PART I: REFERENCES

- Federal Register, 40 CFR Part 141, Wednesday, November 13, 1985, pp. 46968-46971.
- Federal Register, 40 CFR Part 141, Tuesday, June 12, 1984, p. 24343.
- Flint, R.F., The Surficial Geology of the Haddam Quadrangle, State Geological and Natural History Survey of Connecticut, Quadrangle Report #36, 1978.
- USEPA, Environmental Criteria and Assessment Office, Cincinnati, Ohio, letter to M&E McClellan Hazardous Waste Task Force, May 28, 1986.
- USEPA, Office of Water Regulations and Standards, Washington, D.C., Quality Criteria for Water 1986, pp. 65-66.
- Winterbottom, W.L., ConnDEP Water Compliance Unit, Interdepartmental message to E. Archibald, ConnDOT, DOT - Haddam (Higganam) Hazardous Waste Site, March 6, 1984.

PRELIMINARY TEST REPORT

CONNDOT SALT STORAGE AND MAINTENANCE FACILITIES STUDY

HADDAM (CANDLEWOOD HILL ROAD), FACILITY NO. 36

DISTRICT 2, SECTION 3

PART A: TEST INFORMATION

I. Test Team: Meghan Cruise, M & E;
Larry Deschaine, M & E;
David Rode, DTC

II. Test Dates:

A. Well Installation: August 5 - 7, 1985

B. Water and Soils Sampling: August 22 - 23, 1985

C. Depths to Water Table: August 22 - 23, 1985

D. Well Cap Elevations: November 18, 1985

III. Test Location: Haddam, Candlewood Hill Road, 400 feet west of intersection of Routes 9A and 81. See Figure P-36-1.

IV. Background Information: A site inspection report for the Haddam (Candlewood Hill Road) facility, including a complete description of facility activities and infrastructure, and information on the local environment including water resources and geology may be found in Volume 2 of the Phase I Draft Interim Report, submitted to ConnDOT on November 5, 1985.

PART B: TEST RATIONALE AND SAMPLING SCHEDULE

I. Test Rationale: In 1984, trichloroethylene (TCE) was detected in several residential and commercial drinking water wells located along Candlewood Hill Road. None of the concentrations exceeded the ConnDOHS Action Level for TCE. In 1975, about four leaking drums of 2,4-D and 2,4,5-T were reportedly buried in a fill area at the western end of the site. In addition, an experimental joint sealer was reportedly disposed of along the banks of Candlewood Hill Brook on ConnDOT property in the early 1960's. Soils analysis in the vicinity of the disposal area indicated the presence of volatile organics.

The Haddam, Candlewood Hill Road facility was selected as a preliminary test site to identify whether contaminant releases from site activities have occurred. This will

help resolve documented problems and allow measures to be taken such that future impacts may be avoided. Site activities and potential contaminants associated with each are summarized in Table P-36-1.

TABLE P-36-1. ACTIVITIES AND POTENTIAL CONTAMINANTS AT HADDAM (CANDLEWOOD HILL ROAD)

Activity	Activity Period	Potential Contaminants
Salt storage and handling	1941 - 1973	Sodium (Na), chloride (Cl)
Road maintenance	1941 - 1973	Hydrocarbons, volatile organics
Underground fuel storage	1941 - Present	Volatile organics, hydrocarbons
Vehicle repair	1941 - Present	Volatile organics, metals
Stores	1947 - Present	Pesticides
Test borings	1972 - Present	None

II. Sampling Schedule: In conjunction with the preliminary test, three wells were installed at the Haddam site. Samples were collected from these wells and from several other locations as shown in Table P-36-2.

TABLE P-36-2. HADDAM (CANDLEWOOD HILL ROAD) PRELIMINARY TEST SAMPLE LOCATIONS AND ANALYTICAL TESTS

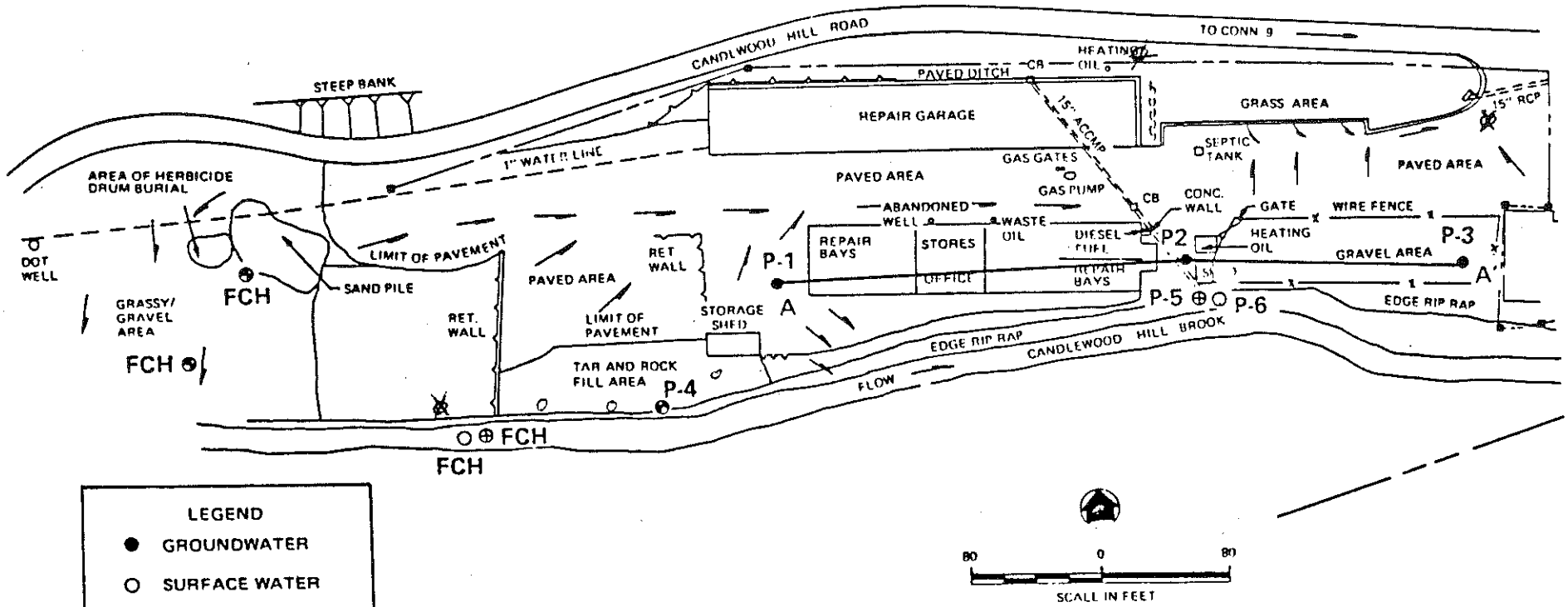
Sample Descriptor[1]	Sample Location	Analytical Tests
P-36-1-GW	Just west of southern repair garage.	Na, Cl, HSL volatile organics, hydrocarbons, NIPDWR herbicides
P-36-2-GW	Just east of southern repair garage.	Na, Cl, HSL volatile organics, hydrocarbons
P-36-3-GW	At eastern end of site by brook in fenced-in storage area.	Na, Cl, HSL volatile organics, hydrocarbons
P-36-4-SL	In fill area where experimental pavement sealer was reportedly disposed of.	HSL volatile organics, hydrocarbons
P-36-5-SD	At outlet of site drainage system into brook.	HSL volatile organics, hydrocarbons
P-36-6-SW	At outlet of site drainage system into brook.	Hydrocarbons, NIPDWR metals

