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ROY F. WESTON, INC.

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INSTALLATION RESTORATION PROGRAM

PHASE II – SITE INSPECTION

WORK PLAN

for

Naval Weapons Station Earle
Colts Neck, New Jersey

September 1991
Revised April 3, 1992

Prepared by

Roy F. Weston, Inc.
1 Weston Way
West Chester, PA 19380-1499

W.O. No. 1771-15-04

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SECTION 1

INTRODUCTION

1.1 U.S. NAVY INSTALLATION RESTORATION PROGRAM

1.1.1 Program Origin

The Navy Assessment and Control of Installation Pollutants (NACIP) Program was promulgated by OPNAV NOTE 6420, SER 45/733503 of 11 September 1980 and by Marine Corps Order 6280.1 of 30 January 1981. The objective of the NACIP Program was to protect human health and the environment by identifying, assessing, and controlling contamination resulting from past operations involving hazardous materials on Navy lands. The NACIP Program has been replaced by the Navy's Installation Restoration Program (IRP).

1.1.2 Program Organization

The IRP has been developed as a four-phase program as follows:

- Phase I — Preliminary Assessment (PA), formerly known as the Initial Assessment Study (IAS) — identifies possible contamination sources through records searches, personnel interviews, and site visits. The purpose of the PA is to evaluate the seriousness of the hazardous substance release, or threat of release, and to recommend additional response actions at the site. No action need be taken if available data indicate there is no threat or potential threat to public health or the environment. Alternatively, the best response action may be an immediate removal of the threat or potential threat. The PA, therefore, establishes the priority for scheduling a Site Inspection by characterizing a site.

- Phase II — Site Inspection (SI), previously known as the Confirmation Study (CS) — supplements the information gathered during the PA, eliminates from further consideration those releases that pose no threat to public health or the environment, and determines the potential need for remedial action. The SI also collects or develops additional data.

- Phase III — Remedial Investigation/Feasibility Study (RI/FS), previously a part of the Corrective Measures (CMs) — performs extensive on-site

investigations, including physical and analytical monitoring, to quantify the extent of the problem and to develop alternatives for possible corrective measures.

- Phase IV — Remedial Action Plan (RAP), within which remedial actions to control and mitigate confirmed contamination are evaluated and implemented.

1.2 LONG-RANGE OBJECTIVES OF THE IRP

The long-range objectives of the IRP at Naval Weapons Station Earle (NWS Earle) are to accomplish the following:

- Assess the extent and magnitude of contamination at past hazardous waste disposal and spill sites.
- Develop remedies consistent with the National Contingency Plan (NCP) for those sites that pose a threat to human health or the environment.

1.3 OBJECTIVES OF THE CURRENT SI EFFORT

This Work Plan describes the scope of work for SI activities for 14 of the 16 SI sites identified at NWS Earle. Two sites, Site 14, Defense Property Disposal Office (DPDO) warehouse, and Site 28, Waste Oil Tank, Building C-16, have been excluded from the current SI sampling effort based on the following rationale. Cleanup efforts were conducted at both sites and sampling has occurred at Site 28. Although no formal SI activities are required at either of these sites, the Agencies have requested that they be addressed in the SI Work Plan and report.

The sites that were identified during the previously conducted IAS and that will be addressed during the SI are:

Site No.	Site Title
1	Ordnance Demilitarization Site (ODS), Secured
6	Landfill west of Normandy Road
8	Landfill east of S-186
9	Landfill southeast of "P" Barricades
12	Battery Storage and Handling Area
13	Defense Property Disposal Office Yard (DPDO Yard)
14	Defense Property Disposal Office Warehouse (DPDO Office)
15	Bilge Water Disposal Site near Waterfront South Gate
16	Fuel Line Connecting Buildings C-19 and C-50
17	Disposal Site Behind Training Barge, Waterfront
23	Paint Chip Disposal Area near Building F-5
24	Closed Pistol Range
25	Closed Pistol Range — Treated Rail Ties
27	Projectiles Refurbishing Area
28	Waste Oil Tank, Building C-16
29	PCBs Spill Site

The primary objective of the SI effort, as described in this Work Plan, is to:

- Confirm the absence or presence of contamination at sites identified by the Initial Assessment Study, Fred C. Hart and Associates, Inc., 1982.
- Classify the sites into two categories:
  - No Action — those sites that pose no threat to public health or the environment.
  - Potential Action — those sites where further investigation is necessary to determine the extent of contamination and the recommended action.

1.4 SI PLANNING DOCUMENTS

1.4.1 SI Work Plan

This Work Plan has been developed apart from the RI Work Plan to address the scope of work specifically related to the SI sites at NWS Earle. It is based on the information included in the Initial Assessment Study (IAS) prepared by F.C. Hart and Associates, Inc. in 1982. In addition, regional information and stationwide data were also obtained from the

"Draft Report for Naval Weapons Station Earle, Colts Neck, New Jersey, Installation Restoration Program Phase II Confirmation Study," prepared by Roy F. Weston, Inc. (WESTON®) in September 1986 and the "Draft Report of Current Situation and Draft Plan of Action," prepared by WESTON in December 1988. These documents have been submitted to the Navy, the New Jersey Department of Environmental Protection and Energy (NJDEPE), and the U.S. Environmental Protection Agency (EPA). A draft of this Work Plan was submitted to NJDEPE and EPA Region II office in November 1989. The Agency's comments on the November 1989 draft have been addressed under separate cover and are also incorporated into this version of the SI Work Plan (September 1991).

1.4.2 Quality Assurance Project Plan

WESTON will prepare a separate Quality Assurance Project Plan (QAPP) for the field activities, sampling, analytical, and data handling, associated with the SI. The QAPP will be consistent with the standard procedures of WESTON's approved laboratory and the requirements of Naval Energy and Environmental Support Activity (NEESA) for analytical methods. Field sample collection and laboratory analyses will be documented in accordance with WESTON's standard chain-of-custody procedures. The QAPP will address the following areas:

- Quality assurance (QA) objectives for data precision, accuracy, completeness, representativeness, and comparability.
- Sampling and laboratory procedures.
- Protocols for field data collection activities such as geophysical surveys, soil investigations, drilling, well construction and installation, and site management.
- Sample custody.
- Instrument calibration procedures, references, and frequencies.
- Internal quality control (QC) checks and frequencies.
- QA performance audits, system audits, and frequencies.

- QA reports to management.
- Preventive maintenance procedures and schedules.
- Specific procedures to routinely assess data precision, representativeness, comparability, accuracy, and completeness for specific parameters.
- Data reporting and handling.
- Corrective actions.

1.4.3 Health and Safety Plan

WESTON will also develop a separate site-specific Health and Safety Plan (HSP)/Site Security Plan for the SI. The HSP will be consistent with the following:

- EPA Order 1440.1 — Respiratory Protection.
- EPA Order 1440.3 — Health and Safety Requirements for Employees Engaged in Field Activities.
- EPA Occupational Health and Safety Manual.
- Other appropriate EPA guidance.
- Applicable standards of the Occupational Safety and Health Administration (OSHA).
- EPA Interim Standard Operating Guide (September 1982).

The HSP will include the following elements:

- Proposed dates of investigation (tentative and final).
- Types of activities.

- Site-specific concerns including:
  - Apparent levels of hazards (serious, moderate, low, none, or unknown) with notes.
  - Types of facilities (impoundment, dump, landfill, open, enclosed, or other).
  - Status of facilities (active, inactive, or unknown).
  - Waste types (gas, liquid, sludge, solid, unknown, or other).
  - Waste characteristics (toxic, corrosive, ignitable, volatile, radioactive, reactive, unknown, or other).
  - Types/forms of hazards (dust, liquid, fume, vapor, contact, respiratory, or other) and levels dangerous to life and health.
  - Levels of protection (A, B, C, D, and any modifications).
  - Surveillance equipment (explosimeter, oxygen detector, Draeger pumps and tubes, organic vapor analyzer, and photoionization detector).
- Histories of site activities.
- Hazard evaluations.
- Safety logistics including, where applicable:
  - Team size (contractor, client, regulatory, other) and designation of team leader and safety officer.
  - Team briefing date and time.
  - Contamination control area locations (initial and alternate).
  - Command post locations (initial and alternate).
  - Hot-line locations (initial and alternate).
  - Personnel decontamination stations.
- Emergency precautions including:
  - Acute exposure symptoms and associated first aid.
  - Hospital/poison control centers (addresses, telephone numbers).

- Emergency transportation systems (fire, police, ambulance).
- Emergency routes for medical evacuation.

The Site Security Plan has as its objectives the protection of the community and workers from potential endangerment, the protection of site conditions from further degradation due to vandalism or criminal action, and the protection against vandalism and theft of any equipment required to be kept on site. The Site Security Plan has been incorporated into the HSP and delineates efforts required to secure operations at the site.

SECTION 2

BACKGROUND

2.1 STATION PROFILE

2.1.1 Description of Station, History, and Current Organization

NWS Earle is located on 11,134 acres of land in the communities of Middletown, Colts Neck, and New Shrewsbury in Monmouth County, New Jersey (see Figure 2-1). Other nearby communities (within 10 miles) include Neptune, Ocean, Farmingdale, Freehold, Eatontown, Atlantic Highlands, and Holmdel. The nearest major commercial jet airport is located in Newark, 55 miles to the north. Access to the main entrance of NWS Earle is provided via U.S. Route 34.

NWS Earle was commissioned as a Naval Ammunition Depot on 13 December 1943. Its primary responsibility is to furnish ammunition to the fleet. The major consideration in the original selection of the station's location was its proximity to New York City. The station provided ships, particularly those in convoy during World War II, and the Navy needed the ability to receive ammunition without delay. This ability was enhanced by the accessibility of Raritan Bay and the interconnected commercial rail facility with lines coming from the west, where the majority of ammunition shipments originated.

Ordnance, the station's major department, coordinates all port services and logistic support to visiting and homeported ships, conducts safety inspections, supervises ammunition loading for the United States Coast Guard, and provides an afloat firefighting capability and standby tug services.

The Ammunition Distribution and Control Division, in concert with the Production Planning and Control Division, ensures that a balanced, purified stock of ammunition is maintained in support of Navy, Coast Guard, and Marine programs.

The Operations Division performs all ammunition movement and ship loading. Additionally, obsolete ammunition is demilitarized. The Operations Division also recycles reclaimable components and renovates various types of ammunition.

The ASW and Special Weapons Divisions plan and carry out station-level maintenance of air and antisubmarine weapons and provide shore-based support to various commanders.

