING EQUIPMENT/METHOD

4" x 7 1/2" HSA / 4" casing - carbide bit

SIZE/TYPE OF BIT

HSA - 8" carbide fingers

SAMPLING METHOD

2' Split Spoon

START/FINISH DATE

7/30-7/30/86

WELL INSTALLED?

YES ☒ NO ☐

CASING MAT./DIA.

2" PVC

SCREEN:

TYPE Manufact MAT. PVC

LENGTH 5.0 DIA. 2"

SLOT SIZE 10

ELEVATION OF:

(FT. ABOVE M.S.L.)

GROUND SURFACE

90.6

TOP OF WELL CASING

93.0

TOP &amp; BOTTOM SCREEN

79.6 - 74.6

GW SURFACE

80.5

DATE

7/30/86

REMARKS:

HSA 0'-P' / 4" casing 0'-10' / NX core 10'-19.8'

BORING/WELL LOCATION SKETCH MAP

N W-25-1

+ 0(1)

+ 5

W-25-2

+ 5

Well

W-25-3/31

+ 5

Candlewood Hill Rd →

## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
5				Sandy fill			
				Asphalt - Black	grinding, block cuttings		
10	SS/0.4	92/12 7/5		SAND M-C and CORBBLES, little gravel disintegrated boulder, dry	grinding		
15				BEDROCK - pegmatite	12.44 PVC 9/1/86		

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

# FRED C. HART ASSOCIATES, INC.

## TEST BORING LOG

BORING NO.

W-25-3A

PROJECT NO./NAME

CONDOT 86001 03

LOCATION

Higganum

DRILLING CONTRACTOR/DRILLER

General Borings of CT / Joe Omer

HART GEOLOGIST/OFFICE

Elizabeth Barrett / Meriden

DRILLING EQUIPMENT/METHOD

BS3 4 1/2 x 7 1/2 HSA

SIZE/TYPE OF BIT

8" carbide fingers

SAMPLING METHOD

2 split spoon

START/FINISH DATE

7/30-7/30/88

WELL INSTALLED?

YES ☐ NO ☒

CASING MAT./DIA.

SCREEN:

TYPE

MAT.

LENGTH

DIA.

SLOT SIZE

ELEVATION OF:

GROUND SURFACE

TOP OF WELL CASING

TOP & BOTTOM SCREEN

GW SURFACE

DATE

REMARKS:

Hole abandoned - 6.5 ft west of W-25-3

BORING/WELL LOCATION SKETCH MAP

N

W-25-1  
A(A)

W-25-2

Wall

W-25-3

Candlewood Hill Bk →

## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
SS1 1.0	9/14 10/7			SAND m-c, little pebble and gravel, trace cobbles; friable; brown; dry	FILL		
SS2 0.75	74/32 26/28			Upper 0.3 - SAND m-c, trace cobbles and gravel brown, wet Lower 0.45 SAND m-c and cobble; probably weathered boulder; lt gray to pink; dry	FILL BOULDER		
SS3 0.25	18/100-6"			Upper 0.15 SAND m-c, little asphalt chips, trace gravel, brown, dry Lower 0.1 SAND m-c, little gravel, shattered boulder, lt gray to dk green, dry	BOULDER		

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

Feet  
Below grade

0

2 -

Sand, gravel  
and cobble  
fill

4 -

6 -

8 -

10 -

Boulders, cobbles +  
gravel, little  
sand

12 -

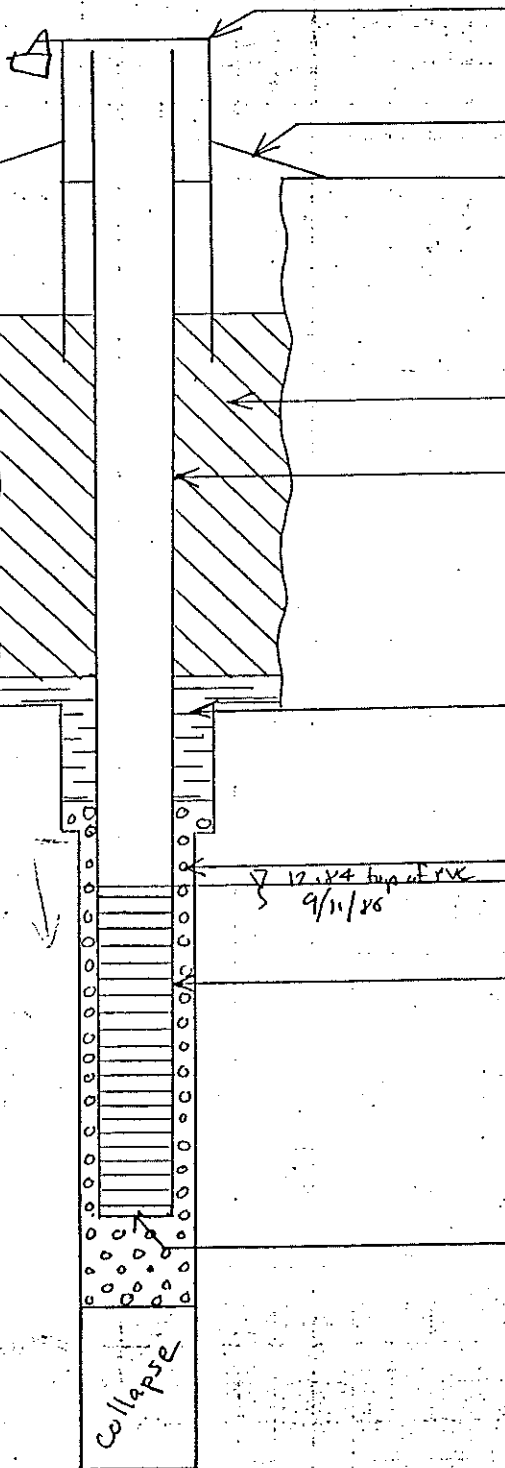
14 -

Bedrock

16 -

18 -

20 -



Protective steel casing  
with locking cap.

cement cap  
ground surface

bentonite-cement slurry

2" diameter, threaded,  
flush joint, schedule  
40 PVC riser pipe

bentonite pellet seal

crushed silica sand pack

2" diameter, manufact-  
ured, schedule 40, 10  
slot (0.010") PVC  
well screen.

well plug

collapse

12" PVC

1 3/4" NX core

1 4" casing

7 5/8" borehole





## FRED C. HART ASSOCIATES, INC.

Page 1 of 2

## TEST BORING LOG

BORING NO.  
W-25-4

PROJECT NO./NAME

CONNDOT/0500100 8600105 HIGGANUM, CT

DRILLING CONTRACTOR/DRILLER

GENERAL BORING/JOE DUNER

HART GEOLOGIST/OFFICE

JIM BLASTING, ED KOCHER ALBANY

DRILLING EQUIPMENT/METHOD

MOBIL 853

SIZE/TYPE OF BIT

4 1/4 I.D. AUGER (0.75" DIA.)

SAMPLING METHOD

SPLIT SPOON

START/FINISH DATE

4/3/87-4/3/87

WELL INSTALLED?

YES ☒ NO ☐

CASING MAT./DIA.

PVC

SCREEN:

TYPE PVC

MAT. SCH 40

LENGTH 10

DIA. 2"

SLOT SIZE 10

ELEVATION OF:

GROUND SURFACE

TOP OF WELL CASING

TOP &amp; BOTTOM SCREEN

GW SURFACE

DATE

(FT. ABOVE M.S.L.)

100.23

100.23

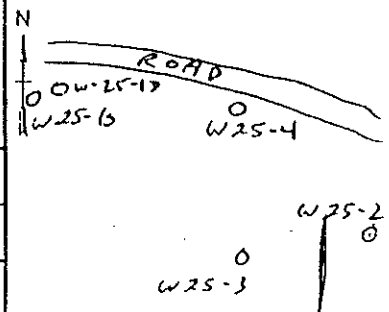
12.2'-22.4' by

90.47 (msl) on

4-7-87

REMARKS:

BORING/WELL LOCATION SKETCH MAP



## LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/0.5'	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
1	S-1	1.20	10/12	SAND - MED GRN, MED BRWN, LITTLE SILT AND CLAY, LITTLE GRANITIC PEBBLES AND ANGULAR ROCK FRAG, TRACE ASPHALT CHIPS	DRY FILL		
3			8/12		ROCK FRAG - ARTIFACT FROM SPLIT SPOON		
5	S-2	0.92	3/7	SAND - M - CSE GRN, MED BROWN, LITTLE SILT AND CLAY, TRACE PEBBLES AND GRANITIC ROCK FRAGMENT, TRACE ASPHALT	MOIST FILL		
7			10/7		BRICK (RED CLAY) FRAGMENT		
10	S-3	1.25	4/4	SAND - CSE - V. CSE GRN, MED - LT BRWN, IRON OXIDE STAINING, SOME PEBBLES, TRACE BLACK SLAB MATERIAL	WATER LEVEL 9.65		
12			5/5		SATURATED FILL		
15	S-4	1.64	28/21	UPPER 0.32' SAND - V. CSE GRN, BRWN - GRAY, QZ.	DRILLING ABUNDANT GRAVEL AND COBBLES		
17			40/31	LOWER 1.32' SAND - M - CSE GRN, BRWN - GRAY, LITTLE GRANITIC ROCK FRAG AND SUBRO-RD PEBBLES.	SATURATED NATURAL MATERIAL		
					REFUSAL @ 19.7'		