1. GW = Groundwater, SW = Surface Water, SL = Soil, SD = Sediment

The six sampling points are shown in Figure P-36-2.

PART C: SAMPLING RESULTS

I. Water Quality Data: A trace of benzene (1 ug/l) was detected in well no. 3, while sodium and chloride were detected in all three groundwater samples. Other volatile organics including TCE (well nos. 1, 2, and 3), pesticides (well no. 1), hydrocarbons (all four water quality samples) and metals (the brook surface water sample) were not detected. The data for water quality parameters detected at Haddam as well as relevant numerical criteria are presented in Table P-36-3.



NOTE: A - A' GEOLOGIC CROSS SECTION

o soil borings
⊗ addl wells

FIG. P-36-2 SITE PLAN AND PRELIMINARY TEST SAMPLE LOCATIONS - HADDAM (CANDLEWOOD HILL ROAD) REPAIR FACILITY

SITE NO. 25 - HIGGANUM

1. Location

This site is located on Candlewood Hill Road in the town of Higganum.

2. Additional Observations

A tar-like substance, which was firm at the time of January, 1985 HART site visit, was observed to be soft and bubbling at the surface near the southeast corner of the fill area at the time of the June, 1985 visit.

3. Grab Sampling

This site was sampled on June 18, 1985. Weather conditions were sunny, warm, and dry. A single grab sample was collected, as shown in Figure II-39.

L-25-1 This surface water sample was collected from the most downstream location of Candlewood Brook adjacent to the fill area. The sample was collected from a calm location to determine if the landfill was having an adverse effect on surface water quality.

4. Lab Results

There was no surface water contamination found to be present at this location.