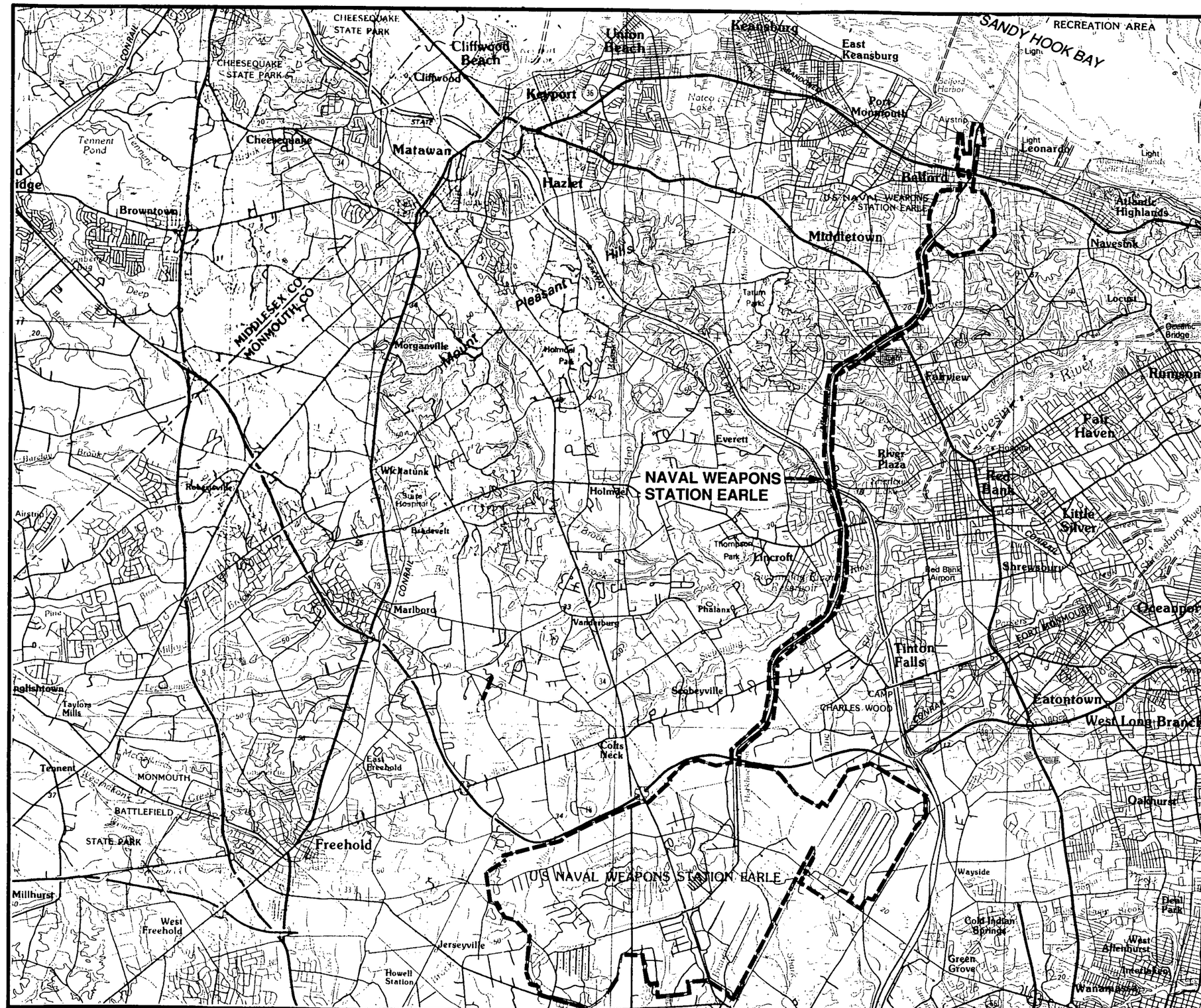
The Port Services Division operates the station fireboat, service craft, and oil pollution containment equipment in addition to providing coordination of a full range of port services for visiting and homeported vessels. The land and associated facilities of NWS Earle are currently used to support the strategic mission of the station.

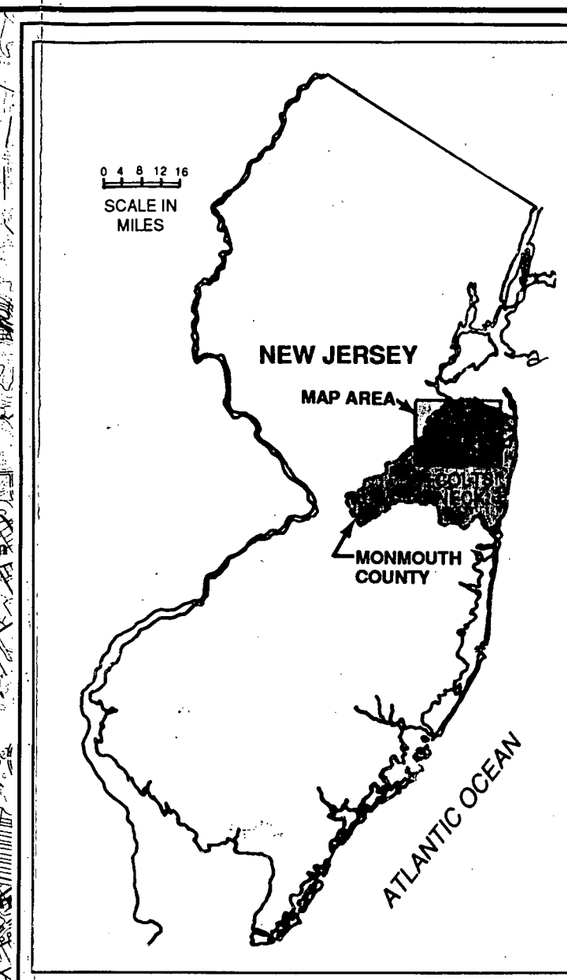
2.1.2 Physical Facilities

2.1.2.1 Wastewater Treatment and Collection Systems

The Mainside and Waterfront Administrative areas are served by separate wastewater collection systems. The treatment plant and collection system at the Mainside were constructed in the early 1940s. The design capacity of the plant was originally rated at 370,000 gpd, but studies in 1988 indicated a capacity of 250,000 gpd with regard to current effluent standards. Since that time, the plant has been improved by upgrading the sand filters and installing a dechlorinator to meet the most recent NJDEPE standards for effluent discharge into Hockhockson Creek. Flows to the plant have averaged about 90,000 gpd in recent years. Since connecting 500 new family housing units to this system, flows now average about 205,000 gpd. With the recent upgrading, the plant is considered adequate to serve the Administrative area, including the 500 new family housing units.

The Township of Tinton Falls has not yet reached its wastewater flow limit established by NEMSA. Additional capacity of the entire sewer system is expected to be available by June 1991.





NORTH

5000 0 5000 10000 15000

SCALE IN FEET

1000 500 0 1000 2000 3000 5000

SCALE IN METERS

Source: Base map adapted from USGS 30x60 Minute Series maps (100,000), Trenton, NJ, PA - NY quadrangle, dated 1984.

NAVAL WEAPONS STATION EARLE
COLTS NECK, MONMOUTH COUNTY
NEW JERSEY

FIGURE 2-1
REGIONAL SITE MAP

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Sewage flows at the Waterfront are pumped from the administrative area and pier/trestle complex to a Township of Middletown Sewerage Authority (TOMSA) interceptor and then to the TOMSA Treatment Plant. Sewage from the administrative area flows in a gravity sewer system to a central wastewater pumping station in Building R-14.

Sewage from ships berthed at the pier/trestle complex and buildings on the piers is collected by the Ship Waste Water Collection Ashore (SWWCA) system, which consists of gravity sewers flowing to a series of pumping stations that convey flows to a central pumping station in Building S-63. From the central booster station, flows are conveyed in an 8-inch force main to the TOMSA interceptor. An existing aerator tank adjacent to Building R-22 is currently unused. Sources of information include Wallace, Roberts and Todd, Master Plan, January 1991.

Storm drainage at NWS Earle ultimately discharges to the Swimming River, the Shark River, or the Manasquan River.

2.1.2.2 Water Supply and Distribution Systems

NWS Earle is served by two different water distribution systems, one at the Mainside and one at the Waterfront. Until recently, the Mainside administrative complex was served by two on-site wells, a water treatment plant, and four reservoir tanks. A second water distribution system at the Mainside serves the M Group area west of Highway 34, including MOMAG Unit Three, the Special Weapons area, and M Group magazines. This area is primarily served by a 130-gpm, 350-foot-deep well with booster pumps to a 300,000 gallon water tank.

In 1989, in anticipation of construction of family housing units which approximately doubled water consumption at the Mainside, the New Jersey-American Water Company (NJAWC) installed a 16-inch water main which enters the Station from the east end of Esperance Road near Gate 24 and extends along Esperance Road to Highway 34. Thus, the Mainside Administrative area including family housing is now served by public water rather than on-

site wells. The water is piped to the existing reservoir, which consists of four 250,000 gallon underground storage tanks. NJAWC has negotiated an easement from NWS Earle to extend the new water main along Esperance Road, across Highway 34, and through the ordnance areas to the western portion of Monmouth County.

The Waterfront is also served by public water supplied by NJAWC at two separate locations; a connection near the Main Gate off Highway 36, and a second connection near the wave tank. After metering, water flows from a 2,700,000 storage tank located on Chapel Hill through separate water mains to the administrative core and the pier/trestle complex. The administrative core is tied into a 12-inch main which is sufficient to meet existing and projected needs. The pier/trestle complex is served by a 6-inch main which should be replaced by a 12- to 16-inch main to adequately serve future homeporting requirements.

In total, water consumption at NWS Earle is approximately 225,000 gpd at the Mainside and 200,000 gpd at the Waterfront. NJAWC is planning to expand their capacity to meet current and future demand in the region.[1] The main NJAWC treatment plant at Swimming River has a current capacity of 24 mgpd. An additional 6 mgpd is supplied by the Neptune plant and 6 mgpd by the Jumping Brook plant to provide a total capacity of 36 mgpd. The Jumping Brook Plant, which went back on line in April 1990, will eventually increase its capability to 30 mgpd which will boost overall capacity substantially. OM base supply wells were used in the past.

The inactive supply wells for the station are screened in the Cretaceous Englishtown deposits, with total depths from 240 to 480 feet below ground surface (BGS). Potential well yields range up to 410 gallons per minute (gpm) in the large-diameter wells. All wells combined could in the past supply 720,000 gallons per day (gpd) to the station. Figure 2-2 shows the locations of inactive water supply wells at NWS Earle.

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[1]Patty Gannon, Construction Department, NJAWC, personal communication.