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core



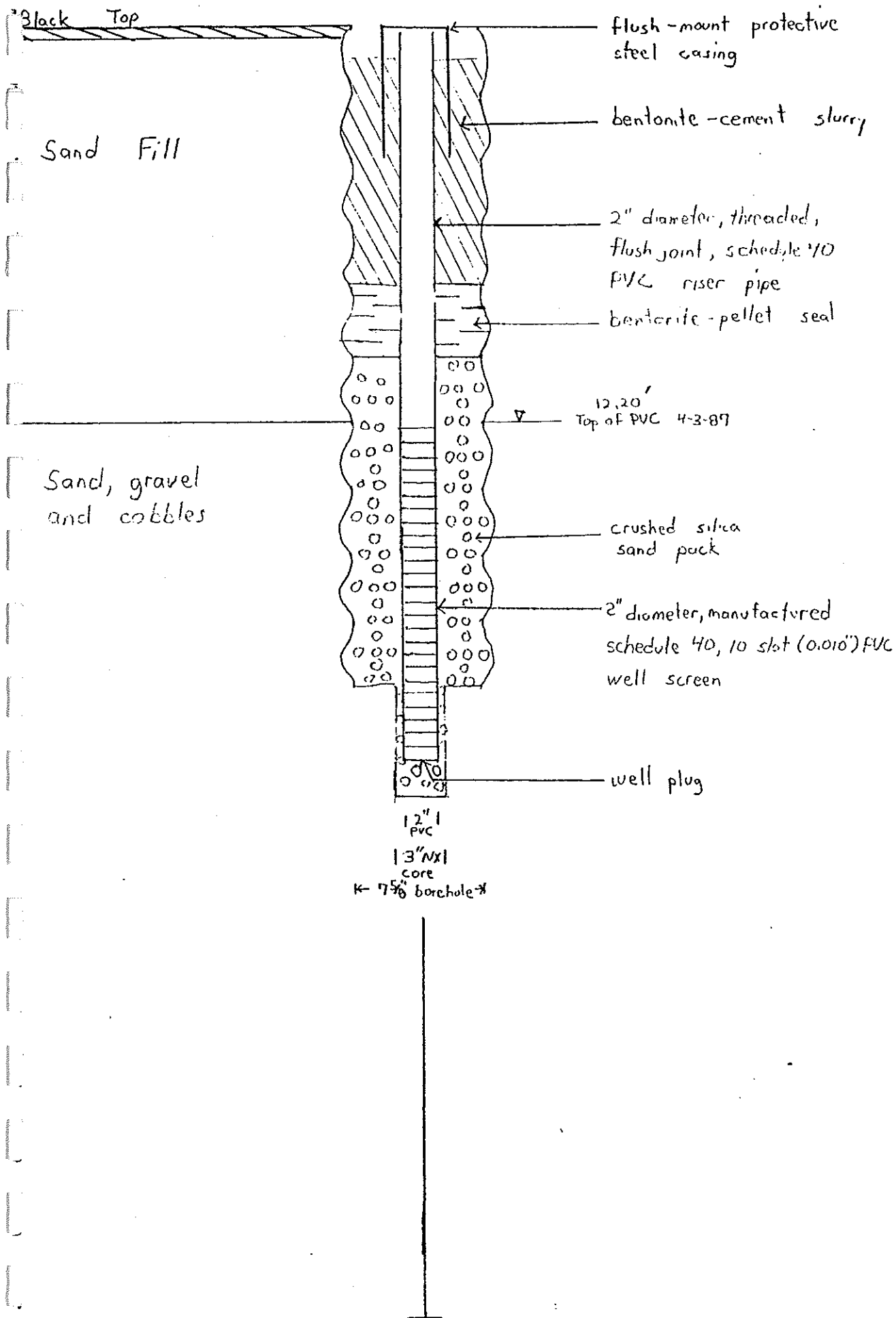
## FRED C. HART ASSOCIATES, INC.

BORING NO.

W-25-4

## LOG OF TEST BORING

DEPTH (FT) SAMPLE NO. AND TYPE RECOVERY (FT) PENETRATION RESIST- ANCE BLOWS/FT				DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
25					Core #1 20.8-24.21' cut 3.4' REC 0.15' GRAVITE  @ 22.3' BROKE OUT OF HARD LAYER CUTTINGS CHANGE FROM FRESH ROCK TO SEDIMENT DRILLED & CORED 2.6' BOULDER  29.5' DRILL FLUID CHANGE TO DK BRN BIT SAMPLE - CLAY MD, BRN, STICKY SS-S DRIVE SPLIT SPRINT THRU 4' FALLIN SS-6 DRIVE THRU 3' FALLIN. REFUSAL @ 33.33' CHANGE TO ROLLER BIT  40.4 BIT PENETRA- TION SUGGEST HARD LAYER 40.7 TD CLEAN QTZ+MICA FROM HARD LAYER		
30	S-5	2'	18/22 31/40	UPPER 0.8' SAND + GRAVEL FALLIN LOWER 1.2' TILL - CLAY BRWN, GUMMY, STICKY, TRACE SILT, LITTLE GRAVEL, RD-SUBRD			
32	S-6	2'	57/83 100	FALLIN - SAND, BRWN, LSE GRAVEL, HOMOGENOUS			
34							
35							
40							



TEST PIT  
VISUAL CLASSIFICATION

PROJECT NUMBER: A045f	PROJECT NAME: ConnDot Phase 1A	
TEST PIT NUMBER TP-25-1	COORDINATES:	DATE: 2-6-86
ELEVATION: 100'	GWL: Depth      Date/Time	DATE STARTED: 2-6-86
ENGINEER/GEOLOGIST: Jim Blasting		DATE COMPLETED: 2-6-86
EXCAVATION EQUIPMENT Backhoe (NEPPCO)		PAGE 1 OF 1

DEPTH ( ) IN.	SAMPLE TYPE & NO.	% COARSE* FRAGMENTS	MOISTURE	DESCRIPTION	USDA SYMBOL	STRUCTURE	REMARKS
0-72	-	15%	Moist	<p>Fine to medium quartzitic sand with small, subangular pebbles. Common long (10-20") with some very large (2-3') fragments of asphalt and some other fill material. Entire area is artificial fill.</p> <p>Total depth = 6' Pit - 7' wide X 10' long - no indication of drums.</p>			Metal detection in pit showed no readings over background.

## NOTES:

\*Coarse fragments are those defined as greater than (2.0 mm) 0.078 inches particle diameter.

TEST PIT  
VISUAL CLASSIFICATION

PROJECT NUMBER: M001c	PROJECT NAME: ConnDot	Higganum Site
TEST PIT NUMBER TP-25-1A	COORDINATES:	DATE: 3-27-86
ELEVATION: 100'	GWL: Depth	Date/Time
ENGINEER/GEOLOGIST: Jim Blasting		DATE COMPLETED: 3-27-86
EXCAVATION EQUIPMENT Backhoe		PAGE 1 OF 2

DEPTH ( ) FT.	SAMPLE TYPE & NO.	% COARSE* FRAGMENTS	MOISTURE	DESCRIPTION	USDA SYMBOL	STRUCTURE	REMARKS
0-10		Varies Dry Laterally		<p>Test pit excavation began 8:00 AM 3-27-86 at edge of blacktop driveway adjacent to test pit excavated on 2-7-86 (see map).</p> <p>Test pit excavated to a depth of 9-10 feet over it's entire areal extent.</p> <p>Entire excavation was in fill material consisting of brown to reddish brown coarse sand with common dark bands. Moderate amounts of coarse fragments are present throughout, consisting of well rounded gravel to cobbles. Rounded boulders (2-3 feet in diameter) are present in moderate amounts.</p> <p>Other fill materials encountered include wood beams, logs, pieces of asphalt (some large), rare pipe and scrap metal, road sweepings.</p> <p>Fill material varies throughout pit as follows:</p>	-	None	<p>Boulders are rare in Western extent of pit.</p> <p>Amount of scrap metal encountered is minimal.</p>

## NOTES:

\*Coarse fragments are those defined as greater than (2.0 mm) 0.078 inches particle diameter.

\*\*In general, this area consists of clean, uniform fill.

\*\*\*Base of fill, as indicated by black, fine clay, encountered at 10 feet in eastern half of test pit.