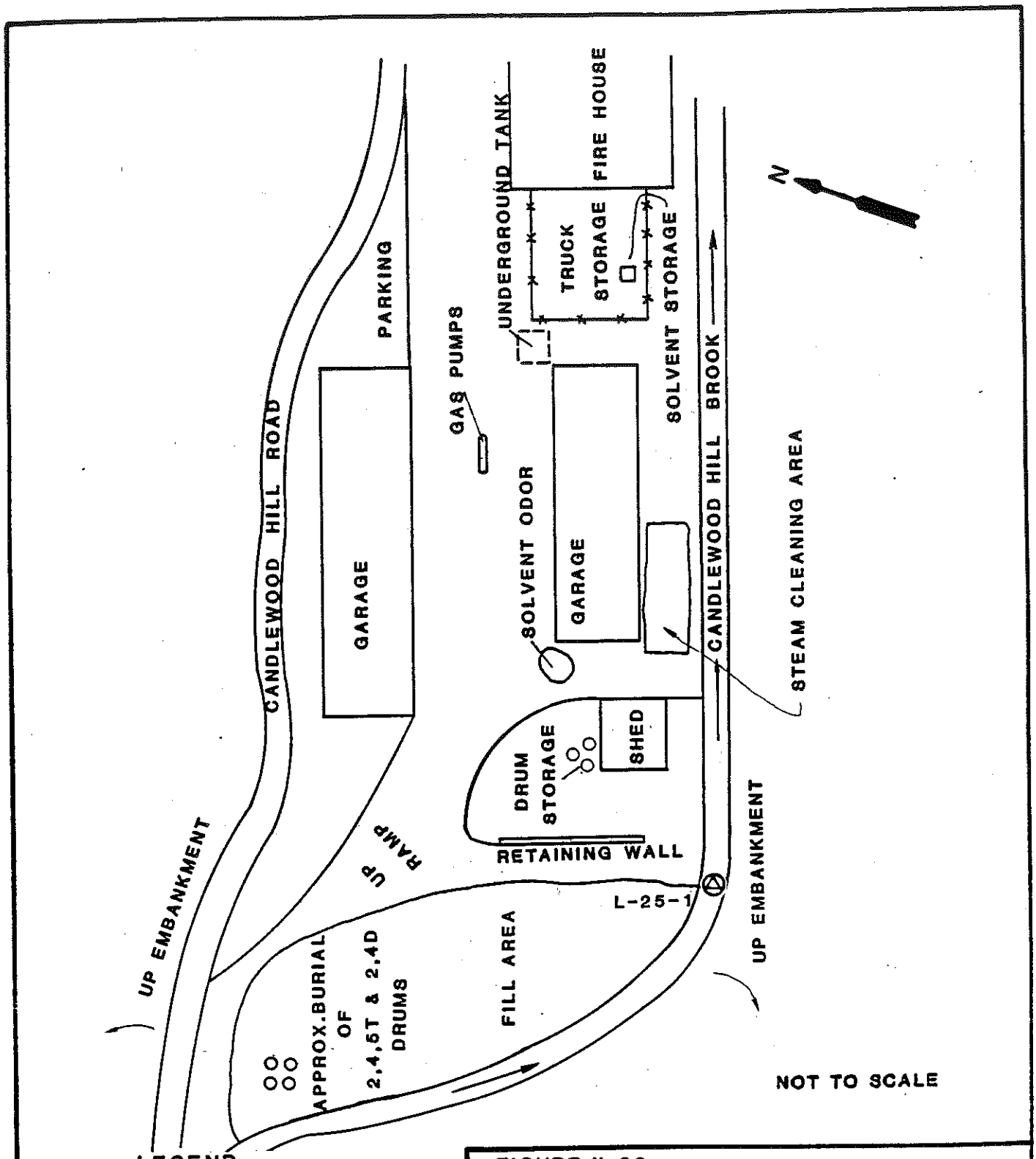


FIGURE II-39

SAMPLE LOCATIONS

SITE NO. 25- HIGGANUM
(CANDLEWOOD HILL RD.)
SKETCH MAP

CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

TABLE II-17
ANALYTICAL RESULTS

CONN DOT GRAB SAMPLING PROGRAM

JUNE 1985

SITE #25 - HIGGANUM

VOLATILES (ppb)	L-25-1								
	(A)								
chloromethane									
bromomethane									
vinyl chloride									
chloroethane									
methylene chloride									
acetone									
carbon disulfide									
1,1-dichloroethene									
1,1-dichloroethane									
trans-1,2-dichloroethene									
chloroform									
1,2-dichloroethane									
2-butanone									
1,1,1-trichloroethane									
carbon tetrachloride									
vinyl acetate									
bromodichloromethane									
1,1,2,2-tetrachloroethane									
1,2-dichloropropane									
trans-1,3-dichloropropene									
trichloroethene									
dibromochloromethane									
1,1,2-trichloroethane									
benzene									
cis-1,3-dichloropropene									
2-chloroethylvinylether									
bromoform									
2 hexanone									
4-methyl-2-pentanone									
tetrachloroethene									
toluene									
chlorobenzene									
ethylbenzene									
styrene									
total xylenes									
HYDROCARBON SCREENING (ppm)	(A)								
METALS (ppm)	(B)								
Aluminum									
Arsenic									
Cadmium									
Chromium									
Copper									
Lead									
Titanium									
Zinc									

(A) None Detected
(B) Not Analyzed For

TABLE II-17

ANALYTICAL RESULTS

CONN DOT GRAB SAMPLING PROGRAM

JUNE 1985

SITE #25 - HIGGANUM

PESTICIDE/HERBICIDE SCREENING (ppb)	L-25-1
Acid Herbicides	(A)
Organochlorine Pesticides	
4,4'-DDE	
4,4'-DDD	
4,4'-DDT	
O,p'-DDT*	
Chloditan*	
Organophosphorus Pesticides	
Carbamate Pesticides	
Organonitrogen Pesticides	
Other	
Quinone Pesticides	
Corbit (9-10-Anthraquinone)*	
P.C.B.'s**	(B)
1016	
1221	
1232	
1242	
1248	
1254	
1260	

* Tentatively Identified Compounds at Estimated Concentrations

** S = mg/kg
L = ug/L

(A) None Detected
(B) Not Analyzed For

5. Geophysical Investigations

a. Techniques Employed. A metal detection survey was performed at this site on May 30, 1985 by HART personnel. Reported drum burial by DOT employees initiated the investigation.

b. Specific Methodology. A grid was not developed at this site because of the small area involved. Figure II-40 shows the surveyed area. Metal detection, alone, was performed because the burial was stated to be shallow. The results are shown in Figure II-41.

c. Results. One area of high metal readings was delineated by this survey. This location was in the precise vicinity of the reported burial.

6. Recommendations for Additional Investigation

This is one of the "14" sites having a work plan prepared as an attachment to this report.