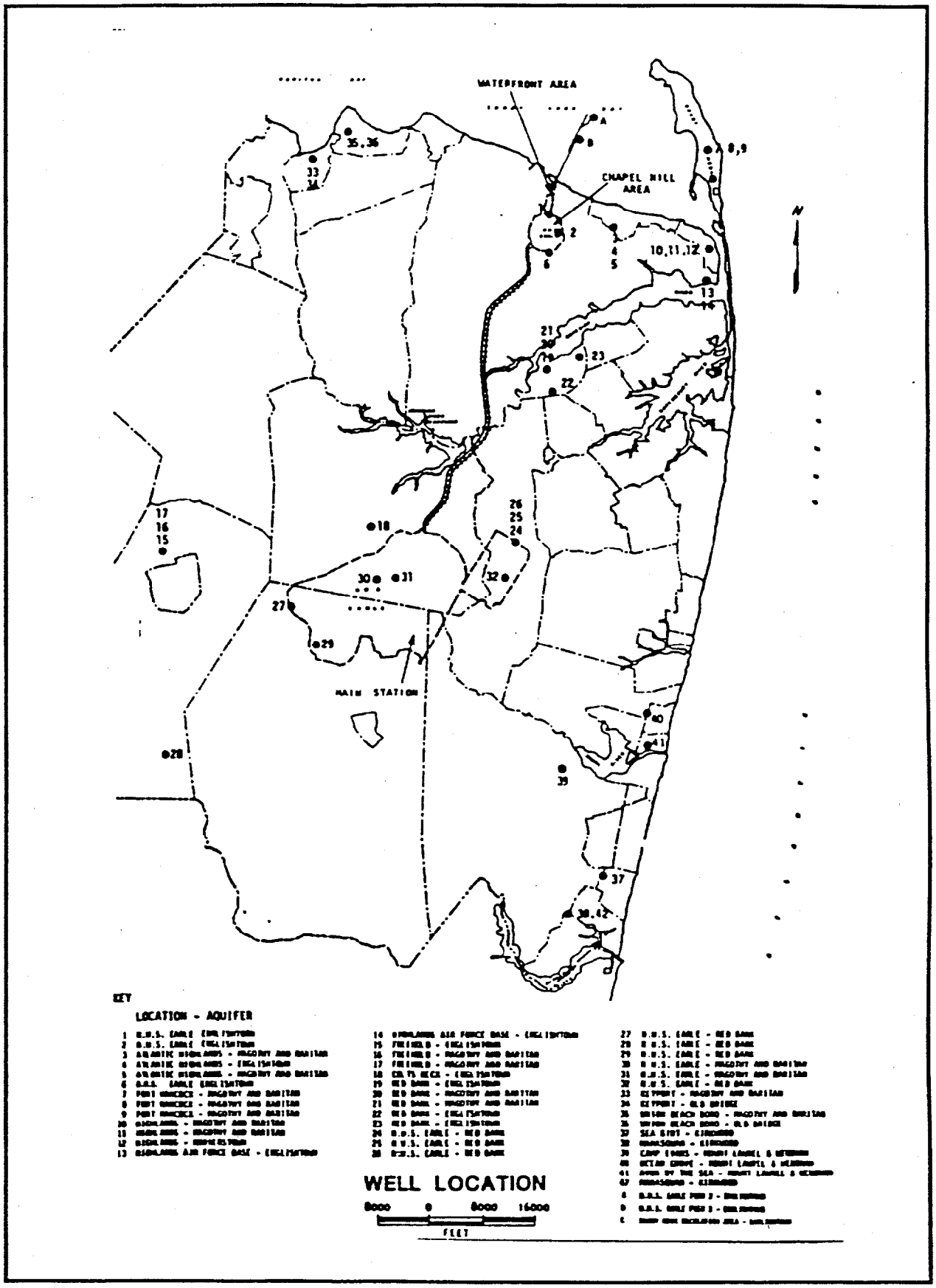


FIGURE 2-2 INACTIVE PRODUCTION WELLS, NORTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND NWS EARLE, COLTS NECK, NJ

Sources of information include NWS Earle personnel, the United States Geological Survey (USGS) office in Trenton, New Jersey, and Wallace Roberts and Todd, Master Plan, NWAS Earle, January 1991.

2.1.3 Past Waste Management Practices

Past activities in support of munitions maintenance operations at NWS Earle have resulted in the disposal of wastes, including solvents, paint strippers, and paint chips. The total quantity of the wastes is unknown; however, crude estimates are reported in the Hart and Associates IAS (Hart and Associates, Inc., 1982). In addition to the industrial wastes, outdated munitions were disposed of through controlled burning and/or detonation. Past industrial waste was disposed of along with domestic refuse. Controlled burning of the waste in trenches preceded burial at some disposal sites.

Currently, station refuse is disposed by contract collection. The refuse is directed to the county-managed Monmouth County Reclamation Center in Tinton Falls. The center consists of a combined recycling center and landfill.

2.1.4 Previous Investigations

Previous subsurface and water quality investigations at NWS Earle have focused on identifying, evaluating, and quantifying the hazards at several sites. Those investigations are briefly reviewed in the following subsections.

2.1.4.1 Phase I Study

The Phase I IAS, submitted to the Navy in 1983, identified 29 sites at NWS Earle. The IAS recommends that only four sites be considered for further investigation. Additional sites were selected by the Navy during consultation with NJDEPE and EPA. These additional sites brought the number of sites identified for further investigation to 11. These 11 sites have been investigated through a Phase II confirmation study, and the planning documents

for the Phase III RI/FS study have been submitted to EPA and NJDEPE. Two of the 18 sites not previously recommended are currently being investigated under a RCRA investigation. The remaining 16 sites are the subject of this SI.

These 16 sites are listed in Table 2-1, along with the contaminants identified through the site descriptions provided in the IAS, field examination by NJDEPE, and field observations made by WESTON. The dates of operation or date of the spill, if any occurred, are provided in Table 2-1. These dates were obtained from the IAS. Figures 2-3 and 2-4 show the locations of the 16 sites to be investigated during this SI.

2.1.4.2 Phase II Study

The CS for 11 other sites at NWS Earle was submitted by WESTON in December 1986. Field work for the Phase II study was performed between October 1984 and January 1986. The Phase II field investigations included surface geophysics (ground penetrating radar and magnetometry) at selected sites, power auger borings for soil sampling and subsurface characterization, exploratory drilling and installation of 29 permanent monitor wells, groundwater and surface water sampling and analysis, and sediment sampling and analysis of selected streams and ditches.

Field investigations and their results are described in detail in the reports "Interim Report, Confirmation Study to Determine the Existence and Possible Migration of Specific Chemicals In Situ, NWS Earle, Colts Neck, New Jersey," (WESTON, 1986), and the "Report of Current Situation, Draft Plan of Action, NWS Earle, Colts Neck, New Jersey."

2.1.4.3 Phase III Study

The RI Work Plan for the 11 sites at NWS Earle was submitted in January 1991. Field work for the Phase III study was initiated in January 1991. The Phase III study included surface water, sediment, and subsurface soil sampling and the installation of 26 additional monitor wells. The first round of groundwater sampling from all 55 monitor wells was

Table 2-1

Past Use of SI Sites
NWS Earle, Colts Neck, NJ

Site No.	Site Name	Size	Period of Use	Past Land Use
1	ODS, Secured	6 acres	1943-1975	Burn area (ordnance disposal site).
6	Landfill West	4 acres	1943-1965	Landfill for possible municipal and industrial solid waste.
8	Landfill East	1 acre	1943-1965	Landfill (dunnage lumber).
9	Landfill Southeast	3 acres	1967-1972	Landfill/burn area (dunnage lumber).
12	Battery Storage and Handling Area	< ¼ acre		Battery storage and handling.
13	DPDO Yard	Unknown	Unknown	Storage yard (scrap metal, forklift batteries, transformers, vehicles).
14	DPDO Office	16,000 sq ft	1970	Warehouse (DPDO).
15	Bilge Water Disposal Area	Unknown	1970s	Railsiding where ship bilge water was dumped from rail cars.
16	Fuel Line, Bldg C-19-C-50	500 sq ft	1977	Diesel fuel line in railroad yard.
17	Disposal Area Behind Training Barge, Waterfront	Unknown	Active	Landfill for possible municipal and debris, empty drums).

Table 2-1

Past Use of SI Sites
NWS Earle, Colts Neck, NJ
(continued)

Site No.	Site Name	Size	Period of Use	Past Land Use
23	Paint Chip Disposal Area	200 sq ft	1970s - present	Disposal area (paint chips).
24	Closed Pistol Range	3-4 acres	Unknown	Closed pistol range.
25	Closed Pistol Range - Treated Rail Ties	3-4 acres	Unknown	Closed pistol range.
27	Projectiles Refurb. Area	500 sq ft	1940s - present	Projectiles refurbishing area (blasting shot, paint chips).
28	Waste Oil Tank, Bldg C-16	490 sq ft	1982(?)	Waste oil tank (UST). Since closed.
29	PCBs Spill Site	0.4 acres	1977	PCBs spill site.

conducted in March 1991. The second and third rounds of sampling occurred in November and December 1991.

Field investigations and their results are described in detail in the draft report of the Phase III RI of the 11 sites, which was submitted to the Navy and the Agencies in March 1992.

2.2 SITE-SPECIFIC BACKGROUND

Table 2-1 summarizes the information gathered from earlier IAS investigations for each of the sites to be included for further work during the SI. For more information on each site, refer to the Phase I report (Hart and Associates, Inc., 1982). Approximate site outlines, locations of sampling points, and the locations of cultural features are shown in the site maps provided in the site-specific scope of work (see Section 5).