TEST PIT  
VISUAL CLASSIFICATION

PROJECT NUMBER: M001c	PROJECT NAME: ConnDot - Higganum Site		
TEST PIT NUMBER TP-25-1A	COORDINATES:	DATE: 3-27-86	
ELEVATION: 100'	GWL: Depth	Date/Time	DATE STARTED: 3-27-86
ENGINEER/GEOLOGIST: Jim Blasting			DATE COMPLETED: 3-27-86
EXCAVATION EQUIPMENT Backhoe			PAGE 2 OF 2

DEPTH ( )	SAMPLE TYPE & NO.	% COARSE* FRAGMENTS	MOISTURE	DESCRIPTION	USDA SYMBOL	STRUCTURE	REMARKS
				<ul style="list-style-type: none"> <li>- Large pieces of blacktop common in eastern portion of pit.</li> <li>- Thin (2-4") lense of leaves and twigs in south-central portion of pit 6' deep.</li> <li>- Black lense of tar in southwest corner of pit. 4.5' deep. Tar odor noticed but OVA read only 1-2 ppm for short time, then none detected.</li> <li>- 1 55 - gallon drum encountered at a depth of 5.5' + in south-central portion of pit. Fill around drum is reddish-brown sand with some iron-oxide staining. Boulders (2 cubic feet) of chlorite-mica schist near drum. 1 small (one gallon) paint can and 2 top to 5-gallon tar cans near drum.</li> </ul> <p>Total size of pit = 38' X 44' X 10 feet deep.</p>			<p>Drum was rusted and dented with no top. Inside appears to be coated with cement. One sample obtained from soil in and on barrel. (TP-25-1A). Drum encountered at 2:10 PM.</p>

## NOTES:

\*Coarse fragments are those defined as 'greater than (2.0 mm) 0.078 inches particle diameter.

TEST PIT  
VISUAL CLASSIFICATION



PROJECT NUMBER: A045f	PROJECT NAME: ConnDot Phase 1A	
TEST PIT NUMBER TP-25-2	COORDINATES:	DATE: 2-6-86
ELEVATION: 100'	GWL: Depth      Date/Time	DATE STARTED: 2-6-86
ENGINEER/GEOLOGIST: Jim Blasting		DATE COMPLETED: 2-6-86
EXCAVATION EQUIPMENT Backhoe (NEPPCO)	PAGE 1	OF 1

DEPTH ( IN.	SAMPLE TYPE & NO.	% COARSE* FRAGMENTS	MOISTURE	DESCRIPTION	USDA SYMBOL	STRUCTURE	REMARKS
0-16			Moist	Reddish-brown clay and sand fill material. Dark gray clay lenses throughout.			Entire area is fill material. No evidence of drums.
16-20			Dry	Coarse, angular gravel; uniform throughout.			
20-60			Moist	Reddish-brown fine sand with large (1-4") rounded quartz pebbles throughout.			
60-69			Moist	Yellow sand with rounded 1-3" pebbles. Large chunks of wood.			
69-136"				Greenish gray silty sand with some large rounded cobbles (to 10" diameter). Very large pieces of asphalt throughout. Wood, metal, other trash 10-12".  Total Depth - 11'4"			

NOTES:

\*Coarse fragments are those defined as greater than (2.0 mm) 0.078 inches particle diameter.

TEST PIT  
VISUAL CLASSIFICATION

PROJECT NUMBER: A045f	PROJECT NAME: CommDot Phase IA		
TEST PIT NUMBER TP-25-3	COORDINATES:	DATE: 2-7-86	
ELEVATION: 100'	GWL: Depth      Date/Time	DATE STARTED: 2-7-86	
ENGINEER/GEOLOGIST: Jim Blasting		DATE COMPLETED: 2-7-86	
EXCAVATION EQUIPMENT Backhoe (NEPPCO)		PAGE 1 OF 1	

DEPTH ( )	SAMPLE TYPE & NO.	% COARSE* FRAGMENTS	MOISTURE	DESCRIPTION	USDA SYMBOL	STRUCTURE	REMARKS
Total Depth Approx 12'		-	-	<p>This test pit was dug immediately adjacent to and southeast of TP-25-1.</p> <p>The entire pit was excavated in fill material consisting mainly of medium, quartz-rich, reddish brown sand with some yellowish lenses. Coarse fragments consist mainly of 10-20% rounded pebbles. Some large boulders were encountered.</p> <p>Large pieces of blacktop (asphalt), wood, and metal were encountered.</p> <p>One very badly corroded, broken, buried drum was encountered at 58" depth</p> <p>See map for extent of excavation.</p> <p style="text-align: center;">Total Depth - 12'</p>			This area was marked with stake for future evaluation.

## NOTES:

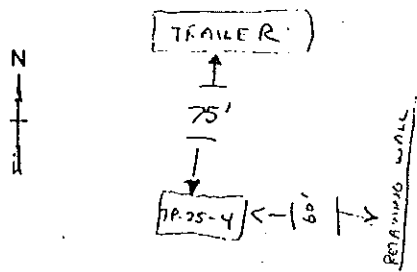
\*Coarse fragments are those defined as greater than (2.0 mm) 0.078 inches particle diameter.





## FRED C. HART ASSOCIATES, INC.

## TEST PIT LOCATION SKETCH MAP



TEST PIT NO.

TP-25-4

## TEST PIT LOG

PROJECT NO./NAME

CONNDOT

LOCATION

HIGGANUM

EXCAVATOR/EQUIPMENT/OPERATOR

NEPPCO / BACKHOE / STANISZEWSKI

HART INSPECTOR/OFFICE

S. SINGER / MERIDAN

START/FINISH DATE

6/25/86

ELEVATION OF: GROUND SURFACE/BOTTOM OF PIT

(FT. ABOVE MSL) 297'

CONDITION OF PIT

DRY

## REMARKS:

TEST PIT CHARACTERIZED BY A SANDY FILL INTERMIXED WITH LG. VOL. OF ASPHALT / TAR / COLD PATCH

DEPTH	SAMPLE INTERVAL	DESCRIPTION OF MATERIALS	REMARKS
0	0-6"	SAND FILL (FINE) LITTLE med sand, TRACE fine and med. gravel (subrounded)	FILL MATERIAL: Asphalt, ROAD TAR, wood timbers and FRAGMENTS
1	6"-2.0'	ROAD TAR, COLD PATCH, asphalt	
2	2.0-2.8	SANDY FILL WITH abundant PATCHES of TAR, cold patch and ASPHALT	Asphalt/TAR persists AT depth and appears to continue laterally AT significant levels.
3	2.8-4.0	ROAD TAR, SOME SAND	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

APPENDIX B  
ANALYTICAL DATA

0001A

YORK LABORATORIES DIVISION

YWC

## CHAIN OF CUSTODY RECORD

CLIENT FCAAJOB No. 30860-877

## SAMPLE IDENTIFICATION

Sample No.	Sample Description	Condition	Comments
1673	TP-25-1A	-	Pesticides

## CHAIN OF CUSTODY CHRONICLE:

COLLECTED BY:

1	NAME: <u>Timothy J. Loeble</u>	DATE: <u>3-27-86</u>
	SIGNATURE: <u>Timothy J. Loeble</u>	SEALS PLACED ON CONTAINERS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

CUSTODY TRANSFERRED TO:

2	NAME: _____	DATE: _____	TIME: _____
	SIGNATURE: _____	ARE SEALS INTACT? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	

CUSTODY TRANSFERRED TO:

3	NAME: _____	DATE: _____	TIME: _____
	SIGNATURE: _____	ARE SEALS INTACT? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	

RECEIVED IN LABORATORY BY:

4	NAME: <u>Jill Wakeley</u>	DATE: <u>3/28/86</u>	TIME: <u>3:15</u>
	SIGNATURE: <u>Jill Wakeley</u>	ARE SEALS INTACT? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	

WERE ANY SAMPLES SPLIT WITH ANOTHER PARTY?  
IF YES, IDENTIFY: \_\_\_\_\_☐ YES☒ NO

September 3, 1986

30860-845R  
FRED C. HART ASSOCIATES  
40 Ames Avenue  
Meriden, Connecticut 06450

Attention: Mr. Steven Gelb

PURPOSE

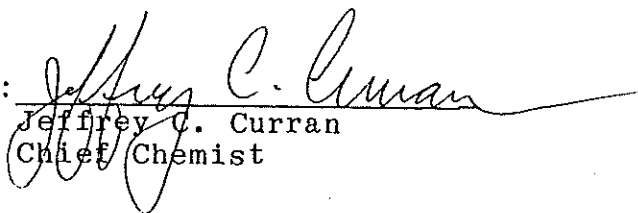
One soil sample was submitted to York Laboratories Division of YWC, Inc. by Mr. Steven Gelb of Fred C. Hart Associates. Mr. Gelb requested the sample be analyzed for EPA HSL Pesticides.

METHODOLOGY

The sample was analyzed according to EPA Method 608 and USEPA Contract Laboratory Program Protocols, July 1985 revision.

RESULTS

The results are presented in Table 1. Appropriate QA/QC and raw data are included in Appendix A.

Prepared by:   
Jeffrey C. Curran  
Chief Chemist

JCC/md

The liability of YWC, Inc. is limited to the actual dollar value of this project.

TABLE 1.0  
30860-845  
FRED C. HART ASSOCIATES  
EPA HSL PESTICIDES

All Results Reported as ug/Kg.