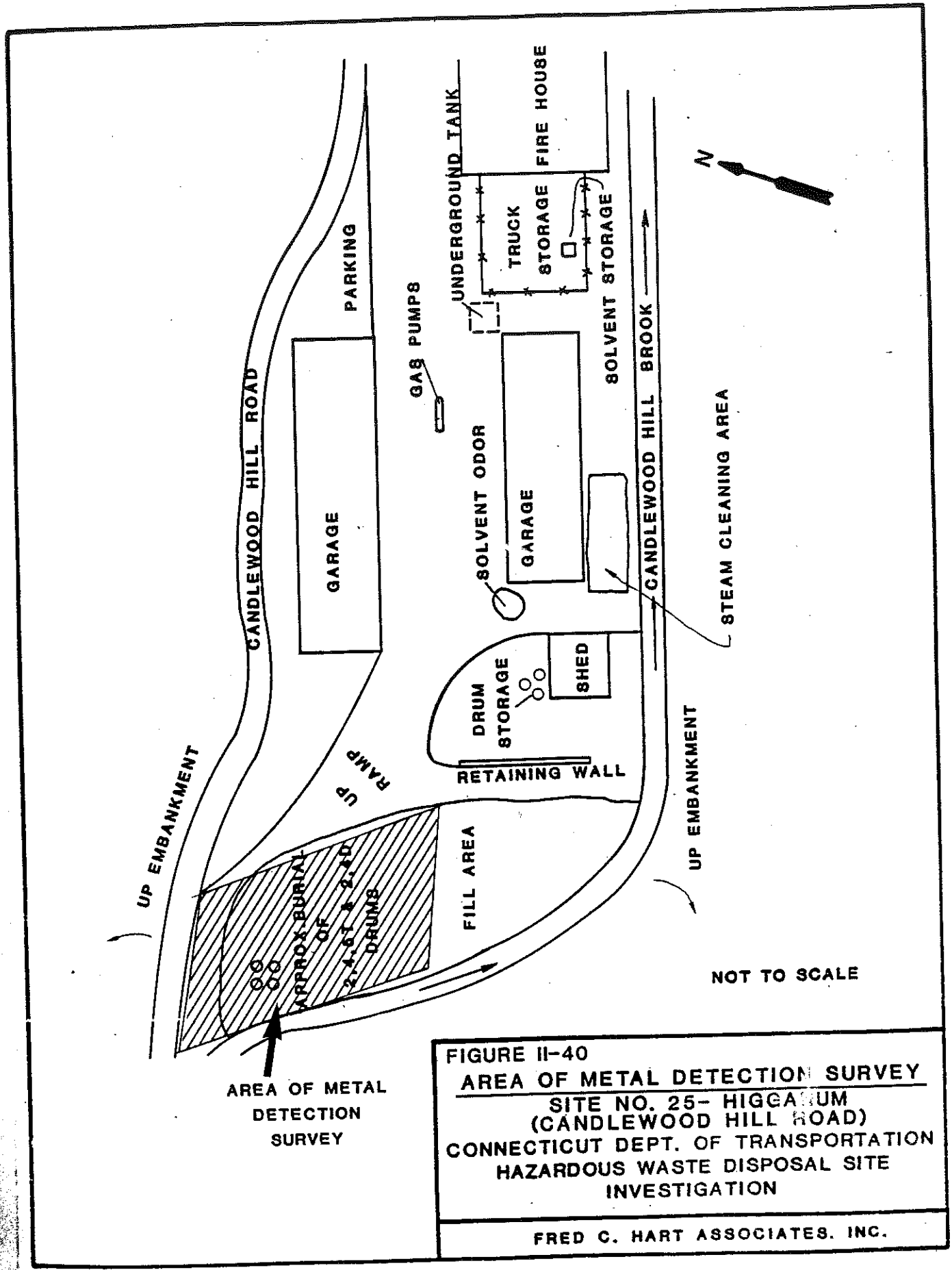


FIGURE II-40
AREA OF METAL DETECTION SURVEY
SITE NO. 25- HIGGANUM
(CANDLEWOOD HILL ROAD)
CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

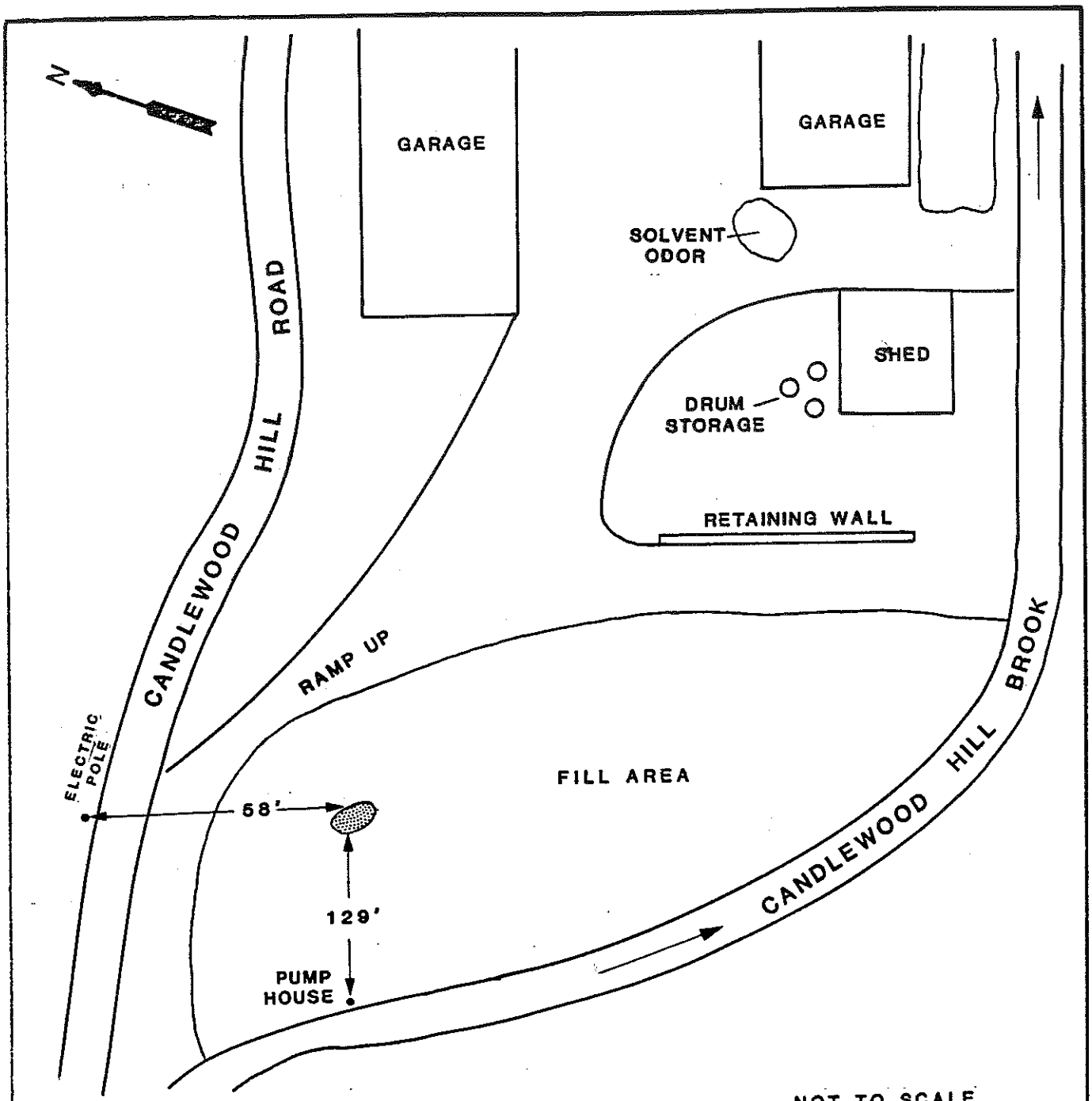


FIGURE II-41

METAL DETECTION RESULTS

SITE NO. 25- HIGGANUM
CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

FIELD INVESTIGATION
WORK PLAN 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, CT. 06109

November 26, 1985

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1.0 Background

1.1 Site Location and Physical Setting

The Higganum site is located on Route 9A south of Candlewood Hills Road and west of the intersection of Routes 81 and 9A . This location is situated in a small east-west trending valley which lies in the Connecticut River drainage basin of the Eastern Highlands geomorphic province of Connecticut (Figure 1-1).