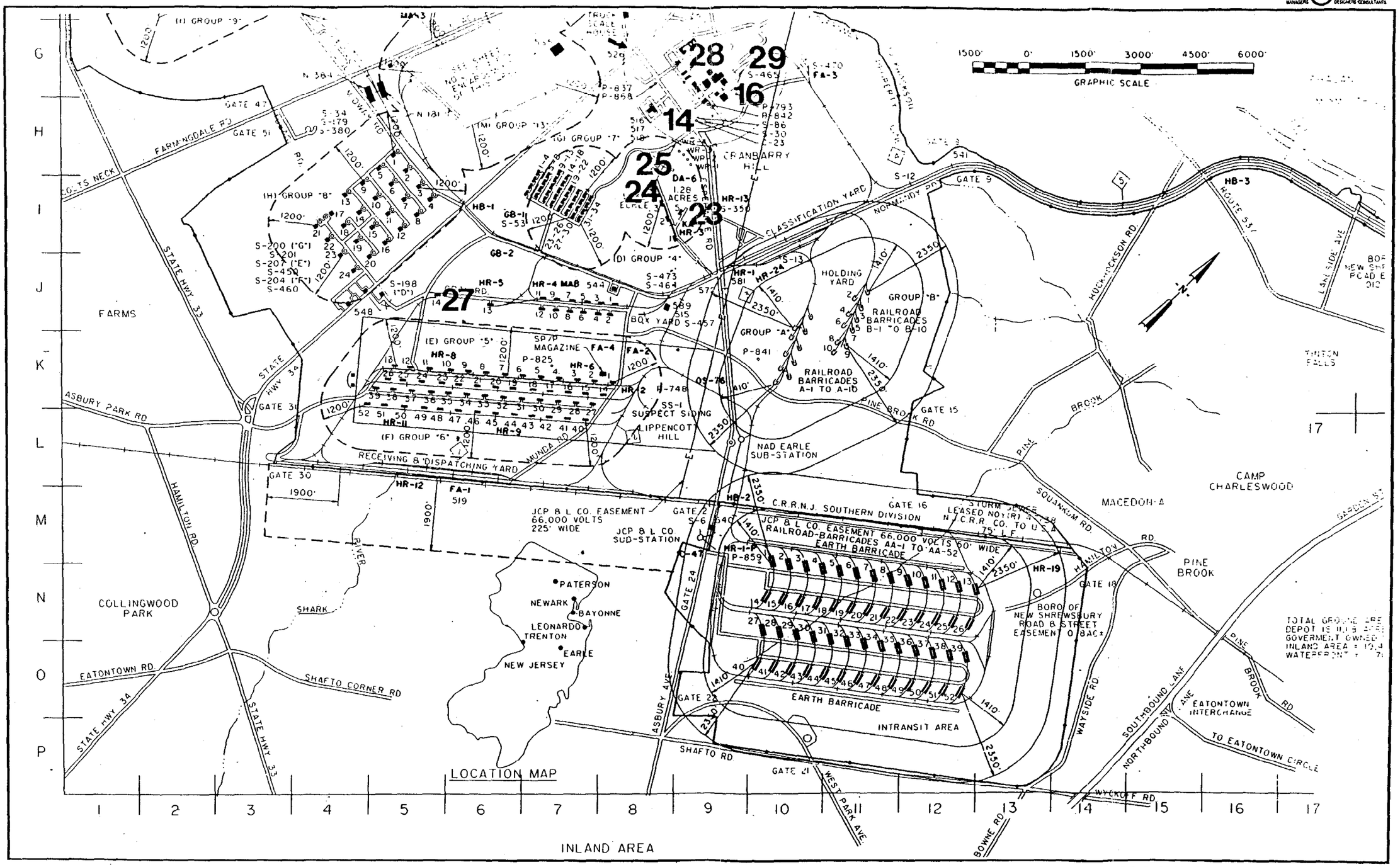


FIGURE 2-3 MAP SHOWING SITE LOCATIONS-MAIN BASE AREA, NWS EARLE, COLTS NECK, NJ

00207AB2Z

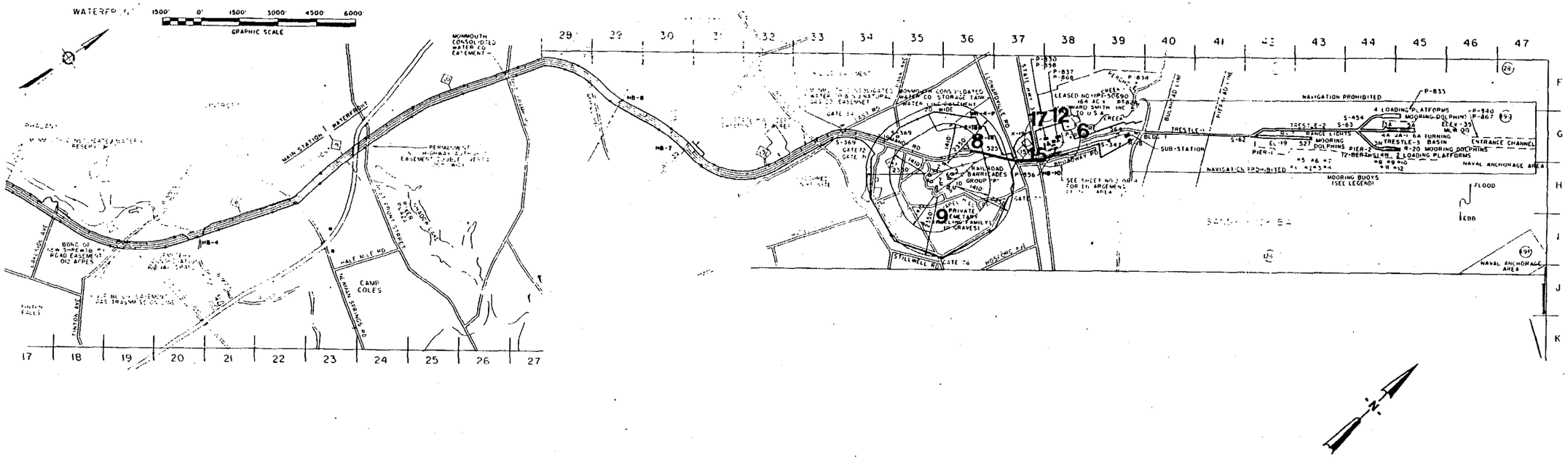


FIGURE 2-4 MAP SHOWING SITE LOCATIONS WATERFRONT AREA NWS EARLE, COLTS NECK, NJ

SECTION 3

ENVIRONMENTAL SETTING

3.1 PHYSICAL ENVIRONMENT

3.1.1 Physical Geography

NWS Earle is located in the Coastal Lowlands of Monmouth County in eastern New Jersey. This area falls within the Atlantic Coastal Plains Physiographic Province, approximately 6 miles inland from the Atlantic Ocean.

The station is divided into three physically separate areas, the largest being the Main Base (10,428 acres), and the smaller being the waterfront and Chapel Hill areas (706 acres, combined).

The Main Base lies within the Outer Coastal Plain, a relatively flat area with little topographic relief, except for the Hominy Hills. The Hominy Hills are a northeast-trending set of low hills near the center of the Main Base. Elevations range from approximately 100 to 300 feet above mean sea level (MSL).

The waterfront area is on the southern coast of Sandy Hook Bay, an inlet on New Jersey's Atlantic coastline. This area is known as the Bayshore Lowlands. The waterfront property occupies a long strip of land perpendicular to the shore. Much of the area is swamp or tidal marsh, with areas of manmade land (fill). Average elevation is approximately 10 feet above MSL.

The Chapel Hill area is approximately 1 mile inland and is connected to the waterfront area by private road and rail line. It occupies a polygonal plot of land, roughly circular in outline. The Chapel Hill area falls within the Highland-Mt. Pleasant Hills area and has the most topographic relief of NWS Earle. The Highland-Mt. Pleasant Hills form the drainage divide between the Inner and Outer Coastal Plains. Average elevation is approximately 100

feet above MSL. The Chapel Hill area contains the topographic high point of the area, at the High Point Chapel, approximately 200 feet above MSL.

3.1.2 Climate and Air Quality

The Main Base area is characterized by a predominantly continental climate with significant seasonal and daily temperature fluctuations. High humidity occurs frequently along the coast and less frequently inland. Freezing temperatures occur intermittently from October to April. The average first frost occurs on October 17, and the average last frost occurs on April 24, allowing for an average growing season of 198 days. The average annual precipitation is 44.67 inches at Long Branch and 41.82 inches at Newark. The annual peak daily rainfall (1- year, 24-hour) is greater than 2.5 inches. The mean annual temperatures at the Long Branch and Newark meteorological stations are 56.2°F and 45.2°F, respectively (Table 3-1).

Because of its location near the coastline, Monmouth County is subject to easterly storms throughout late summer and early fall, causing high tides and flooding. Intense tropical hurricanes occasionally sweep the coast. The winter is characterized by storms that move along the eastern seaboard. The storms from the north are associated with high winds and precipitation in the form of snow, ice pellets, or rain; however, the snow is seldom prolonged and generally results in little accumulation.

Spring is a period of contrasting weather, particularly during April. Spring and autumn are periods of frost. Summer is warm and humid with occasional showers and thunderstorms. Ground fog is a frequent weather occurrence in the summer, especially during the early morning hours. Autumn is a season of comfortable temperatures (average temperatures range from 50° to 60°F) and generally pleasant weather.

During the period of the RI (January through December 1991), the weather was marked by warm winter months and generally low precipitation. Site groundwater levels dropped significantly between the initial monitor well installation at the start of the year to the

Table 3-1

Representative Meteorological Data
NWS Earle Region*

Month	Temperature (°F) Daily Maximum	Daily Minimum	Monthly Average
January	38	24	31
February	40	25	33
March	49	33	41
April	61	43	52
May	72	53	62
June	81	62	72
July	86	68	77
August	84	67	76
September	77	59	68
October	66	48	57
November	54	39	47
December	42	29	36

*Daily maximum, minimum, and average temperatures by month for the 1951 to 1980 period of record at the Newark International Airport (U.S. Department of Commerce, 1978) (Local Climatological Data, 1989 Annual Summary with Comparative Data, NOAA, National Climatic Data Center).

groundwater sampling at the end of the year, at which point several of the originally installed wells were dry.

Winds are highly variable in the NWS Earle area. The dominant winds are from the northwest during the winter and early spring. Onshore winds predominate during the spring and summer.

Although the climate of a large area in and around NWS Earle can be described generally, the microclimates, or climates in small areas, may differ from the general climate of the area. For example, temperature, wind velocity, light, and humidity on the Main Base are quite different from the conditions at the waterfront due to the influence of the bay. Therefore, plants and animals that may not seem suited for the general climate may indeed be present but are restricted to the microclimate created by the unusual environmental conditions of a specific location.

NJDEPE maintains and operates air quality monitoring instrumentation at Freehold and Asbury Park in Monmouth County. The NJDEPE also samples for particulates at Asbury Park, Brielle, Millstone Township, and Red Bank in Monmouth County. All of New Jersey is classified as a nonattainment area for ozone. Carbon monoxide (CO) concentrations in Freehold exceeded the 9-ppm, 8-hour average primary standard (National and New Jersey Ambient Air Quality Standards) twice in 1980 (10.8 and 9.4 ppm CO). Monmouth County air quality complies with all other Ambient Air Quality Standards (NJDEPE, 1980).

3.1.3 Surface Drainage

All rivers and streams draining NWS Earle, which are located just a few miles inland, ultimately discharge to the Atlantic Ocean. The headwaters and drainage basins of three major Coastal Plain rivers (i.e., Swimming, Manasquan, and Shark) originate on the Main Base. The northern half of the Main Base is in the drainage basin of the Swimming River, and tributaries include Mine Brook, Hockhockson Brook, and Pine Brook. The southwestern portion of the Main Base drains to the Manasquan River via either Marsh Bog

Brook or Mingamahone Brook. The southeastern corner of the Main Base drains to the Shark River. Both the Swimming River and the Shark River supply water to reservoirs used for public water supplies.

Surface water drainage from the waterfront area enters Sandy Hook Bay. Much of this area is under tidal influence. Most of the surface drainage from the Chapel Hill area flows north to Sandy Hook Bay via Compton, Ware, and Wagner Creeks. A very small area at the topographically high southern end of the Chapel Hill area drains south through McClees Creek to the Navesink River.

3.1.4 Soils

The soils at NWS Earle are generally distributed in northeast/southwest-trending belts that parallel the outcrop patterns of the underlying geologic units. More than half of the identified soil types in Monmouth County are found on the NWS Earle facility.

The dominant soil in this area is sandy and well drained. The soils typically have high iron and sulfur contents and many are acidic. Acidic soils are formed from the weathering of pyrite (iron sulfide) or lignite (low-grade coal) contained in sedimentary deposits. When exposed to air and water these materials form corrosive sulfuric acid. Severely acidic soils with pH values as low as 3.5 can be developed naturally in some of the soils found at NWS Earle.

Poorly drained soils are typically organic rich and occur in low-lying areas such as swamps, marshes, and flood plains. These poorly drained unconsolidated sediments are prone to settlement and subject to flooding and tides.

At the Main Base the most prevalent soils include the Lakewood, Lakehurst, Leon, and St. Johns Series. These range from well-drained sandy soils to very poorly drained flood plain soils adjacent to streams and swamps. Highly acidic black soils have been exposed at various depths on the Main Base by construction activities. The black soils are apparently

related to lignite-rich clays of the Kirkwood Formation, which crop out across the southern end of the station.

Soils in the Chapel Hill area include the Collington, Sassafras, and Colts Neck Series, which are generally well drained sandy to loamy sand soils. Few streams and flood plains occur in the area. No black acid soils have been uncovered in the Chapel Hill area.

Tidal marsh soils and beach sands predominate in the waterfront area. The natural conditions have also been substantially altered by manmade filled land reclaimed from the marsh (i.e., the railroad trestle area near the shore) and by the presence of several (now closed) sanitary landfills. Sandy areas, such as along the shore of the bay and south and east of the pier, range from loamy sand to silt loam and are typically well drained. The tidal marsh soils, soft organic-rich silts, sands, and clays, are poorly drained and are typically flooded twice daily by the tides and occasionally by storms. The boundaries of the raised landfill areas are subject to minor erosion. Acidity problems due to black soils have not been documented in the waterfront area.

The determination of naturally occurring levels of metals in soils through the analysis of soils in areas off base has not been undertaken during previous investigations. During the preparation of this Work Plan, WESTON has performed a cursory examination of published soil analyses results from the United States Soil Conservation and Stabilization Service (SCS), United States Geologic Survey, and State of New Jersey publications. This literature examination and personal telephone interviews with soil scientists in the Freehold office of the SCS and Rutgers University could not identify naturally occurring levels nor variations in the levels of metals in the formations present on NWS Earle.

3.1.5 Surficial Geology

The geologic setting at NWS Earle consists of a thick wedge of layered unconsolidated sediments that dip seaward (southeast). The sedimentary formations of the Coastal Plain are exposed at the surface in a banded outcrop pattern roughly parallel to the shore.

These sedimentary units are formed of interbedded sands (gravel, silt, and clay). They tend to thicken downdip (in the seaward direction) because they were deposited on the edge of the ocean basin. The coarser, more permeable deposits form aquifers, while the interbedded fine sediments form confining beds that restrict the vertical flow of water. A stratigraphic column from USGS Open File Report 84-730 is shown in Figure 3-1.