Sample Identification			
<u>Dilution Factor</u>	<u>1</u>	<u>1</u>	
<u>Method Blank I.D.</u>	<u>4/03/86</u>	<u>4/03/86</u>	
<u>Compound</u>	<u>Method Blank</u>	<u>1673 TP-25- 1A</u>	<u>Lower Limits of Detection with no Dilution</u>
alpha BHC	U	U	0.80
beta BHC	U	U	0.66
gamma BHC	U	U	0.54
delta BHC	U	U	0.80
Heptachlor	U	U	0.66
Aldrin	U	U	1.3
4,4' DDE	U	U	1.3
Dieldrin	U	U	1.3
4,4' DDD	U	19	1.3
Methoxychlor	U	U	110
Endrin Ketone	U	U	0.02
4,4' DDT	U	U	15
Chlordane	U	U	40
Endosulfan I	U	U	1.3
Endosulfan II	U	U	1.3
Endosulfan Sulfate	U	U	9.4
Endrin	U	U	1.3
Heptachlor Epoxide	U	3.3	1.3
Toxaphene	U	U	220

\*U - See Appendix for definition.

## APPENDIX

- \*U - Indicates that the compound was analyzed for but not detected.
- \*J - Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value, which is less than the specified minimum detection limit but is greater than zero.
- \*B - This flag is used when the analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.
- \*D - Sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method lower limits of detection for this sample are necessarily increased by this dilution factor.
- \*N - Indicates that the compound was analyzed for but not requested as an analyte. Value will not be listed on tabular result sheet.
- \*M - Matrix spike compound.

CHAIN OF CUSTODY RECORD

CLIENT

FCHA / 30860 - 1570

JOB No.

SAMPLE IDENTIFICATION

Sample No.	Sample Description	Condition	Comments
0971	SB-25-2 (10-12')	10-12' Soil	HSL BNA, HSL PEST. HSL METALS HSL VOA
0972	SB-25-2 (16-18')	16-18' Soil	HSL BNA, HSL PEST. HSL METALS HSL VOA
4665	WSW-25- <del>1</del> 1	Water	HSL BNA, HSL PEST. HSL VOA, RCRA METALS

CHAIN OF CUSTODY CHRONICLE:

COLLECTED BY:

1 NAME: WESLEY GAMBLE DATE: 07-31-86  
SIGNATURE: Wesley Gamble SEALS PLACED ON CONTAINERS? ☒ YES ☐ NO

CUSTODY TRANSFERRED TO:

2 NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
SIGNATURE: \_\_\_\_\_ ARE SEALS INTACT? ☐ YES ☐ NO ☐ N/A

CUSTODY TRANSFERRED TO:

3 NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
SIGNATURE: \_\_\_\_\_ ARE SEALS INTACT? ☐ YES ☐ NO ☐ N/A

RECEIVED IN LABORATORY BY:

4 NAME: Donald Gonyea DATE: 8/4/86 TIME: 12:40  
SIGNATURE: Donald Gonyea ARE SEALS INTACT? ☒ YES ☐ NO ☐ N/A

WERE ANY SAMPLES SPLIT WITH ANOTHER PARTY?  
IF YES, IDENTIFY \_\_\_\_\_

( ) YES ( ) NO

December 15, 1986

30860-1510  
FRED C. HART ASSOCIATES  
40 Ames Avenue  
Meriden, Connecticut 06450

Attention: Mr. Tim Lorette

Re: Site 25

PURPOSE

Two (2) soil samples and one water sample were submitted to York Laboratories Division of YWC, Inc. by Fred C. Hart Associates. The client requested the samples be analyzed for the parameters listed in Table 1.

METHODOLOGY

Metals were determined according to Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020 and Procedures for Handling and Chemical Analysis of Sediment and Water Samples, EPA/CE-81-1.

Base-neutral/acid extractable organics were determined via capillary GC/MS. The instrumentation used was a Hewlett-Packard Model 5890 gas chromatograph interfaced with a Model 5970 Mass Selective Detector.

Volatile organics were determined using purge and trap GC/MS. The instrumentation used was a Tekmar Model 4000 Dynamic Headspace Concentrator interfaced with a Hewlett-Packard Model 5995C GC/MS/DS.

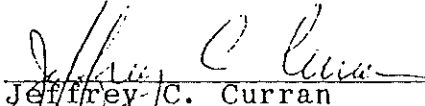
Pesticides were determined via GC/ECD. The instrumentation used was a Perkin-Elmer Model Sigma 3 gas chromatograph equipped with an electron capture detector (Ni<sup>63</sup>).



## RESULTS

The results are presented in the following Tables. Attached as Appendix A are appropriate QA/QC and raw data.

Prepared by:

  
Jeffrey C. Curran  
Laboratory Manager

JCC/md

The liability of YWC, Inc. is limited to the actual dollar value of this project.

TABLE 1.0  
30860-1510  
FRED C. HART ASSOCIATES  
ANALYTICAL REQUESTS

<u>Sample Identification</u>	<u>Parameters Requested</u>
0971 SB-25-2 (10-12)	HSL-base-neutral/acid extractable organics, HSL-pesticides, HSL- metals, HSL-volatile organics
0972 SB-25-2 (16-18)	
4665 WSW-25-DL-1	HSL-base-neutral/acid extractable organics, HSL-pesticides, HSL- volatile organics, RCRA metals

nearby landmarks. Test pit locations were subsequently transposed to the site survey map prepared by Diversified Technologies Corporation (DTC) of North Haven, Connecticut.

Continuous air monitoring was performed by HART's site safety officer during all excavation activities using an organic vapor analyzer (OVA). The OVA readings and visual observations were used to establish levels of respiratory protection and to determine what materials, if any, should be sampled for laboratory analysis.

### 3.1.3 Results

All test pits were completed in artificial fill consisting mainly of fine to coarse, reddish-brown quartzitic sand. Lenses of gravel and cobbles were encountered in each excavation. No water or bedrock was encountered.

Lenses of asphalt up to three feet in length were common in test pit TP-25-1. Upon excavation to a depth of six feet below grade, the entire test pit was scanned with a metal detector. No metal was indicated within the limits of the test pit; therefore, the excavation was backfilled.

Test pit TP-25-2 was excavated to a depth of approximately 11.3 feet. Wood, scrap metal, and large pieces of asphalt were encountered from approximately 5.8 feet to 11.3 feet below grade. No drums or evidence of contamination were encountered.

Large boulders and large pieces of wood, asphalt, and scrap metal were encountered in test pit TP-25-3. Portions of a badly corroded, broken 55-gallon drum were found at a depth of approximately five feet near the southern extent of the test pit. No soil contamination was evident.

An area 44 feet long, 38 feet wide, and 10 feet deep was excavated at TP-25-1A. The fill material encountered included wood beams, logs, large lenses of asphalt, boulders, pipes, and scrap metal. A thin lens of tar was

intersected in the southwest corner of the pit at approximately four and one-half feet below grade. The OVA readings never exceeded two ppm, although a "tar-like" odor was present. One rusted 55-gallon drum, one empty one-gallon paint can, and several five-gallon can tops coated with tar were encountered in the south-central portion of the pit at approximately five and one-half feet below grade.

The 55-gallon drum was partially full of sandy soil. The inside of the drum was encrusted with a white substance that appeared to be cement. HART'S site safety officer collected one composite sample of the soil from inside and outside the drum. Subsequent analysis of this soil sample detected 4,4,DDD at 19 ppb and heptachlor epoxide at 3.3 ppb. The entire excavation area was backfilled and graded once drum removal, sampling, and logging was completed. The drum was placed in an 85-gallon salvage drum and stored in the on-site staging area.

A grading blade was attached to the backhoe for excavation of TP-25-4. Excavation began by scraping the surface where buried "tar" was suspected. A lens of tar-like substance was encountered from grade to approximately two feet below grade. Excavated "tar" was placed directly into 85-gallon salvage drums which were then secured in the staging area.

A layer of sandy fill was encountered from 2.0 to 2.8 feet below grade. Excavation was temporarily stopped upon reaching the soil layer so that the test pit conditions could be examined. OVA monitoring indicated 25 ppm of organic vapors within the excavation; therefore, Level C protection was required during test pit logging.

Excavation continued, resulting in a ten-foot by ten-foot pit approximately four feet deep. A total of five 85-gallon salvage drums were filled with the tar-like substance and staged. At this point, HART judged

that the quantity of "tar" could not be removed effectively using salvage drums. Consequently, field activities were documented, the excavation area was delineated with wooden stakes, and the excavation was backfilled and graded. The vertical and horizontal extent of the tar-like mass was not determined.

### 3.2 Groundwater Investigation

#### 3.2.1 Purpose/Approach

A groundwater investigation was conducted by HART at the Higganum site to determine if past disposal practices in the fill area have affected local shallow groundwater quality. The groundwater investigation was designed to determine the geology, hydrogeology, soil quality, and groundwater quality proximal to the Higganum fill area.

Four test borings, each to be finished as a groundwater monitoring well, were initially completed as part of this investigation. Selected soil samples were obtained from test borings and groundwater samples were collected subsequent to well construction and development. Upon review of data obtained from this phase of the groundwater investigation, a fifth test boring/groundwater monitoring well was completed to confirm hydrogeologic conditions at the site.

Test boring/monitor well locations were selected to allow for proper analysis of the local shallow groundwater system (Figure 3-1). Location W-25-1 was selected because it is upgradient of the main fill area. Two wells (deep well W-25-1D and shallow well W-25-1S) were installed at this location as a nested well pair. The 14 foot vertical separation between well screens in this nested well pair would result in water level information indicative of the effects of the nearby water supply well on local groundwater gradients. This location would also provide background samples for groundwater quality determinations.