The site is bounded on the south by Candlewood Hill Brook (Figure 1-2). The brook flows eastward in a 10-foot deep stone-lined channel and discharges into Ponset Brook, 1000 feet downstream of the site. Ponset Brook drains from the Higganum Reservoir and eventually discharges into the Connecticut River. The Connecticut River is located less than one mile northeast of the site and flows southeast across generally north-trending hills which typify the Highlands.

The narrow strip of land which comprises the site slopes gently toward the east from 100 feet above mean sea level to approximately 70 feet above mean sea

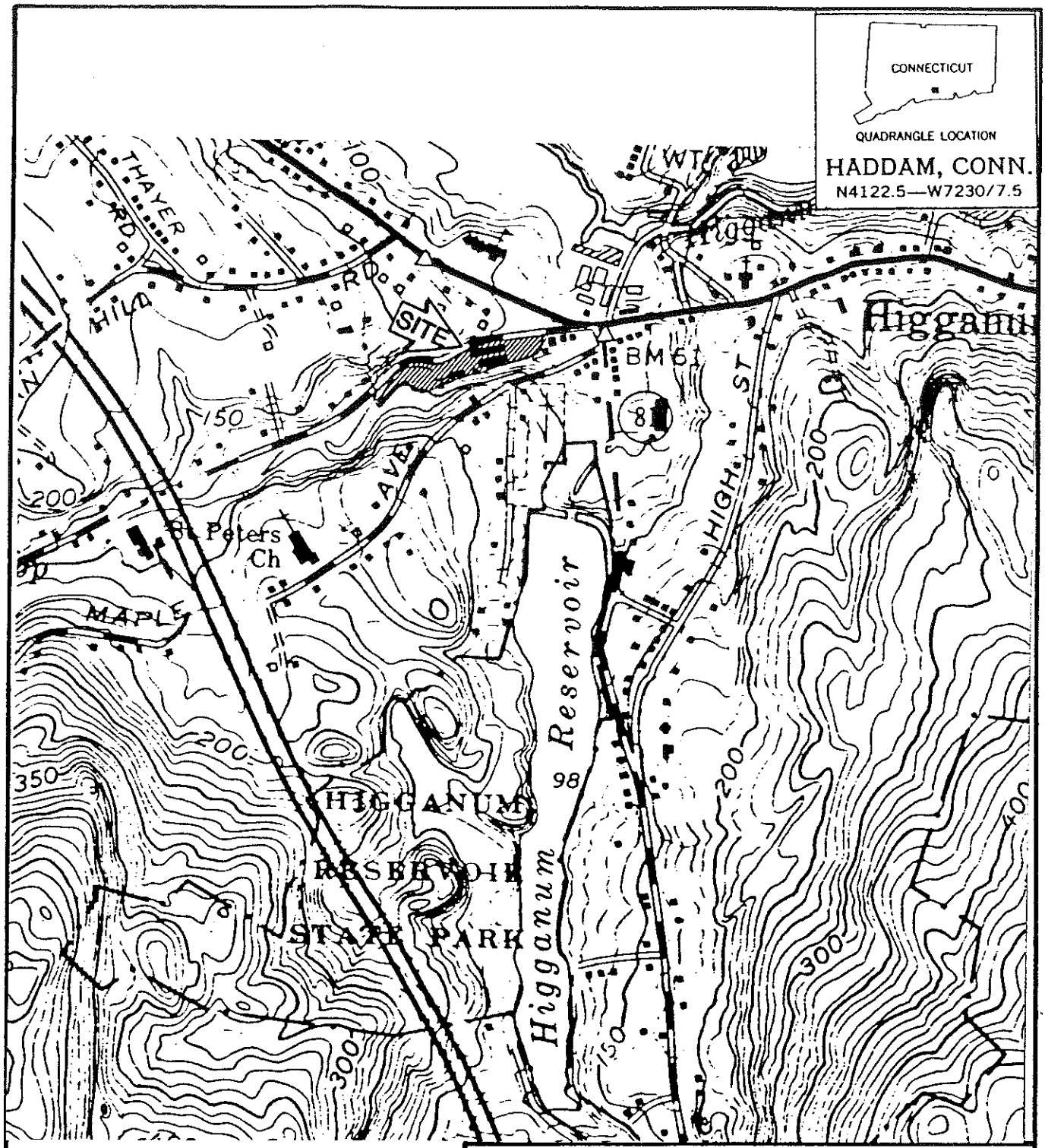

FIGURE 1-1

SITE NO. 25- HIGGANUM (CANDLEWOOD HILL RD.)