The total thickness of the sediments is on the order of 1,300 feet inland to over 6,000 feet near the shore. The crystalline bedrock surface itself dips gently to the southeast at 80 to 100 feet per mile. Successively younger units have a decreasing upward dip that drops to approximately 10 feet per mile for the uppermost sedimentary layers.

The sedimentary formations range in age from late Cretaceous to postglacial. Rocks of intermediate age (post-Precambrian but pre-Cretaceous) were presumably removed by erosion prior to the deposition of the present strata.

The depositional environment of the Coastal Plain sediments represents alternating periods of marine transgressions and regressions. Finer textured sediments represent quiet water conditions (i.e., deeper marine or backshore lagoons), while coarser textures represent higher energy zones (i.e., beachfront or streams). The last major depositional event resulted from the Pleistocene glaciation. NWS Earle falls outside the southern limit of the Wisconsin terminal moraine. Minor transgressions of the sea due to glacial melting resulted in some Pleistocene deposits at lower elevations.

The oldest formation, located at the bottom of the sedimentary sequence, is the Raritan Formation, a medium- to coarse-grained arkosic sand unit up to 400 feet thick.

Despite the presence of minor interbedded kaolinitic clay layers, it is a very important regional aquifer and supplies water for many municipal wells. Due to its similarity in composition, the Raritan is commonly lumped with the next youngest unit, the Magothy Formation. The Magothy is also dominantly sand (fine-grained, micaceous, and lignitic) and

Geologic and hydrogeologic units in the Coastal Plain of New Jersey.

SYSTEM	SERIES	GEOLOGIC UNIT	LITHOLOGY	HYDROGEOLOGIC UNIT	HYDROLOGIC CHARACTERISTICS
Quaternary	Holocene	Alluvial deposits	Sand, silt, and black mud.	Undifferentiated	Surficial material, often hydraulically connected to underlying aquifers. Locally some units may act as confining beds. Thicker sands are capable of yielding large quantities of water.
		Beach sand and gravel	Sand, quartz, light-colored, medium- to coarse-grained, pebbly.		
	Pleistocene	Cape May Formation	Sand, quartz, light-colored, heterogeneous, clayey, pebbly.		
Tertiary	Miocene	Pensauken Formation		Kirkwood-Cohansey aquifer system	A major aquifer system. Ground-water occurs generally under water-table conditions. In Cape May County the Cohansey Sand is under artesian conditions.
		Bridgeton Formation			
		Beacon Hill Gravel	Gravel, quartz, light colored, sandy.		
		Cohansey Sand	Sand, quartz, light-colored, medium to coarse-grained, pebbly; local clay beds.		
		Kirkwood Formation	Sand, quartz, gray and tan, very fine- to medium-grained, micaceous, and dark-colored diatomaceous clay.	confining bed	Thick diatomaceous clay bed occurs along coast and for a short distance inland. A thin water-bearing sand occurs within the middle of this unit.
				Rio Grande water-bearing zone[1]	
				confining bed	
				Atlantic City 800-foot sand	A major aquifer along the coast.
				Composite confining bed	Alloway Clay member or equivalent
	Eocene	Piney Point Formation	Sand, quartz and glauconite, fine- to coarse-grained.	Piney Point aquifer	Yields moderate quantities of water locally.
		Shark River Formation	Clay, silty and sandy, glauconitic, green, gray and brown, fined-grained quartz sand.		Poorly permeable sediments.
		Manasquan Formation			
	Paleocene	Vincentown Formation	Sand, quartz, gray and green, fine- to coarse-grained, glauconitic, and brown clayey very fossiliferous, glauconite and quartz calcarenite.	Vincentown aquifer	Yields small to moderate quantities of water in and near its outcrop area.
		Hornerstown Sand	Sand, clayey, glauconitic, dark green, fine- to coarse-grained.		Poorly permeable sediments.
Cretaceous	Upper Cretaceous	Tinton Sand	Sand, quartz, and glauconite, brown and gray, fine- to coarse-grained, clayey, micaceous.		
		Red Bank Sand		Red Bank sand[2]	Yields small quantities of water in and near its outcrop area.
		Navesink Formation	Sand, clayey, silty, glauconitic, green and black, medium- to coarse-grained.		Poorly permeable sediments.
		Mount Laurel Sand	Sand, quartz, brown and gray, fine- to coarse-grained, slightly glauconitic	Wenonah-Mount Laurel aquifer	A major aquifer.
		Wenonah Formation	Sand, very fine- to fine-grained, gray and brown, silty, slightly glauconitic		
		Marshalltown Formation	Clay, silty, dark greenish gray, glauconitic quartz sand.	Marshalltown-Wenonah confining bed	A leaky confining bed.
		Englishtown Formation	Sand, quartz, tan and gray, fine- to medium-grained; local clay beds	Englishtown aquifer system	A major aquifer. Two sand units in Monmouth and Ocean Counties.
		Woodbury Clay	Clay, gray and black, micaceous silt	Merchantville-Woodbury confining bed	A major confining bed. Locally the Merchantville Fm. may contain a thin water-bearing sand.
		Merchantville Formation	Clay, glauconitic, micaceous, gray and black; locally very fine-grained quartz and glauconitic sand.		
		Magothy Formation	Sand, quartz, light-gray, fine- to coarse-grained; local beds of dark-gray lignitic clay	Potomac-Raritan-Magothy aquifer system: upper aquifer	A major aquifer system. In the northern Coastal Plain the upper aquifer is equivalent to the Old Bridge aquifer and the middle aquifer is the equivalent of the Farrington aquifer. In the Dela. River Valley three aquifers are recognized. In the deeper subsurface, units below the upper aquifer are undifferentiated.
		Raritan Formation	Sand, quartz, light-gray, fine- to coarse-grained, pebbly, arkosic, red, white and variegated clay.	conf bd; middle aquifer; conf bd	
	Lower Cretaceous	Potomac Group	Alternating clay, silt, sand, and gravel	lower aquifer	
Pre-Cretaceous		Bedrock	Precambrian and lower Paleozoic crystalline rocks, metamorphic schist and gneiss, locally Triassic basalt, sandstone and shale	Bedrock confining bed	No wells obtain water from these consolidated rocks, except along Fall Line.

[1] Rio Grande water-bearing zone.

[2] ------ Minor aquifer not mapped in this report.

Modified from Seaber, 1965, table 3.

FIGURE 3-1 GEOLOGIC AND HYDROGEOLOGIC UNITS IN THE COASTAL PLAIN OF NEW JERSEY

up to 175 feet thick, but the sands tend to be discontinuous and the clay interbeds more common. The Magothy and Raritan (combined) are typically described in drillers' logs as a series of alternating sand and silt beds. Together, these two units form a deep, thick, and important regional aquifer.

The next five units, from the Merchantville Formation up through the Wenonah Formation, are all part of the upper Cretaceous Matawan Group. The Merchantville Formation, a 60-foot thick, dark, micaceous, glauconitic silty clay, is often considered in combination with the succeeding Woodbury Clay, also a gray to black micaceous clay 60 or more feet thick. Together, these two clays range in thickness from 160 feet inland to 250 feet near the shore. They are generally nonwater bearing and act as a single aquiclude.

The Englishtown Formation has a variable lithology that changes from a fine to medium-grained sand inland to a clay-rich texture downdip, where it resembles the underlying Woodbury Formation and the overlying Marshalltown Formation. The Englishtown aquifer is an important source of water in Monmouth County.

The overlying Marshalltown is a relatively thin formation that consists of up to 50 feet of clayey, glauconitic quartz sand and clay. The Wenonah Formation, at the top of the Matawan Group, is another micaceous, glauconitic sand. It tends to be fine to very fine grained and is up to 85 feet thick.

Mount Laurel Sand is at the base of the next sedimentary sequence, the Monmouth Group, although it is sometimes grouped with the Wenonah because they tend to function as a single aquifer, 60 to 100 feet thick. The Mount Laurel is a very fine to coarse-grained, glauconitic quartz sand.

The Navesink Formation is a sandy marl composed mostly of glauconite, quartz grains, and clay. It is an important source of water for home wells, yielding an average of 10 gpm or less.

The top of the Monmouth Group is represented by Red Bank Sand, including Tinton Sand, composed of up to 140 feet of medium to coarse micaceous sand plus partly pyritized lignite (important in groundwater geochemistry in that it lowers the pH and EH of the water). The unit contains a lower clay member of dark, fossiliferous, micaceous, glauconitic sandy clay.

The Hornerstown Sand is the basal Tertiary formation in Monmouth County and the oldest unit in the Rancocas Group. It is a massive, green, glauconitic sand with interbedded shale. The lithology is homogeneous, and the thickness is fairly constant downdip, with an average thickness of 30 to 50 feet. The Hornerstown crops out along the northwestern boundary of the Main Base.

The Vincentown Formation is a fossiliferous quartz sand, up to 130 feet thick, that contains some coarse-grained glauconite and some clay. An upper member is a lime sand with abundant fossil fragments. The Vincentown Formation is an important source of water for low-yield home wells, with an average range of 10 to 50 gpm. The Vincentown Formation crops out at the surface at the Main Base, covering approximately 25% of the station in a band along the northern border of the facility.

The Manasquan Formation at the top of the Rancocas Group (plus the overlying Shark River Marl) is clayey, glauconitic sand that varies in thickness from a few feet at the outcrop area to over 200 feet in the subsurface along the shore. Neither crops out at the Main Base but may be locally present at depth.

The Kirkwood Formation of the Miocene Age is an important aquifer both regionally and locally. It crops out at the surface over two-thirds of the Main Base (the central and southern portions) as well as across the southern tier of Monmouth County.

In fact, most of the southern part of New Jersey consists of surface exposure of the Kirkwood Formation (grouped with the Cohansey Sand). Texturally, the Kirkwood consists of fine- to medium-grained quartz sand with some mica, some lignite, and some diatomaceous clay. A lower member is finer grained, darker, and pebbly and contains some

glauconite. The total thickness ranges from approximately 30 feet at the outcrop area on the station to 800 feet near the coast. The texture grades from fine-grained sand and silt inland (updip) to clay beds with finer strings of sand along the coast.

The Kirkwood is used locally for domestic wells and in other areas of the Coastal Plain for municipal supplies. Yields range from 15 to over 1,000 gpm, but the water is generally acidic and contains iron and sulfide.

The overlying Cohansey Sand is a light-colored medium- to coarse-grained quartz sand, occasionally pebbly, with local clay beds. In combination with the Kirkwood, it forms a major unconfined aquifer throughout the New Jersey Coastal Plain. It produces brackish or salty water in some coastal areas. The Cohansey Sand crops out at the Main Base, forming the topographically prominent Hominy Hills area. No wells are known to top the Cohansey on the station. Due to its position at the top of the sedimentary sequence, the Cohansey provides recharge to the underlying aquifers, particularly the Kirkwood.

Very young Quaternary sediments consist of highly organic silt plus clay in marshy or swampy areas, beach sands along the shore, and very recent stream sands and gravels.

3.1.6 Bedrock Geology

Bedrock in the Coastal Plain area consists of the Precambrian basement complex at a depth of 1,300 to 6,000 feet BGS. The basement complex consists primarily of Precambrian metamorphic rocks, such as schist and gneiss. Minor amounts of Triassic basalt and/or early Paleozoic metasediments may also be present locally.