Locations W-25-2 and W-25-3 were selected to provide sampling locations for groundwater quality determinations downgradient of the main fill area. A boring at location W-25-2 would also provide information on the thickness and

Table 3-1

Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

## Well Construction Summary

Monitor Well #	Date Installed	Elevations <sup>1</sup>		Total Well Length (ft.)	Screen Length (ft.)	Screened Interval <sup>2</sup>	Material Screened
		Grade	Top of PVC				
W-25-1D	7-30-86	99.9	101.66	35.56	1.9	31.9-33.8	sand; some gravel and cobbles
W-25-1S	7-25-86	99.9	102.28	16.38	2.0	12.0-14.0	coarse sand; little gravel
W-25-2	7-31-86	98.0	100.33	20.83	5.0	13.5-18.5	sand; little gravel and cobbles
W-25-3	7-30-86	90.6	93.04	18.44	5.0	11.0-16.0	cobbles and bedrock
W-25-4	4-3-87	100.3	100.01	22.40	10.2	12.2-22.4	coarse sand; little gravel

<sup>1</sup>feet above mean sea level<sup>2</sup>feet below grade

Diversified Technologies Corporation (DTC) of North Haven, CT surveyed the Higganum site upon the completion of previously described field activities. Site topography, test pit locations, and monitor well locations were among the features surveyed. USGS elevation datum was referenced. The resulting survey map is included in this report as Plate A.

#### 3.2.2.2 Groundwater Sampling

HART obtained groundwater samples from the wells at the Higganum site on September 11, 1986. The exact well depths and depths to water were determined for each well using a solvent-cleaned steel tape. These data were used to calculate the exact volume of water in each well.

A one-liter stainless-steel bailer with teflon check valve was used to evacuate and sample each well. At least five "well volumes" of water were removed from each well prior to sampling. Four bailers were used so that a separate, clean bailer with clean nylon rope was introduced into each well.

A groundwater sample was obtained from each well immediately following evacuation of that well. The specific conductivity and pH of each sample was measured immediately upon extraction from the well. The temperature of groundwater samples obtained from W-25-1D and W-25-1S was also measured. An additional sample was prepared as a field blank as required by HART's QA/QC program. Table 3-2 summarizes monitor well sampling procedures and field data.

Groundwater samples were analyzed for EPA Hazardous Substance List (HSL) volatile organic compounds, HSL base/neutrals and acid extractables (BNA), HSL pesticides, and Priority Pollutant metals. With the exception of the field blank and the portion of the sample to be analyzed for Priority Pollutant metals, sample collection was performed by pouring the contents of the bailer directly into sample bottles prepared and supplied by YWC.

Table 3-2

Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

## Summary of Monitoring Well Sampling Procedures/Field Data

<u>Date Sampled</u>	<u>Well ID</u>	<u>Lab ID</u>	<u>Total Well Depth*</u>	<u>Depth to Water*</u>	<u>Height of Standing Water Column (ft)</u>	<u>Volume Standing Water in Well (gal)</u>	<u>Approx. Volume Water Removed (gal)</u>	<u>Approx. Number of Well Volumes Removed</u>	<u>Specific Conductance (mmhos)</u>	<u>Temp. (°C)</u>	<u>pH</u>
9-11-86	W-25-1D	2174	33.8	14.59	19.21	3.07	15.0	5	116	19	7.4
9-11-86	W-25-1S	2175	14.0	12.87	1.13	0.18	4.5	25	123	19	6.2
9-11-86	W-25-2	2176	18.5	14.50	4.00	0.64	6.0	9	1350	--	6.2
9-11-86	W-25-3	2177	16.0	12.84	3.16	0.51	7.0	14	700	--	6.1

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\*measured in feet below top of PVC casing



Groundwater samples analyzed for metals were filtered with a Geotech filter using a 0.45-micron membrane filter before pouring into the sample bottle. The field blank for the site was prepared at monitor well location W-24-3 by pouring the contents of bottles filled with YWC supplied water directly into the clean bailer to be used for sampling monitor well W-24-3. This water was then transferred into a new set of sample bottles.

All samples were stored on ice for transport to YWC. Sampling was completed and samples were delivered to YWC on September 11, 1986.

Upon evaluation of the information obtained from the Hazardous Substance Inventory and Groundwater Investigation, HART determined that additional drilling and well installation was needed to fully characterize the hydrogeology of the Higganum site. On April 2, 1987, HART's field team and General Borings drilling team returned to the site to install a well near Candlewood Hill Road in the north-central portion of the disposal area.

The boring was drilled with hollow-stem augers until refusal occurred at 20.8 feet below grade. Soil samples were obtained at five-foot intervals in advance of drilling to this depth. Rock coring with NX core barrel penetrated a granitic boulder 2.6 feet thick. A tri-cone roller bit was used to advance the boring through unconsolidated material underlying the boulder to a depth of 40.7 feet. Bedrock was encountered at this depth. Because the borehole stayed open upon drill rod removal, it was possible to obtain selected soil samples below the boulder in advance of roller-bit drilling.

One soil sample obtained at 15 to 17 feet below grade was sent to Resource Analysts, Inc. (RAI) in Hampton, New Hampshire for chemical analysis. This sample was analyzed for HSL volatiles, HSL base/neutral and acid extractables, HSL pesticides and RCRA metals. Because location W-25-4 is upgradient of the main disposal area, analysis of this sample would indicate background soil quality. Sample collection, storage and transport was as previously described.

The boring was backfilled to approximately 22 feet below grade so that a well could be constructed with the screen set just below the water table.

This well (W-25-4) was then constructed in the manner previously described using a ten-foot screen. Water level information obtained from the well was used to confirm groundwater flow direction. Upon analyzing water level data obtained from all wells, HART determined that no groundwater sample collection from W-25-4 would not be necessary; therefore, well development was not needed.

The location of this well was surveyed by HART's field team by referencing to previously surveyed site features. The elevation of the surface of Candlewood Hill Brook was also surveyed at several locations at that time. Locations and elevations were placed on the site survey map prepared by DTC.

### 3.2.3 Results

#### 3.2.3.1 Soil

Each boring drilled within the fill area intersected 10 to 12 feet of artificial fill material consisting of reddish-brown, medium sand with some gravel and minor amounts of asphalt, brick and other debris. The boring drilled at location W-25-3, just outside the disposal area next to a six-foot high retaining wall, intersected about seven feet of fill material. Asphalt lenses were intersected at about six to seven feet below grade at locations W-25-2 and W-25-3.

Natural material underlying the fill is fine to coarse sand and gravel with some cobbles and boulders. Small lenses of dark brown fine silt were present near the base of the fill in several borings. A small layer of brown, dense clay was intersected at location W-25-4 at 30 to 31 feet below grade. Clay was not encountered at any other drilling location.

The borings located at W-25-1D, W-25-3 and W-25-4 intersected bedrock at elevations of approximately 66, 80, and 60 feet above mean sea level,

respectively. Bedrock consists of interlayered calc-silicate gneiss and feldspar-rich pegmatite of the Monson formation. The bedrock surface is highly fractured and weathered.

Two soil samples from the boring located at W-25-2 were analyzed by YWC. Sample SB-25-2 (10-12'), obtained within the fill material, contained significant concentrations of 16 BNA compounds. Two pesticides, 4,4'-DDD and heptachlor epoxide, were present in concentrations of 125 ppb and 85 ppb, respectively. Methylene chloride was also detected in this sample at a concentration of 120 ppb.

Sample SB-25-2 (16-18') was obtained in natural material just below the base of the fill. Five BNA compound were detected in this soil sample. This sample also contained 120 ppb methylene chloride. No pesticides were detected in SB-25-2 (16-18').

Lead was detected in Sample W-25-4 (15-17') at a concentration of 2.3 ppm, well within acceptable limits for soil. No other compounds were detected in this sample. Valid analytical results of soil boring sample analysis are presented in Table 3-3.

#### 3.2.3.2 Groundwater

The elevations of the groundwater surface in monitor wells installed by HART were measured periodically. Minor seasonal fluctuations in water levels were noted in each well. The water level variations between nested wells W-25-1S and W-25-1D were not consistent. The water level elevation in the deeper well was about one foot less than that in the shallow well during the first two rounds of measurement; this relationship was reversed in the third round. The fourth round of measurements showed that the water levels in these nested wells were about the same.