LOCATION MAP

CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

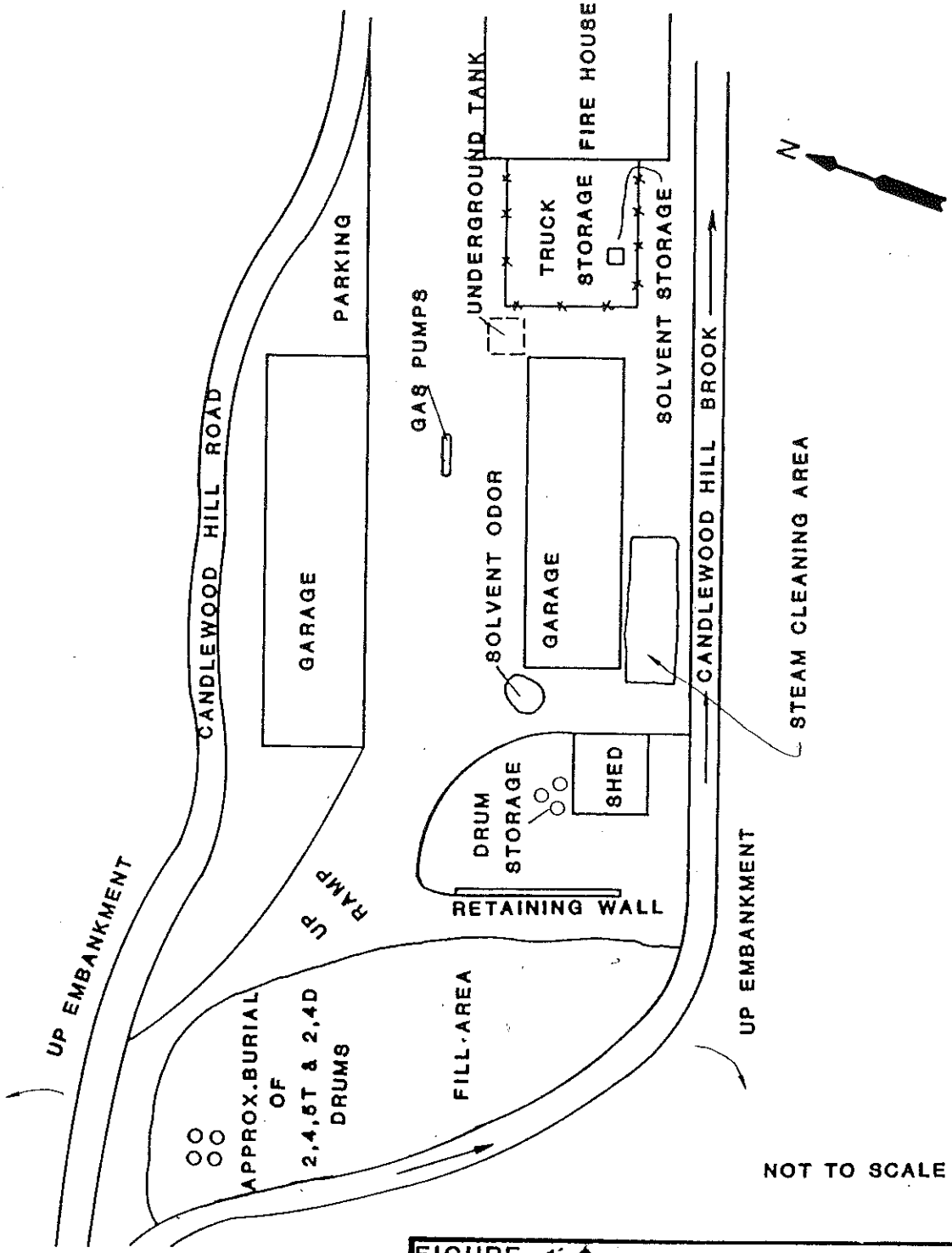

FIGURE 1-2
SITE NO. 25- HIGGANUM
(CANDLEWOOD HILL RD.)
SKETCH MAP

CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

level. The disposal area forms a flat topographic bench at the western end of the site. Nearby hills rise to over 450 feet above mean sea level.

1.2 Site History

Background information obtained from interviews with ConnDOT employees indicates that the Higganum site was established in 1941. A wetland area at the western end of the site was set aside for dumping and landfilling.

It was reported that four to five drums of 2,4-D and 2,4,5-T from ConnDOT's Portland facility were buried at this site in 1975. It is estimated that 2000 gallons of joint sealer was also buried at this site. This is evidenced by a tar-like substance which bubbles to the surface during the summer.

ConnDOT highway crews are no longer stationed at this location but the garages are being used for repair and storage of ConnDOT equipment.

1.3 Site Geology

The Higganum area is dominated by high rounded hills that are cut by relatively narrow stream valleys. Candlewood Hill Brook, Ponset Brook and Higganum Creek occupy narrow valleys that meet in a relatively flat irregular-shaped area at the town of Higganum. Alluvial silt, sand and gravel lie in the stream channels and in flat flood plain areas extending several thousand feet upstream from Higganum. The alluvium has been deposited along the lower valley slopes on outwash terraces consisting of medium-grained sand to coarse-grained, rounded gravel.

A deposit of glacial till blankets most of the adjacent hills. A layer of till (a nonsorted, nonstratified mixture of boulder to clay sized particles) probably underlies the outwash terraces, separating unconsolidated material from the underlying bedrock. The thickness of glacial till deposits ranges greatly from 0 to 100 feet, but the presence of local bedrock outcrops indicates that till below the Higganum site is probably less than 20 feet thick.

Bedrock below the Higganum area is layered to massive Monson gneiss. The formation consists of light to medium gray, medium grained feldspar and quartz with abundant layers of biotite and pegmatite. Groundwater

moves through the gneiss along steeply dipping fractures. Most of the area water supply is provided by wells yielding 5 to 20 gallons per minute from the fractured bedrock aquifer.

The Higganum site is located about 2000 feet west of the junction of Ponset and Candlewood Hill Brook. The western portion of the DOT property in Higganum consists of a landfill. The landfill varies in thickness, with the greatest thickness expected to be 15 feet in the southeast corner. The landfill directly overlies a pond deposit composed of silt, clay and muck, which is expected to be several feet thick. Outwash deposits are not expected to be present beneath the landfill. Glacial till, and/or Candlewood Hill Brook alluvium is expected to underlie the pond deposit, with an anticipated thickness of approximately 10 feet. The till generally has poor permeability and lies directly on the fractured bedrock aquifer.

The ground surface east of the landfill between Candlewood Hill Road and Candlewood Hill Brook has been graded with a thin layer of artificial fill material. The clean fill blankets outwash, alluvium, and till deposits downstream of the site.

1.4 Summary of Previous Investigative Activities

The Connecticut DEP conducted two site investigation at the Higganum site previous to HART's preliminary investigation. The first investigation was conducted in May, 1983, and established the location and extent of the disposal area. The second investigation in June, 1983, included the collection and chemical analyses of a sample of tar oozing from the landfill. The laboratory results indicated elevated concentrations of benzene, ethyl-benzene, toluene, and xylene.

In addition, available background information indicated that on April 4, 1983, ConnDOT conducted an excavation at the site in an attempt to locate buried drums. No drums were found; however, indications were that drums may have been buried in other areas. ConnDOT also requested the collection of soil samples for chemical analyses for 2,4-D and 2,4,5-T. The laboratory results are unavailable.

HART's investigation was initiated in January, 1985. The first phase of this investigation consisted of a site visit to collect background information

needed for a site ranking model. Physical site characteristics were also identified during this visit.