An erosional unconformity marks the top of the bedrock surface. A 400-million-year gap exists in the geologic record between the underlying Precambrian and the overlying Cretaceous units. Some of the missing geologic material removed by weathering and erosion is still present in the form of sediments within the current strata. The top surface

of the bedrock is an undulating plain that overall dips seaward, despite the highs and lows marking this erosional surface.

3.1.7 Hydrogeology

3.1.7.1 Regional Hydrogeology

The Atlantic Coastal Plain sediments are the most important source of potable water in the region. More than 75% of the fresh water supply in the New Jersey Coastal Plain is from groundwater. The Coastal Plain province is composed of a wedge-shaped deposit of alternating layers of sand and clay that thickens to the southeast and overlies a crystalline basement. These deposits store and transmit water through interconnected pore spaces.

Recharge to the groundwater system is derived from precipitation, which averages 44 inches per year. Approximately 15 to 39 inches of this precipitation recharges the groundwater reservoir annually. In addition to precipitation in the outcrop areas, recharge is also provided by vertical leakage through confining beds and by seepage from surface water bodies.

The five principal Coastal Plain aquifers are the:

- Kirkwood-Cohansey aquifer system.
- Atlantic City "800-foot sand."
- Wenonah-Mount Laurel aquifer.
- Englishtown aquifer.
- Potomac-Raritan-Magothy aquifer system.

All but the Kirkwood-Cohansey are confined, except where they crop out or are overlain by permeable surficial deposits. NWS Earle is situated over the recharge area of many of these formations.

Water quality is generally satisfactory for drinking. Minor problems due to local high iron concentrations occur in several aquifers, including the Potomac-Raritan-Magothy. Saline

water is a problem in some coastal areas with unconfined aquifers and in deep portions of some confined aquifers.

In general, in the New Jersey Coastal Plain, the deeper aquifers are used for public water supplies, and the near-surface aquifers are used for shallow domestic wells.

3.1.7.2 Local Hydrogeology at NWS Earle

Four sedimentary formations of the Coastal Plain crop out at the Main Base:

- The Hornerstown Sand.
- The Vincentown Formation.
- The Kirkwood Formation.
- The Cohansey Sand.

These units and their hydrologic significance are described in detail in Subsection 3.1.5. All these units are recharged by direct precipitation at the surface. Of particular importance are the Vincentown and Kirkwood Formations because they are used extensively for residential wells in the nearby area. None of the aquifers is used for municipal wells in the area. High iron content is a problem in these aquifers.

3.1.7.3 Surface Water

The surface water flow directions follow the local topography. Surface water flow is influenced by the tidal effect in areas of the waterfront.

Groundwater flow from the Main Base is generally to the east/southeast. Two deep water supply wells located on the Main Base tap the Raritan-Magothy aquifer system at depths of approximately 800 feet BGS. The outcrop and recharge areas of this aquifer system are located several miles north and west of the Main Base; therefore, water quality in these aquifers would not be affected by activities at NWS Earle.

Surface outcrops consist of the Navesink Formation and the Mt. Laurel and Wenonah Sands at the waterfront and Chapel Hill areas. These units are used for domestic wells, but not in the vicinity of NWS Earle. Residences adjacent to the waterfront and Chapel Hill areas are supplied by municipal water systems that use both deep wells and the Swimming River reservoir.

3.1.8 Background Water Quality

New Jersey classifies its surface waterways according to potential uses based on water quality. The streams and brooks found on the main section of NWS Earle are classified as FW2. The surface waterways in the Chapel Hill area are poorly defined. In the waterfront area, the tidal reaches are brackish, and the water supply is not potable. However, estuaries are highly productive areas for the development of aquatic communities, and food chains in these communities are potentially sensitive to manmade contaminants.

The most important groundwater aquifers in the area of NWS Earle occur in the Englishtown, Vincentown, and Kirkwood-Cohansey Formations. Natural groundwater quality in these formations is good and is generally suitable for drinking water purposes. Local high concentrations of nitrate/nitrite occur and are generally associated with higher population densities.

3.2 HUMAN ENVIRONMENT

3.2.1 Population

NWS Earle is situated within the municipalities of Monmouth County, New Jersey, namely the towns of Colts Neck and Middletown. The information provided here relates to the population characteristics of these towns. NWS Earle itself does not have a sizeable active duty population in comparison to the overall population:

Officers	-	20	
Enlisted	-	394	
Total	-	414	Navy personnel

There are no nonactive duty personnel as of 22 December 1988.

There are 700 civilians employed within NWS Earle. Approximately 90% of these civilian employees are located on the Main Base. As of 31 December 1988, an estimated 229 dependents of Navy personnel are at the base. Thus, the total daytime population on the base is estimated at between 1,000 and 1,500.

Tables 3-2 and 3-3 present the historical and projected population data for the municipalities associated with NWS Earle, the planning region, and the county. From 1960 through 1980 the county population more than doubled. This shows that the immediate vicinity of NWS Earle is considered a growth area in terms of population and fast growing in terms of economic activities.

Table 3-3 shows population projections for Monmouth County as a whole and for each of the municipalities adjacent to NWS Earle. Based on these figures, the population for the entire County grew by 48,678 (a 10% increase) between 1980 and 1988. Projections through the year 1995 show that the Monmouth County Planning Board expects the population to rise to 655,322, a 21% increase from 1980. Of the communities adjacent to NWS Earle, Howell is projected to experience the largest absolute population increase (+28,254) and Tinton Falls the largest percentage increase (+79%) in the County during the 1980-1995 period (Wallace, Roberts and Todd Master Plan for NWS Earle, January 1991).

A number of small communities are located along or close to NWS Earle boundaries. The closest ones are Colts Neck, Green Grove, and Freehold. The actual population data for these communities are unavailable at this time.

3.2.2 Land Use

The primary information sources for land use at the station and for the municipalities are the USGS topographic quadrangle maps for the area (not currently up to date), aerial photographs, and the series of maps prepared for the Monmouth County Planning Board.

Table 3-2

Population Characteristics for New Jersey, Monmouth County, and Colts Neck Township

Population[a]	New Jersey	Monmouth County	Colts Neck Township
Percent change 1950 to 1982[b]	53.8	127.5	237.1
Percent change 1970 to 1982[b]	1.0	11.0	37.7
Percent under age 5	6.3	6.2	4.3
Percent under age 18	27.0	28.6	31.6
Percent age 65 and over	11.7	11.8	7.2
Median age	32.2	32.3	32.8
Persons per household	2.84	2.9	3.48
Percent black and other nonwhite	16.8	10.7	3.0

[a] All data are from the 1980 Census of Population unless otherwise noted.
[b] 1982 population estimates are from the New Jersey Department of Labor.

Sources: U.S. Department of Commerce, 1982; New Jersey Department of Labor, August 1983; New Jersey Department of Labor, September 1983.

Table 3-3

Population Estimates for New Jersey, Monmouth County, and Colts Neck Township

Municipalities	1980 U.S. Census	1988 MC Project	1995 MC Project
Colts Neck	7,888	8,202	9,479
(Index)	(100)	(104)	(120)
Middletown	62,575	67,358	67,078
(Index)	(100)	(108)	(108)
Howell	25,065	37,668	43,319
(Index)	(100)	(150)	(173)
Tinton Falls	7,740	10,788	13,823
(Index)	(100)	(139)	(179)
Wall	18,952	20,242	23,962
(Index)	(100)	(107)	(126)
Monmouth County	503,173	551,851	608,450
(Index)	(100)	(110)	(121)

Source: Monmouth County Planning Board, February, 1989

The following land use categories are within 1 mile of the station (approximately 11,000 acres):

- Institutional (approximately 75%).
- Woodland.
- Abandoned land.
- Residential (small area along the Route 34 corridor).
- Agricultural (small portion).
- Extractive (a very small section).

Current land uses at the station include:

- Buildings/offices.
- Dormitories/residences.
- Transportation (roads).
- Recreational area.
- Medical clinics/community facilities.
- Open space.
- Undeveloped.

3.2.3 Socioeconomics

This subsection discusses the social setting of the communities in the vicinity of the station, the economic background, and the facilities and services available within the region. With approximately 645 military personnel (including dependents) and 700 civilian personnel at the station, this is an important economic influence in the overall growth of the region. Although the station is located outside any metropolitan area, it benefits the surrounding communities.

The payroll of the military sector of the community is estimated to be $4.5 million. The civilian payroll is estimated to be $22 million. Based on total annual gross wages of all military and civilian employees, local contract and military construction project expenditures, and expenditures for educational and health care services for base personnel and their dependents, the total economic impact (TEI) of the station to the local economy in Fiscal

Year 1986 was nearly $26 million. It is estimated that the station has created a total of 1,710 secondary jobs within the local communities.

Traditionally, the Colts Neck region is a farming community area. However, the region now is in rapid growth, primarily converting farming to residential use.

The transportation system in the vicinity is based primarily on highways. The main access roads to the station are U.S. Route 34 and State Route 18. Access to the waterfront and Chapel Hill areas is controlled through guarded entrances to Normandy Road, a government-owned, two-lane road. A rail line used solely by the Navy links the Main Base and the waterfront areas. This rail line runs adjacent to Normandy Road. State Routes 36 and 35 cross under Normandy Road. There is no direct uncontrolled access to Normandy Road from these highways.

The area has community facilities and services available for the population, including state parks, golf courses, schools, public institutions, hospitals, and police and fire prevention services.

3.3 BIOLOGICAL ENVIRONMENT

The biologic resources of the station are detailed in the Fred C. Hart and Associates, Inc. IAS report. Additional biological inventories have been performed for the environmental impact statements for the "United States Navy Family Housing Project" and the "Modernization and Expansion of Logistic Support Systems Project." Both documents were examined and reviewed at the Atlantic Highlands Municipal Library.

SECTION 4

BASIS FOR PROGRAM APPROACH

4.1 CONTAMINANTS OF CONCERN

The contaminants of concern at a site are those compounds that are detected above background levels at the site and that are likely to have a significant impact on human health or the environment at the levels detected. The determination of those compounds that are most likely to pose a significant threat is normally based on one or more of the following:

- The existing data indicate the widespread presence of the compound at a site.
- The concentrations of the detected compounds are above the applicable action levels.
- The likely environmental fates of the compounds represent potential hazards based on toxicity, mobility, and/or persistence.

4.1.1 Identification of Contaminants of Concern at NWS Earle

In the absence of definitive data the following rationale was applied to determine the contaminants of concern for NWS Earle:

- Target compound groups were identified for each of the sites under study, based on the waste types known or suspected to have been disposed at the site.
- Where compound-specific data are available for one site (e.g., an explosives disposal area), the same contaminants of concern were identified by analogy at sites with similar past use but without compound-specific data. Studies at other sites at NWS Earle have provided such information, particularly gathered during the 11 site RI during early 1991.
- In the absence of compound-specific data for a target compound group at a site or analogous sites at NWS Earle, particular compounds in the target group that are known to have been in use at Navy installations during the

period of operation of the site were identified as contaminants of concern. For example, at a site where solvents are included in the waste type, volatile organic compounds (VOCs) were identified as the target compound group.

The contaminants of concern at the 16 sites at NWS Earle are summarized by site in Section 5. The initial analysis of groundwater, where groundwater monitoring is being done, will include, at a minimum, the full EPA Target Compound List (TCL) organic and Target Analyte List (TAL) inorganic compounds. Analyses will also include landfill indicator parameters at solid waste landfills (Sites 6 and 17) and explosive compounds at ordnance disposal areas (Site 1).