Table 3-3  
Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

Valid Analytical Results--Soil Borings

	SB-25-2 (10-12')	SB-25-2 (16-18')	SB-25-4 (15-17')
<u>Chlorinated Volatiles (ppb)</u>			
methylene chloride	120	120	*
<u>Base/Neutrals and Acid Extractables (ppb)</u>			
phenol	660	*	*
4-methylphenol	1000	*	*
2,4-dimethylphenol	810	*	*
naphthalene	17000	*	*
2-methylnaphthalene	19000	*	*
acenaphthylene	15000	*	*
acenaphthene	7300	*	*
dibenzofuran	9000	*	*
fluorene	28000	*	*
phenanthrene	430	980	*
benzo(a)anthracene	*	390	*
chrysene	*	420	*
benzo(b)fluoranthene	10000	*	*
benzo(k)fluoranthene	3000	*	*
benzo(a)pyrene	12000	*	*
indeno(1,2,3-cd)pyrene	5300	*	*
benzo(g,h,i)perylene	5600	*	*
fluoranthene	1400	520	*
pyrene	*	750	*
<u>Pesticides (ppb)</u>			
4,4'-DDD	125	*	*
heptachlor epoxide	85	*	*
<u>Metals (ppm)</u>			
Lead	*	*	2.3

\* = Not Detected

Four groundwater samples and a field blank were analyzed for HSL volatiles, HSL BNA's, HSL pesticides and Priority Pollutant metals. The sample obtained from deep upgradient well W-25-1D contained 8 ppb benzene. A common BNA, di-n-octyl phthalate, was present in both upgradient wells. Six BNA compounds (including di-n-octyl phthalate) was detected in the groundwater sample obtained from monitor well W-25-3. The sample obtained from the DOT supply well (see Section 3.2.2.1) contained 7 ppb trans-1,2-dichloroethene. Valid analytical results for groundwater samples are summarized in Table 3-4.

Table 3-4

Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

## Valid Analytical Results--Groundwater

	<u>W-25-1D</u>	<u>W-25-1S</u>	<u>W-25-2</u>	<u>W-25-3</u>	<u>WSW-25-DL-1</u>
<u>Volatiles (ppb)</u>					
benzene	8	*	*	*	*
trans-1,2-dichloroethene	*	*	*	*	7
<u>Base/Neutrals and</u> <u>Acid Extractables (ppb)</u>					
2-methylnaphthalene	*	*	900	*	*
dibenzofuran	*	*	440	*	*
phenanthrene	*	*	20	*	*
fluoranthene	*	*	13	*	*
pyrene	*	*	16	*	*
di-n-octyl phthalate	50	180	10	*	*

\* = Not detected

#### 4.0 QUALITY CONTROL AND DATA VALIDATION

Sampling QA/QC was evaluated using trip blanks, field blanks, and duplicate/replicate samples. Field blank results were used to determine if any contamination was introduced by the sampling equipment and sampling procedure. The trip blank results indicate if any contamination was introduced while the samples and bottles were being transported back and forth to the laboratory. Duplicate/replicate sample results indicate sampling precision as well as matrix homogeneity. The frequency of QA/QC sampling is as follows:

- 1) Duplicate/replicate sample - minimum of one in ten
- 2) Field blanks - minimum of one in ten
- 3) Trip blanks - minimum one in every batch of samples shipped.

Laboratory data is checked and evaluated for adherence to QA/QC parameters by qualified HART personnel. Modified EPA Contract Laboratory Protocols (CLP) are used in the data evaluation procedure. The data are flagged as required by the CLP. Flagging includes marking data as an estimate (J), unusable (R), undetected (U), etc. Data for a compound or compounds may be deemed invalid for one or more of the following reasons:

- 1) Method blank contamination
- 2) Field blank contamination
- 3) Trip blank contamination
- 4) CLP QA/QC parameter out of control

Data addressed in this report are above Contract Required Detection Limits (CRDL) and have been validated by the CLP.

## 5.0 SUMMARY OF FINDINGS

### 5.1 Geology and Hydrology

HART's investigation of the Higganum DOT facility focused on the one-third acre disposal area in the western portion of the site. Fill thickness in this area is approximately 10 to 15 feet. Fill materials include fine to coarse sand with some gravel and cobbles, asphalt, wood, metal and other debris. One rusted, empty 55-gallon drum and the rusted remains of another 55-gallon drum were exhumed from the fill area during the Hazardous Substance Inventory. At least 40 cubic yards of a tar-like substance is buried in the south-central portion of the fill.

Background information indicates that disposal activities infilled what was once a man-made pond. This is evidenced by thin layers of organics and dark, fine silt encountered near the base of the fill during test pit excavation and drilling.

Glacial outwash sand and gravel containing some cobbles and boulders underlie the fill materials. A thin lens of dense clay was encountered in one test boring. The coarse-grained outwash deposits are very permeable; all groundwater monitoring wells completed in this material yield at least four gallons of water per minute while displaying very little drawdown.

Drilling confirmed that Monson gneiss underlies the unconsolidated materials below the disposal area. The bedrock consists of interlayered pegmatite and calc-silicate hornfels rich in plagioclase, pyroxene, and quartz. Drilling indicated that the bedrock surface is weathered and fractured. Published information states that wells completed in this fractured bedrock aquifer are capable of yielding 5 to 20 gallons of water per minute.



The bedrock surface was encountered at an approximate elevation of 80 feet above mean sea level at location W-25-3. This corresponds to the elevation of bedrock exposed in the stream bed adjacent to this well. The bedrock surface dips steeply west below the fill area, as evidenced by bedrock surface elevations of 60 and 66 feet at locations W-25-4 and W-25-1D, respectively. Geologic cross sections (Figure 5-1 and Figure 5-2), based on information obtained during this study, display geologic conditions at the site.

The shallow, unconfined (water table) aquifer exists in the permeable outwash deposits and the fractured bedrock below the study area. The seasonal high water table rises above the base of the fill at some locations, temporarily saturating one to two feet of fill material. Water level information obtained from all wells installed by HART is summarized in Table 5-1. Relative water level fluctuations between nested wells W-25-1D and W-25-1S indicate a variation in the direction of vertical hydraulic gradients at that location. These vertical gradient fluctuations could be caused by periodic pumping of the DOT water supply well. The water table profiles included on the geologic cross sections represent water level data obtained on May 5, 1987.

The water table contour map presented as Figure 5-3 indicates that the shallow groundwater flow direction is east-southeast. The surface water elevation survey conducted by HART shows that stream elevations correspond to water levels in adjacent wells. This indicates that Candlewood Hill Brook is an effluent stream which receives water from the groundwater system.

## 5.2 Soil and Groundwater Quality

Four soil samples and five groundwater samples (excluding blanks) were submitted for laboratory analysis as shown in Table 5-2. Soil sample TP-25-1A consisted of fill material from inside the buried 55-gallon drum. Two soil samples were obtained from the boring located at W-25-2, one within the fill and one directly below the fill. The sample of natural soil obtained at location W-25-4 was analyzed to provide soil quality information background to the main disposal area.

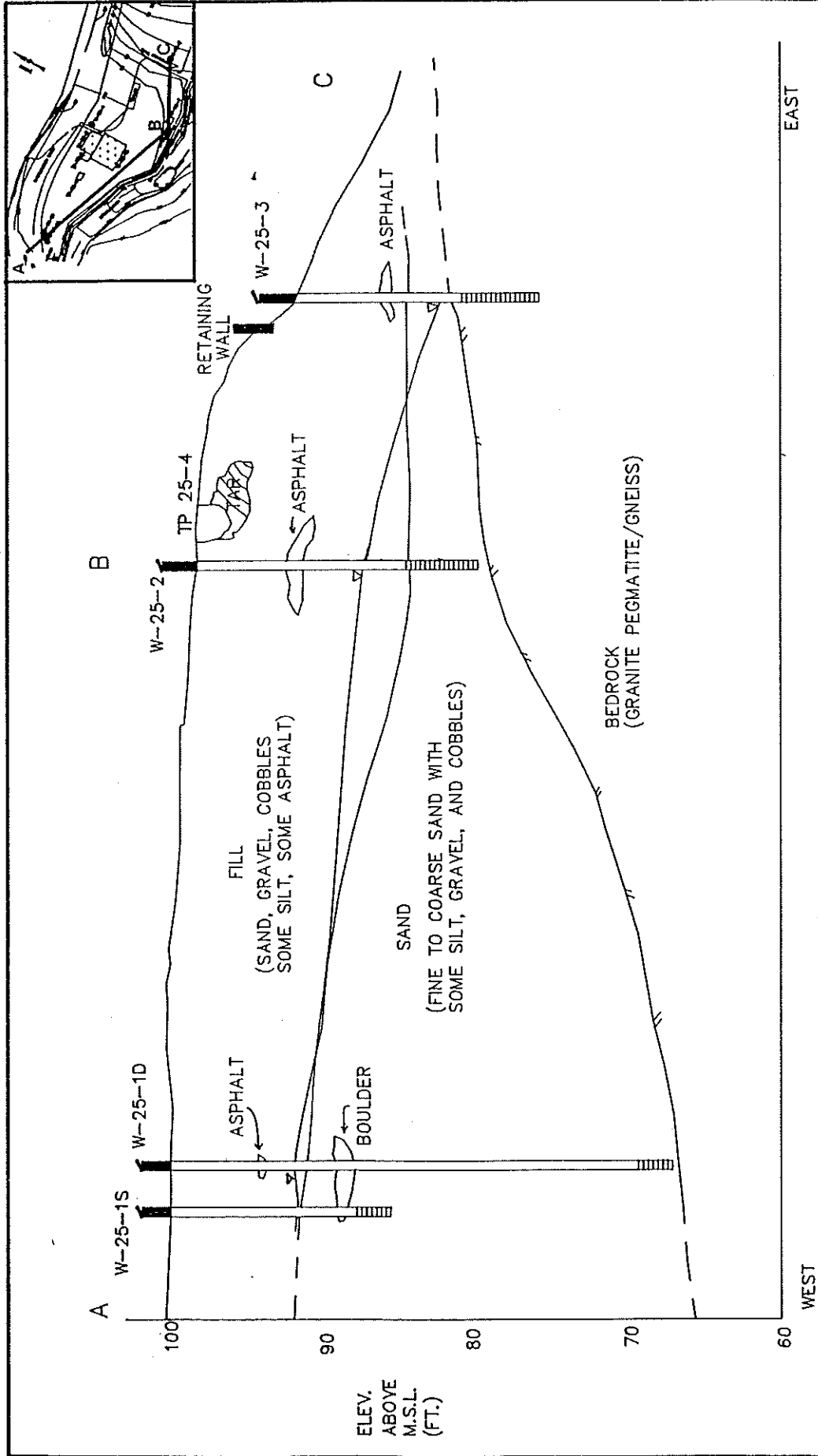
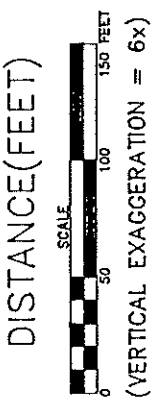