Based on the findings of previous investigations and available background information, HART conducted a geophysical survey and grab sampling program at the site. The geophysical survey, conducted in May, 1985 consisted of a metal detection survey designed to correlate high metallic readings with areas of alleged drum burial. A positive correlation was made and the area was staked and located on the site survey map.

The grab sampling program, conducted in June, 1985, was designed to assess the potential impact of past disposal activities at the site on the surface water quality in Candlewood Hill Brook. One water sample from Candlewood Hill Brook was collected downgradient of the main fill area and analyzed for volatiles, hydrocarbon screening, and pesticide/herbicide screening. No contaminants were detected.

2.0 Field Investigation Plan

2.1 Introduction

Available background information and preliminary field investigations conducted by the Connecticut DEP and HART indicate a potential for buried drums at the Higganum site. The subsequently described field investigation plan has been designed to determine the location and extent of any buried drums at this site.

As previously discussed, a tar-like substance was observed at the site by the Connecticut DEP and characterized as part of a previous investigation. Visual observations will be made to confirm the continuing presence of this material; however, no further investigation of this area is included as part of this work plan.

In order to accomplish the goals of this program, a limited hazardous substance inventory/soil investigation will be conducted. No additional subsurface, local groundwater, or surface water sampling is considered necessary at this time. However, the findings of this investigation may

indicate a need for additional investigative activities in order to further assess the environmental impact of past disposal practices at the Higganum site. HART will submit an addendum to this work plan describing the objectives and methodology of any additional investigative activities.

2.2. Hazardous Substance Inventory/Soil Investigation

2.2.1 Purpose

The hazardous substance inventory/soil investigation will be conducted to provide information on the location and extent of any buried drums at this site.

If buried drums are found HART will proceed as follows:

1. evaluate the condition of the drums,
2. characterize the contents of the drums,
3. determine the impact of the drums on the environmental quality in the vicinity of the burial, and
4. arrange for the proper disposal of the drums.

This information will be used to evaluate the overall

impact of any drum burial on local environmental quality at this site.

2.2.2 Approach

HART will supervise the excavation of test pits at the locations shown on the Field Investigation Activities Map (Figure 2-1). It is anticipated that two test pits will be required for the purposes of this investigation. The exact location and extent of the excavation will depend on field observations made during investigation activities. Test pit locations were selected based on employee interviews and geophysical surveys.

2.2.3 Procedures

New England Pollution Control Co., Inc., (NEPCCO) of Norwalk, CT, will provide the equipment and personnel necessary for the test pit excavations. HART will supervise all excavation activities and log the conditions and characteristics of the fill, waste material and drums. The anticipated depth of excavation is approximately 10 feet. HART will also perform safety monitoring and any sampling needed to

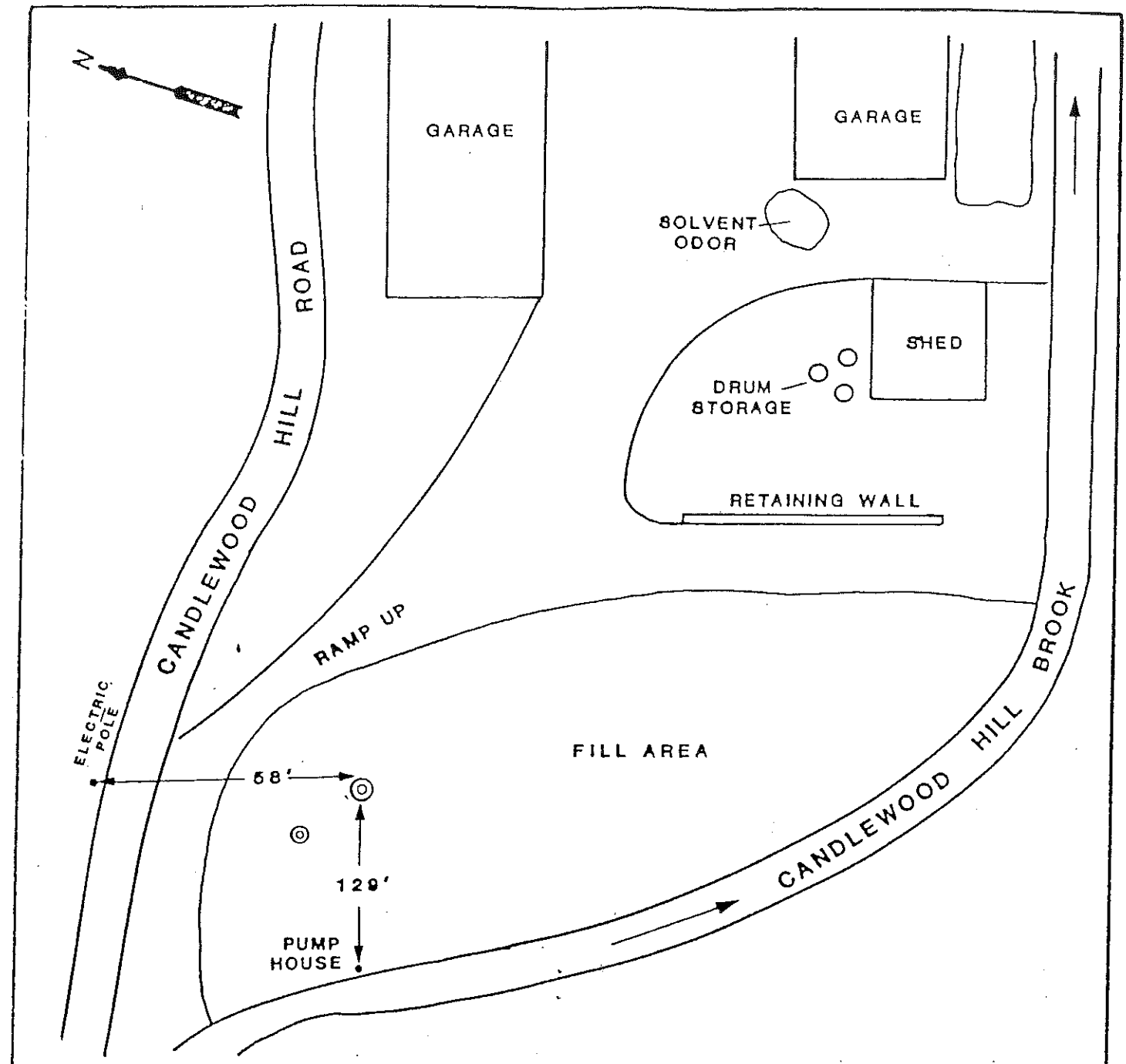

FIGURE 2-1
SITE NO. 25- HIGGANUM
(CANDLEWOOD HILL RD.)
FIELD INVESTIGATION ACTIVITIES MAP
CONNECTICUT DEPT. OF TRANSPORTATION
HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATION

FRED C. HART ASSOCIATES, INC.

define waste and fill characteristics and determine the site remedial response objectives. The location and number of samples, if any, will be based on the results of monitoring and visual inspection of the drums and fill. Sampling, if required, will include drum contents and/or contaminated soil in the vicinity of drum burial. Drum contents will be characterized and drums will be overpacked and staged on-site as per Connecticut DEP regulations. Arrangements will be made through NEPCCO for the transport and disposal of all excavated drums.

2.3 Field Documentation of Investigative Activities

Detailed field documentation will be kept by HART personnel for all test pit excavations and soil sampling activities. Documentation will consist of note taking and photograph records. All field notes will be kept in bound notebooks, with pages sequentially numbered in ink. Photographs will be taken if drums are encountered, in order to record the position, condition and any labels which may be present at the time of excavation.

Information which will be documented includes:

- dates and times of excavation activity, and persons present,

- depth and location of excavation,
- visual observation of fill materials and drum finding,
- sampling procedures and description of materials sampled for drum contents, drum staging and removal activities.

3.0 Site Specific Safety Plan

This safety plan is being presented here as an addendum to our Corporate Health and Safety Program submitted under separate cover. It was developed based on our previous site visits and available background information, and is representative of site specific features and perceived hazards.

The site specific safety plan for the Higganum site is detailed in Attachment 1. All investigative activities at this site will be performed in Level D protection with continuous ambient air monitoring during drilling activities to warn against the sudden release of volatile organics into the air. A sudden significant increase in volatile organic emissions may require immediate withdrawal of site personnel and re-evaluation of protection levels. If non-methane hydrocarbons exceed a continuous 5 ppm at any location, an assessment will be made by the site safety officer regarding the need for respiratory protection. Field team personnel will be equipped with air-purifying respirators with organic vapor/acid gas cartridges.

Based on our preliminary site investigation, the

potential for encountering significant contamination in the form of buried drums at the Higganum site appears to be high and decontamination procedures are expected to be substantial. Any disposable clothing will be containerized for proper disposal and decontamination rinse water will be wasted on-site. A three to four man field team is required to perform all field activities associated with this remedial investigation. Team members and responsibilities are shown in Attachment 1.

4.0 Contingency Plan

4.1 Introduction

The objective of the contingency plan is to minimize hazards to human health and the environment from either fires, explosions or any unplanned releases of hazardous waste into either the air, soil, or surface water that may occur during site activities. In the event that either a fire, a spill or another emergency situation develops, the site safety officer will be responsible for coordinating all emergency response measures. This person has the authority to commit all resources necessary to carry out the contingency plan.

4.2 Implementation of Contingency Plan

In case of an emergency situation, the site safety officer has full authority to make the decision concerning the implementation of the contingency plan. Depending on the degree of seriousness, the following potential emergencies might call for the implementation of the contingency plan at the Higganum site.

4.2.1 Fire

It is unlikely that a fire will occur at this site as a result of investigation activities. However, in the event that a fire does occur, the site will be evacuated. If possible, "clean" soil from an adjacent area will be placed on the affected area with a backhoe.

4.2.2 Air Contamination

Air contamination resulting from site investigation activities would most likely result from the sudden release of volatile organic hydrocarbons during excavation activities. Since all subsurface activities will be continuously monitored with portable instrumentation, such a release would be documented immediately. In case of such an occurrence, an assessment will be made by the site safety officer concerning the need for respiratory protection. Depending on the duration and concentration of any contamination release, additional sampling might be required to further characterize the contamination prior to continuing site activities.

4.3 Emergency Response Procedure

- Any employee either discovering or causing a nonacute situation must immediately contact the site safety officer.

- The site safety officer in conjunction with the HART Team Leader will take all necessary measures to contain the hazard and to prevent its spread to the environment and to adjacent homes.

- The site safety officer in conjunction with the HART Team Leader will assess the situation and contact the appropriate personnel to respond to the emergency situation.

- Safety measures will be taken to ensure maximum protection of emergency personnel and will include the use of appropriate protection equipment.

- All nonemergency personnel will be removed from the hazard area until the hazard has been contained and controlled.

- Following containment and control of the emergency the site safety officer will

assess the situation to determine if all contaminated wastes generated by the emergency personnel have been collected and disposed of on-site.

- The site safety officer in conjunction with the HART Team Leader will ensure that all emergency equipment is restored to full operational status by the emergency personnel.

- The site safety officer in conjunction with the HART Team Leader will investigate the cause of the emergency and will take steps to prevent a reoccurrence of such an incident.

- The site safety officer will notify ConnDOT and the Connecticut DEP.

- If necessary, the site safety officer will submit a written report of the incident to ConnDOT and/or the Connecticut DEP.

5.0 Quality Assurance/Quality Control Plan

5.1 Project Description

As described in Section 2 of this work plan, HART will conduct a field investigation/feasibility study at the Higganum disposal site in order to assess site impacts to human health and environment. This investigation is also designed to determine the location and extent of any buried drums, characterize and evaluate the migration potential of suspected contamination, and evaluate any remedial alternatives required to alleviate a possible contamination problem.

Hart conducted a preliminary site investigation and grab sampling program in May, 1985, to assess the immediate and significant hazards posed at the site, and to better define the requirements and goals of this field investigation. A metal detection survey conducted as part of this preliminary investigation confirmed the presence of significant buried metal at the site. Surface water samples from the Candlewood Hills Brook showed no contamination.