SECTION 5

SITE INSPECTION SCOPE OF WORK

The scope of work for the NWS Earle SI study will focus on site and waste characterizations and potential releases to the environment. Field investigation data will be used to eliminate from further consideration those sites that pose no threat to public health and the environment or to determine the need for additional characterization and possible remediation. Existing data will be incorporated throughout the investigation phases to ensure continuity and to avoid duplication of data gathering efforts.

At the conclusion of the SI, investigations of a portion of the sites should be complete; that is, it will have been determined that no action is required or that sufficient data exist to identify the remediation. This information will be available for use in preparing decision documents concerning the completed sites. At sites where further data are required to support an evaluation for possible remedial alternatives, recommendations for further work will be made.

5.1 ORGANIZATION AND SEQUENCING OF THE SITE INVESTIGATION

The scope of work for the SI at NWS Earle will address 16 sites. On-site sampling will be performed at 13 sites; available information only will be used to evaluate the remaining 3 sites. Site histories and waste disposal practices are discussed in Section 2.

The scope of work for the SI at NWS Earle is summarized in Figure 5-1. It includes both general activities (stationwide activities or activities to be included at all sites) and site-specific activities. Site-specific requirements for subsurface soil sampling are listed in Table 5-1. Site-specific requirements for sediment and surface water sampling and analyses are listed in Table 5-2.

Activities	Station-wide	Site Numbers															
		1	6	8	9	12	13	14	15	16	17	23	24	25	27	28	29
Demographics Study	△																
Groundwater Use Study	△																
Groundwater/Surface Water Inventory	△																
Surface Water/Groundwater Flow Path Determination	△	▲	▲								▲						
Soil Vapor Screening		▲	▲	●	▲					▲	▲	▲					
Soil Boring/Soil Sampling		▲		●	▲		▲		▲	▲		▲	▲	▲	▲		▲
Hydropunch Sampling									▲			▲					
Monitor Well Installation/Sampling		▲	▲								▲						
Test Pit Sampling				●	▲												
Boring Log Review			▲								▲						
Review Construction Plans										▲					▲		
Historical Aerial Photo Interpretation		▲	▲	●	▲	▲			▲		▲						
Surface Water Sampling			▲			▲	▲				▲						
Sediment Sampling			▲			▲	▲		▲		▲	▲			▲		

Legend
- ▲ Definite Activity
- △ Possible Activity
- ● Completed Activity

218-1169

FIGURE 5-1 SITE INVESTIGATION ACTIVITY MATRIX

WESTON MANAGERS DESIGNERS/CONSULTANTS

WESTON

TABLE 5-1 Summary of Analytical Requirements for Subsurface Soils NWS Earle, Colts Neck, New Jersey				
Site Number	Site Name	Subsurface Soils		
		Number Soil of Samples	Depth Interval (feet)	Soil Analytes
1	Ordnance Demilitarization Site secured	8 4 8 4	0 - 0.5 0 - 0.5 0.5 - 1.5 0.5 - 1.5	Explosives[a], TPH TAL Metals Explosives[a], TPH TAL Metal
6	Landfill West of Normandy Road	4 (2 borings)		TCL Full Scan, TAL metals + Cn.
8[b]	Landfill East of S-186	-	-	-
9	Landfill Southeast of "P" Barricades	6 Test Pits	Fill Material	TCL Full Scan, TAL metals + Cn, TPH
12	Battery Acid Spill Site	0	0	None
13	Defense Property Disposal Office Yard	6	0 - 3	BNA, PCB TAL Metals + Cn
14	Defense Property Disposal Office Warehouse	0	0	None
15	Bilge Water Disposal Site near Waterfront S. Gate	2 (RR Siding)	To water table	BNA
16	Fuel Line Connecting Buildings C-19 & C-50	6 (6 borings)	From pipe depth to water table[c]	BNA, TPH
17	Disposal Site Behind Training Barge, Waterfront	8 (4 borings)	Fill Material Base of Fill	TAL metals + Cn
23	Paint Chip Disposal Area (near Building D-5)	2 6	0 - 3 0 - 3	TCL Full Scan Pb, Zn, Cu, Cr, Cd
24 & 25	Closed Pistol Range	8 (4 per site)	In Berm, 1 - 4	Pb, Zn, Cu, Cr, Cd
27	Projectile Refurbishing Area	5 5	0 - 0.5 0.5 - 1.5	TCL Full Scan TAL METALS + Cn TCL Full Scan TAL Metals + Cn
28	Waste Oil Tank	0	0	None
29	PCBs Spill Site Building C-16	5	0.5 - 1.5	PCB, TPH

[a] Explosives compounds include nitrate/nitrite; picric acid; nitrocellulose; nitroglycerin; 2,4,6-trinitrotoluene; 2,4-dinitrotoluene; 2,6-dinitrotoluene; tetryl; 1,3,5-trinitrobenzene; 1,3-dinitrobenzene; HMX; and RDX.

[b] Site 8 has been addressed seperately from the SI. Soil samples were taken during an earlier stage investigation of impacted soils and analyzed for full scan TCL organics, TAL Metals, and TPH.

[c] Confirm pipe location from blueprints.

Note: QC Samples (matrix spikes and duplicates) will be taken at a rate of 10 percent minimum per sampling event. Field blanks will be taken daily for each event.

TABLE 5-2

Summary of Analytical Requirements for Sediment and Surface Water, NWS Earle, Colts Neck, New Jersey

Site Number	Site Name	Sediment		Surface Water	
		Number of Sediment Samples	Sediment Analytes	Samples	Analytes
1	Ordnance Demilitarization Site secured	0 0	None None	0	NA
6	Landfill West of Normandy Road	4 4 1	TCL Full Scan TAL Metals + Cn TOC, SGS	2 2 1	TCL Full Scan TAL Metals + Cn TSS, Hardness
8[b]	Landfill East of S-186	-	-	0	NA
9	Landfill Southeast of "P" Barricades	0	None	0	NA
12	Battery Acid Spill Site	1 in storm drain 1 at outfall	TAL Metals + Cn TCL Full Scan, TOC, SGS	1	VOC, TAL Metals + Cn, TSS, Hardness
13	Defense Property Disposal Office Yard	2 2	BNA PCB	3 along drainage 1	BNA, PCB, TAL Metals + Cn TSS, Hardness
14	Defense Property Disposal Office Warehouse	0	None	0	NA
15	Bilge Water Disposal Site near Waterfront S. Gate	4 in (drainageway)	BNA	0	NA
16	Fuel Line Connecting Buildings C-19 & C-50	0	None	0	NA
17	Disposal Site Behind Training Barge, Waterfront	4 4 2	TCL Full Scan TAL Metals + Cn TOC, SGS	2	TCL Full Scan, TAL Metals + Cn, TSS, Hardness
23	Paint Chip Disposal Area (near Building D-5)	2 2 6	TCL Full Scan TAL Metals + Cn Pb, Zn, Cu, Cr	0	NA
24 & 25	Closed Pistol Range	0	None	0	NA
27	Projectile Refurbishing Area	2 2 6	TCL Full Scan TAL Metals + Cn Pb, Zn, Cu, Cr	0	NA
28	Waste Oil Tank	Site Addressed under RECRA Investigation	None	0	None

[a] Explosives compounds include nitrate/nitrite; picric acid; nitrocellulose; nitroglycerin; 2,4,6-trinitrotoluene; 2,4-dinitrotoluene; 2,6-dinitrotoluene; tetryl; 1,3,5-trinitrobenzene; 1,3-dinitrobenzene; HMX; and RDX.

[b] Site 8 has been addressed separetely from the SI. Soil samples were taken during an earlier stage investigation of impacted soils and analyzed for full scan TCL organics, arsenic and TPH.

Note: QC Samples (matrix spikes and duplicates) will be taken at a rate of 10 percent minimum per sampling event. Field blanks will be taken daily for each event.

TOC - Total Organic Carbon
SGS - Sediment Grain Size
TSS - Total Suspended Solids

5.1.1 Project Organization

The 16 sites to be addressed under the SI were identified during the IAS through interviews with base personnel, records checks, and cursory on-site observations. As a result of personnel changes during the original activities and intermittent use, the exact locations or boundaries of sites are often poorly defined. In some cases the sites have been located by a vague reference to an area of the station. In these cases the SI must first identify the most likely boundaries of the sites and then determine the nature and extent of possible contaminants at those sites.

The plan of approach of this SI is to determine the historical use and boundaries through examination of aerial photographs, records searches, personnel interviews, and visual confirmation of historical use. Based on this reconnaissance, planned sampling locations may be adjusted or additional sampling may be recommended in the SI report.

5.2 GENERAL WORK REQUIREMENTS

The following subsections outline the general elements of the SI at NWS Earle.

5.2.1 Planning Documents

The Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HSP) previously submitted and approved for the RI will be revised to apply to the SI.

5.2.2 Literature Search

The project will incorporate the results of the general literature search that has been conducted for the RI/FS for 11 other NWS Earle sites, as described in the Work Plan for the RI/FS submitted to NJDEPE in November 1989. The literature search will include but not limited to the following items:

- Geographic setting.
- Physiography, including topography and surface drainage.
- Geology and hydrogeology.
- Major aquifers and area groundwater use.
- Groundwater and surface water quality.
- Surface water use and classification.
- Sensitive areas near the sites.
- Population distribution.

5.2.3 Review of Aerial Photographs

Area historical aerial photographs available from base files, regional planning agencies, and private services will be examined for evidence of past site locations, boundaries, and periods of activity.

5.2.4 Field Data Collection

The field investigation activities to be conducted during the SI include:

- Ambient air monitoring and headspace vapor screening of samples (an independent OVA scan will be conducted at Site 6 to address the findings of a previous screening conducted by EPA).
- Surface and subsurface soil sampling for laboratory analyses.
- Monitor well installation.
- Water level survey.
- Groundwater, surface water, and sediment sampling for laboratory analyses.

Some or all of the field activities will be conducted at 13 sites during the SI; no action will be taken at the 3 remaining sites. The site-specific scopes of work for the investigation are detailed in Subsections 5.3 through 5.18. Those subsections provide general guidelines for each investigation category to be followed at all sites where it is applied. A complete discussion of these activities is provided in the QAPP.

5.2.4.1 Ambient Air Monitoring and Sample Headspace Screening

WESTON will monitor on-site air quality during intrusive activities such as drilling. Select soil and sediment samples will also be screened in the field by drawing air samples from the headspace in the sample containers. An HNu photoionization meter will be used. These readings provide noncompound-specific readings of VOCs and other compounds. The specific protocols are contained in the QAPP and HSP.

5.2.4.2 Test Borings

The objectives of the test boring programs at these sites are to:

- Characterize soil contamination at depth.
- Develop geotechnical information for site soils to be used in evaluating migration pathways and remedial action alternatives.

Site-specific sampling locations and laboratory analyses for soils requirements are summarized in Table 5-1.

Test borings below 4 feet will be completed using hollow-stem drilling augers and split-spoon sampling. Split-spoon samples will be taken at 2-foot intervals from ground surface to approximately 15 feet in depth, or total depth, as determined by site-specific requirements. Test borings at Site 15 will be completed at first water encountered. Samples at Sites 13, 23, 24, and 25 will be taken with a bucket auger at depths of between 0 and 4 feet (see Table 5-1).

5.2.4.3 Exploratory Drilling and Monitor Well Installation

The following general procedures will be followed during all test borings:

- All soil borings will be tremie grouted to the surface with a cement/bentonite slurry.

- Drill cuttings identified as potentially hazardous will be containerized in new unused drums. Specific procedures are included in the QAPP.

- All drilling, sampling, and other related equipment will be decontaminated as detailed in the QAPP.

- All completed wells will be permanently marked with the NJDEPE ID number and site number.