FIGURE 5-1  
SITE NO. 25 HIGGANUM  
GEOLOGIC CROSS SECTION A-B-C  
CONNECTICUT DEPT. OF TRANSPORTATION  
HAZARDOUS WASTE DISPOSAL SITE  
INVESTIGATION  
FRED C. HART ASSOCIATES, INC.



LEGEND	
▽	- WATER LEVEL (3/87 DATA)
~	- FILL/NATIVE MATERIAL CONTACT
---	- BEDROCK
	- SCREENED INTERVAL

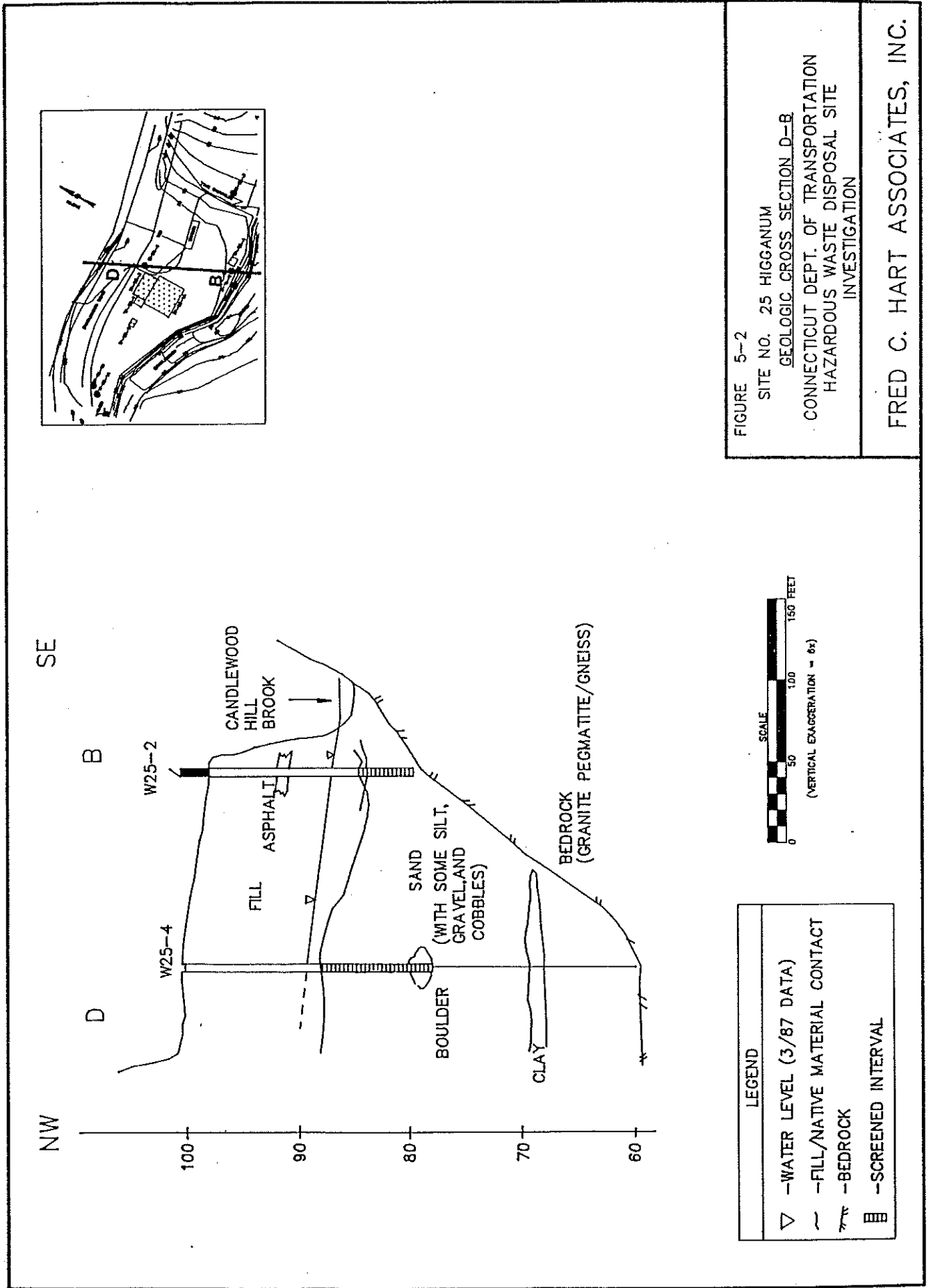


Table 5-1

Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

## Depth to Groundwater and Water Table Elevations

September 11, 1986

<u>Monitoring Well</u>	<u>Depth to Water (ft)<sup>1</sup></u>	<u>Top of PVC Elevation (ft)<sup>2</sup></u>	<u>Groundwater Elevation (ft)<sup>2</sup></u>
W-25-1D	14.59	101.66	87.07
W-25-1S	12.87	102.28	89.41
W-25-2	14.50	100.33	85.83
W-25-3	12.84	93.04	80.20

March 3, 1987

<u>Monitoring Well</u>	<u>Depth to Water (ft)<sup>1</sup></u>	<u>Top of PVC Elevation (ft)<sup>2</sup></u>	<u>Groundwater Elevation (ft)<sup>2</sup></u>
W-25-1D	11.66	101.66	90.00
W-25-1S	11.24	102.28	91.04
W-25-2	13.41	100.33	86.92
W-25-3	11.49	93.04	81.55

April 7, 1987

<u>Monitoring Well</u>	<u>Depth to Water (ft)<sup>1</sup></u>	<u>Top of PVC Elevation (ft)<sup>2</sup></u>	<u>Groundwater Elevation (ft)<sup>2</sup></u>
W-25-1D	8.55	101.66	93.11
W-25-1S	10.17	102.28	92.11
W-25-2	12.59	100.33	87.74
W-25-3	10.89	93.04	82.15
W-25-4	9.54	100.01	90.47

May 5, 1987

<u>Monitoring Well</u>	<u>Depth to Water (ft)<sup>1</sup></u>	<u>Top of PVC Elevation (ft)<sup>2</sup></u>	<u>Groundwater Elevation (ft)<sup>2</sup></u>
W-25-1D	10.68	101.66	90.98
W-25-1S	11.54	102.28	90.74
W-25-2	13.38	100.33	86.95
W-25-3	11.56	94.04	82.48
W-25-4	10.84	100.01	89.17

<sup>1</sup>measured from top of PVC riser<sup>2</sup>above mean sea level

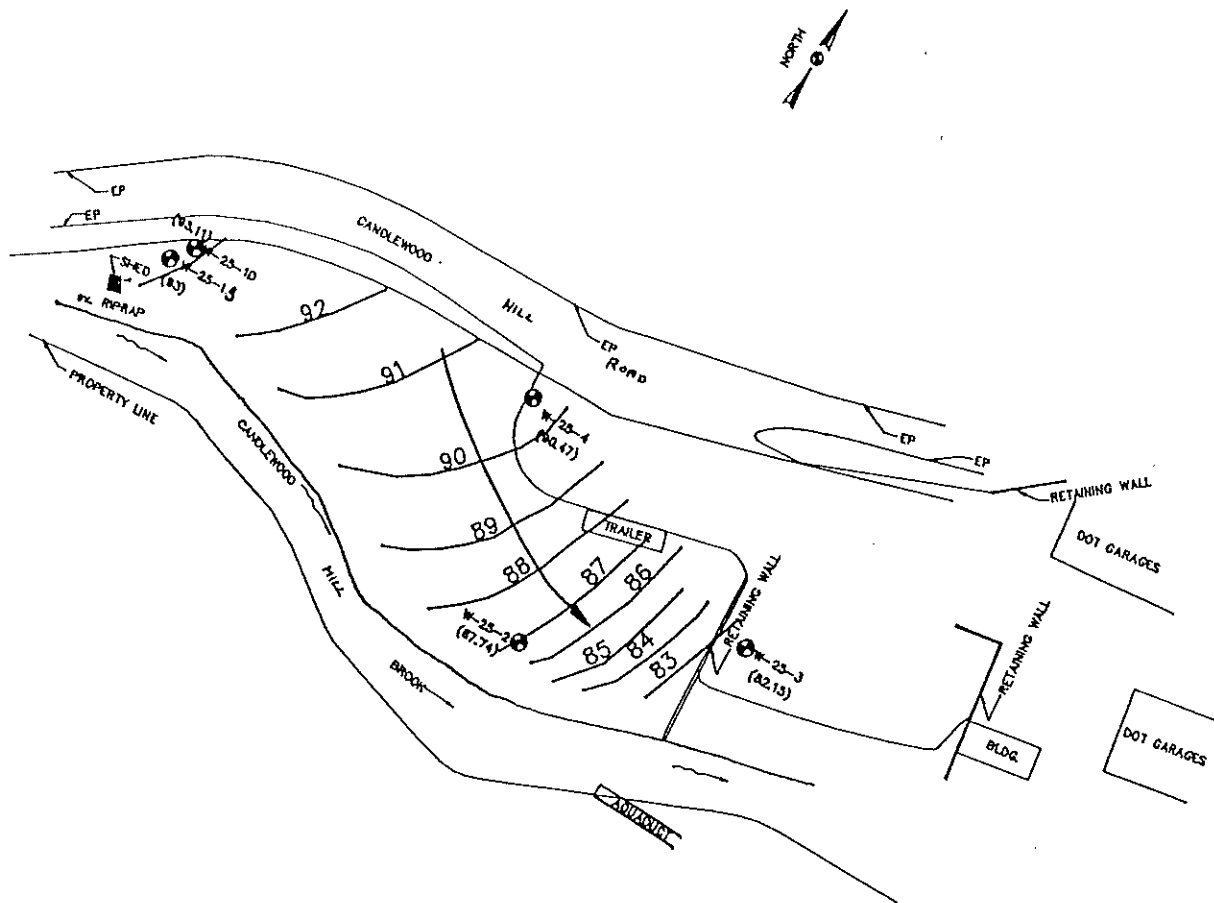
Table 5-2

Connecticut Department of Transportation  
Hazardous Waste Disposal Site Investigation  
Higganum Site #25

Summary of Sample Collection and Analysis

<u>Sample ID</u>	<u>Lab ID</u>	<u>Type of Sample</u>	<u>Date Collected</u>	<u>Parameters</u>
TP-25-1A	1673	Test Pit	3-27-86	EPA HSL Pesticides
SB-25-2 (10-12)	0971	Soil Boring (10-12')*	7-31-86	EPA HSL Volatiles, BNAs, Metals and Pesticides
SB-25-2 (16-18)	0972	Soil Boring (16-18')*	7-31-86	EPA HSL Volatiles, BNAs, Metals and Pesticides
SB-25-4	2700	Soil Boring (15-17')*	4-2-87	EPA HSL Volatiles, BNAs, Metals and Pesticides
WSW-25-DL-1	4665	Water Supply Well	7-31-86	EPA HSL Volatiles, BNAs and Pesticides RCRA Metals
W-25-1	2174	Groundwater	9-11-86	EPA HSL Volatiles, BNAs and Pesticides EPA Priority Pollutant Metals
W-25-1A	2175	Groundwater	9-11-86	EPA HSL Volatiles, BNAs and Pesticides EPA Priority Pollutant Metals
W-25-2	2176	Groundwater	9-11-86	EPA HSL Volatiles, BNAs and Pesticides EPA Priority Pollutant Metals
W-25-3	2177	Groundwater	9-11-86	EPA HSL Volatiles, BNAs and Pesticides EPA Priority Pollutant Metals
W-25-0(A)	2178	Field Blank (Groundwater)	9-11-86	EPA HSL Volatiles, BNAs and Pesticides EPA Priority Pollutant Metals
	2539	Trip Blank	9-11-86	EPA HSL Volatiles

\*feet below grade



#### LEGEND

- MONITOR WELL LOCATIONS
- GROUNDWATER FLOW DIRECTION
- CONTOUR INTERVAL = 1'

FIGURE 5-3

SITE NO. 25 HIGGANUM  
WATER TABLE CONTOUR MAP  
 CONNECTICUT DEPT. OF TRANSPORTATION  
 HAZARDOUS WASTE DISPOSAL SITE  
 INVESTIGATION

FRED C. HART ASSOCIATES, INC.

Low levels of the pesticides 4,4-DDD and heptachlor epoxide were detected in the samples of fill material obtained from the exhumed 55-gallon drum and the boring located at W-25-2. This reflects the reported disposal of pesticides in the fill area. The fill sample from the boring at W-25-2 also contained significant concentrations of 16 BNA compounds. The presence of these coal tar derivatives is apparently due to the proximity of the boring to the buried mass of tar.

The sample of natural soil obtained below the fill sample at W-25-2 was analyzed to determine if contaminants were migrating from the fill into underlying native material. Only five BNA compounds were detected in this soil sample. The concentration of total BNA's was low with respect to the overlying fill sample. No pesticides were present in the sample of native soil. This indicates that pesticides and, to some extent, BNA compounds are being retained in the fill materials and are relatively immobile.

Methylene chloride was detected in both the fill and soil samples obtained from boring location W-25-2. This common laboratory contaminant was also present in the method blank and is not considered to be of concern at the low levels detected. Lead was present in the background soil sample at a concentration of 2.3 ppm; well within the range of natural occurrence.

The groundwater sample obtained from monitor well W-25-2 was contaminated by six BNA compounds. This can be attributed to the wells proximity to the buried tar. One of these BNA compounds, di-n-octyl phthalate, is also present in the shallow and deep background wells at low concentrations. This common phthalate ester does not pose an environmental problem at the levels detected.

The groundwater sample obtained from the deep background well W-25-1D contained 8 ppb of benzene. Benzene was reportedly detected in the sample of the tar-like material analyzed for the Connecticut DEP in 1983. However, well

W-25-2 is approximately 280 upgradient feet of the tar-like mass.

Additionally, the consulting firm of Metcalf and Eddy (M & E) has reported finding benzene in groundwater samples obtained from off-site wells. HART's findings suggest that materials in the landfill are not the source of the deep groundwater contamination by benzene.

As part of HART's investigation, a sample obtained from DOT's on-site water supply well was analyzed. Because this sample was collected to determine the quality of water introduced into the borehole during drilling, the sample was taken after water passed through the drill rig holding tank, pump and hose. A water sample was not obtained directly from the DOT well. Trans-1,2-dichloroethene was detected in the drilling water sample at 7 ppb, just over the detection limit.



## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Past disposal activities in the fill area at the Higganum site have had an adverse affect on the quality of soil and groundwater near the site. One rusted 55-gallon drum which was removed from the fill area probably contained pesticides at one time. Extensive excavation indicated that no other pesticide drums are present within the landfill. Also, a large mass of a tar-like substance is buried within the disposal area. Samples of fill obtained during HART's soil borings program show significant contamination by base/neutral and acid extractable compounds and pesticides within the fill.

Decreased concentrations of total base/neutral and acid extractable compounds are present in natural material below the contaminated fill. No pesticides were detected in natural material. This indicates that all of the pesticides are being attenuated by fill materials. BNA compounds; however, appear to be migrating vertically, as indicated by the relatively low concentration of total BNA compounds in the native soils.

Groundwater contamination by BNA compounds was detected in samples obtained from well W-25-2. This is apparently due to the proximity of this well to the buried tar.

The Connecticut Department of Health Services has established a recommended action level of 1 ppb for benzene in water. Therefore, the 8 ppb of benzene detected in the groundwater sample obtained from the deep, upgradient monitor well is significant. However, HART does not consider the Higganum disposal area to be the source of this benzene contamination for several reasons as follows:

1. HART's study detected benzene only in the sample from the deep background well, which is upgradient of and screened well below the limits of the disposal area;

2. the monitor well installed immediately adjacent to the tar-like mass (the only known potential source of benzene in the fill area) is not contaminated by benzene;
3. benzene is less dense than and only slightly soluble in water;
4. there is no indication that normal pumping of the DOT on-site 200-foot deep well would result in substantial contaminant migration against the natural groundwater flow gradient;
5. none of the monitor wells immediately downgradient of the disposal area exhibit benzene contamination; and
6. analysis of groundwater samples obtained by M & E from wells upgradient of the DOT property reportedly contain benzene.

Based on the results of the HART investigation and M & E reports, a regional benzene contamination problem is suspected.

Analysis of a sample of drilling water contained 7 ppb Trans-1,2-dichloroethene, a suspected breakdown product of the solvent TCE. The source of this water was the on-site DOT supply well; however, the water had passed through the drill rig holding tank, pump, and hoses before being sampled. The low level of contamination could have originated in the drilling equipment.

HART recommends the removal of the buried mass of tar and any associated contaminated soil. Subsequent to tar removal, all monitor wells installed by HART should be sampled semi-annually. Samples should be analyzed for base/neutral and acid extractable compounds and volatile organic compounds. A decrease in the concentration of BNA compounds in the groundwater is anticipated once the suspected source is removed. Analysis for VOC compounds is considered a precautionary measure. HART also suggests that a sample of water obtained directly from the on-site DOT supply well be analyzed for the presence of volatile organic compounds.

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APPENDIX A  
GEOLOGIC LOGS AND WELL DIAGRAMS