A total of 11 new permanent wells will be installed at NWS Earle. The monitor wells will be installed following NJDEPE monitor well construction and grouting specifications for unconsolidated formations. This monitor well design will conform with NJAC 7:9-7, 8, and 9. The following describes drilling and well construction methods to be used.

At a minimum, all drilling will be conducted according to standard hollow-stem auger and hydraulic rotary drilling techniques. Wells intended to monitor the water table aquifer will be installed by placing 4-inch diameter, threaded, PVC casing and 15-foot length well screen with a 0.020-inch slot opening inside the 8-inch hollow-stem augers. The well will terminate at a depth of 10 feet below the groundwater table and will extend 5 feet above the groundwater table. The annulus around the well screen will be filled with Ottawa No. 1 sand, or equivalent, to a point 2 feet above the screen. The sand pack will then be overlain with 2 feet of bentonite pellets. The remainder of the annulus will be filled to grade with a 6:1 cement:bentonite slurry using tremie methods. The augers will be withdrawn as the backfilling proceeds. The top of the monitor well will be completed with a locking steel security casing. This casing will be immobilized with a mounded concrete seal to protect the well and to not allow storm water runoff to collect around the well casing. All water used for drilling must be potable; no surface water will be used during the drilling process.

The tops of the inside well casings of all monitor wells will be surveyed for elevation to the nearest 0.01 foot. The wells will be horizontally located to a accuracy of 1 foot and located on the site maps. All survey work will be done by a New Jersey licensed surveyor.

Permits are required to install monitor wells in or within 1,000 feet of the tidal wetlands adjacent to the sites. This wetlands was classified as emergent, intertidal, nonpersistent

(E2EM) in the National Wetlands Inventory. These permits are issued by the NJDEPE, Division of Coastal Resources, Bureau of Planning and Project Review. The permits will be issued or denied by the Bureau within 90 days of the receipt of the completed applications. In addition, a preapplication review meeting will be scheduled to review the draft permit with the Bureau to ensure that it is complete when submitted.

WESTON will assist the Navy in presenting the permit applications to the Bureau of Planning and Project Review at the preapplication meeting and in finalizing the applications for submission.

5.2.4.4 Hydro-Punch© Sampling

Representative groundwater samples will be collected at sites 15 and 23 using a hydrop-punch sampling device.

The Hydro-Punch© sampler provides a rapid means of collecting chemically representative groundwater samples without the installation, development, and materials costs of a monitoring well. As a site assessment screening tool, the Hydro-Punch© has gained widespread acceptance for its ability to obtain undisturbed groundwater samples. The resulting data can be used to determine the vertical and horizontal extent of contamination and to accurately quantify the concentration of substances in the groundwater. This will also serve to eliminate or minimize the number of future monitoring wells that may be required.

A hollow-stem auger drill rig will first be used to collect standard 2-inch split-spoon samples. Split-spoon samples will be collected and logged by a site geologist to determine the subsurface stratigraphy (e.g., depth to first confining unit) and the depth to the water table. Once the sampling depth has been determined in a given boring by split-spoon methods, the drill rods will be removed and the Hydro-Punch© sampler will be attached to the end of the drill rods for insertion into the split-spoon boring and the collection of groundwater samples for VOC, metals, and TPH.

For collection of a groundwater sample, a check valve is inserted into the Hydro-Punch© tool, the screen and drive point attached, and the tool is driven to the proper zone which will be immediately above the confining layer. The tool is then withdrawn approximately 18 inches to expose the intake screen and the sample chamber (1,250 mls) is allowed to fill with water. When the Hydro-Punch© is removed, the check valve prevents the sample from draining and the drive point remains in the ground. The water sample is discharged to the appropriate sample bottles through a stopcock. Throughout the process, the sample contacts only stainless steel and Teflon. A schematic diagram of the Hydro-Punch© assembly is shown in Appendix A. The Hydro-Punch© is then removed and the boring is subsequently abandoned or grouted to ground surface by tremie methods.

5.2.4.5 Test Pit Investigation

A test pit investigation will be conducted at Site 9 (Landfill southeast of "P" Barricades). The objective of this task is to obtain a physical description of landfill cover and waste material and to obtain samples for chemical analyses.

A backhoe will be used to excavate a minimum of six test pits at the landfill to a maximum depth of 10 feet below ground surface (BGS). Cover material will be stockpiled separately from underlying waste. The test pits will allow visual observations of subsurface conditions. The test pits will be described and logged in the field notebook and will include color, texture, moisture, depth to water, and odor or staining if present.

All sampling will be conducted using the backhoe bucket and a shovel as needed. Two samples will be selected at each site for full TCL organics, TAL inorganics, arsenic, and total petroleum hydrocarbons (TPH) analyses. These grab samples will be taken of the fill material, leachate, or shallow perched water. At least one sample will be of solids; the other sample will be of liquids, if encountered. Upon completion, excavated materials will be sequentially backfilled into the test pit and compacted with the backhoe bucket. The backhoe bucket will be steam cleaned before excavation of the first pit, between sampling locations, and following completion of the last pit.

Sample handling, documentation, analytical, and QA/QC procedure will be consistent with procedures for soil sampling specified in the QAPP.

5.2.4.6 Groundwater Sampling

A single round of groundwater and surface water sampling is planned during the SI, to be performed after installation of the new wells. This groundwater sampling will coincide, if possible, with the round of groundwater samples proposed to be taken during the 11 site RI/FS.

Parameters to be analyzed are listed in Table 5-3. The groundwater samples collected will be field tested for pH, specific conductance, and temperature. Standard QC protocols addressing equipment to be used, protocols to be followed, sample handling, and decontamination procedures are provided in the QAPP.

5.2.4.7 Sampling QA/QC Requirements

Field QA/QC samples will be collected and analyzed as part of all field sampling activities. The field QA/QC samples will be approximately 20% of the total number of field samples and will include trip blanks, ambient blanks, field equipment blanks, and field duplicates.

The distribution of field QA/QC samples is detailed in the QAPP, as are field QA/QC procedures (e.g., decontamination, sample handling). Duplicates, replicates, trip blanks, and field blanks requirements are listed in Tables 5-4 and 5-5.

5.2.5 Data Analysis

Routine quantitative field data collected during the SI will be recorded in field notebooks and entered into a PC database. Analytical data will be validated by an independent laboratory in accordance with the guidance promulgated by EPA Region II.

TABLE 5-3

Summary of Analytical Requirements for Groundwater, NWS Earle, Colts Neck, New Jersey

Site Number	Site Name	Groundwater	
		Number of Proposed Wells	Initial Round of Groundwater Analytes
1	Ordnance Demilitarization Site secured	3	TCL Full Scan TAL Metals Explosives[a]
6	Landfill West of Normandy Road	4	TCL Full Scan TAL Metals Landfill Parameters[b]
8[b]	Landfill East of S-186	0	NA
9	Landfill Southeast of "P" Barricades	0	NA
12	Battery Acid Spill Site	0	NA
13	Defense Property Disposal Office Yard	0	NA
14	Defense Property Disposal Office Warehouse	0	NA
15	Bilge water Disposal Site near Waterfront S. Gate	1 (Hydropunch)	TCL Full Scan
16	Fuel Line Connecting Buildings C-19 & C-5	0	NA
17	Disposal Site Behind Training Barge, Waterfront	4	TCL Full Scan TAL Metals, Landfill Parameters[b]
23	Paint Chip Disposal Area (near Building F-5)	1 (Hydropunch)	TCL Full Scan TAL Metals
24 & 25	Closed Pistol Range	0	NA
27	Projectile Refurbishing Area	0	NA
28	Waste Oil Tank	0 (site addressed under RCRA Investigation)	None

[a] Explosives compounds include nitrate/nitrite; picric acid; nitrocellulose; nitroglycerin; 2,4,6-trinitrotoluene; 2,4-dinitroltuene; tetryl; 1,3,5-trinitrobenzene; 1,3-dinitrobenze; HMX; and RDX.

[b] Landfill Paramters include, nitrate/nitrite, ammonia, turbidity, COD, BOD, TOC, chlorides, phosphates, sulphates.

[c] Site 8 has been addressed separetely from the SI. Soil samples were taken during an earlier stage investigation of impacted soils and analyzed for full scan TCL organics, arsenic and TPH.

Note: QC samples (matrix spikes and duplicates) will be taken at a rate of 10 percent minimum per sampling event. Field blanks will be taken daily for each event.

TABLE 5-4
Summary of Analytical QC Requirements for (SI) Soil and Sediment Analyses, NWS Earle, Colts Neck, NJ

Parameter	Sampling Points	MS/MSD	Duplicates	Field Blanks	Total Number of Samples
Explosives	16	1/1	2	2	22
TAL Metals (Including cyanide)	56	3/3	6	5	73
Lead, zinc, copper, chromium	26	2/2	3	2	35
Cadmium	14	1/1	2	2	20
(TCL Full Scan)	36	2/2	4	4	48
BNAs (TCL) - exclusively	20	1/1	2	2	26
Pesticide/PCBs (TCL) - exclusively	13	1/1	1	1	17
Total petroleum hydrocarbons	33	0	0	3	36
TOC	4	-	1	-	5
SGS	4	-	-	-	4

Exact number of QC samples may vary based on actual schedule and shipping conditions.

TABLE 5-5

Summary of Analytical QC Requirements for (SI) Surface Water and Groundwater Analyses, NWS Earle, Colts Neck, NJ

Parameter	Sampling Points	MS/MSD	Duplicate Samples	Trip Blanks	Field Blanks	Total Number of Samples
Explosives	3	1/1	1	0	1	7
TAL Metals	20	1/1	2	0	2	26
TCL Full Scan	17	1/1	2	3	3	27
VOCs (TCL)	1	-	-	-	-	1[b]
BNAs	3	1/1	1	0	1	7
Pest/PCBs	3	1/1	1	0	1	7
TSS	4	-	1	-	-	5
Hardness	4	-	1	-	-	5
Landfill Parameters[a]	8	1/0	1	-	1	11

[a] Landfill Parameters include, nitrate/nitrite, ammonia, turbidity, COD, BOD, TOC, chlorides, phosphates, sulfphates.
[b] QC samples included in TCL Full Scan analyses.
Exact number of QC samples required may vary based on actual schedule and shipping conditions.

The field and laboratory data will be used to produce data tables and graphics to display results and conclusions. Sample analytical results will be compared to published federal and state standards and background levels to determine the presence or absence of contaminants at the sites.

5.3 SITE 1: ORDNANCE DEMILITARIZATION SITE, SECURED

Site Description

This 6-acre site, located near Building S-465, was used for burning ordnance materials from 1943 to 1974. A site layout is shown in Figure 5-2. Operations at the site were discontinued in 1975. It is currently used by the U.S. Army as a communications facility. The site is mostly open field, with a communications tower located in the appropriate center. Demilitarization of the site involved plowing the area, spreading a layer of diesel fuel-soaked hay, and setting the hay ablaze to burn the site's surface. This operation was carried out three times.

Identification of Possible Site Contaminants

Based on interviews conducted by Fred C. Hart and Associates, Inc., it was determined that at least 90% of the material burned during the lifetime of this site was smokeless powder, which is essentially nitrocellulose. Black powder (which is 75% potassium (or sodium) nitrate, 15% charcoal, and 10% sulfur) may have been used to aid in igniting the smokeless powder. No records or other hard data describing the operations of this ordnance disposal range are available.

The disposal and burning of ordnance materials and subsequent demilitarization procedures are the source of potential contaminants. These include explosive compounds and petroleum hydrocarbons.

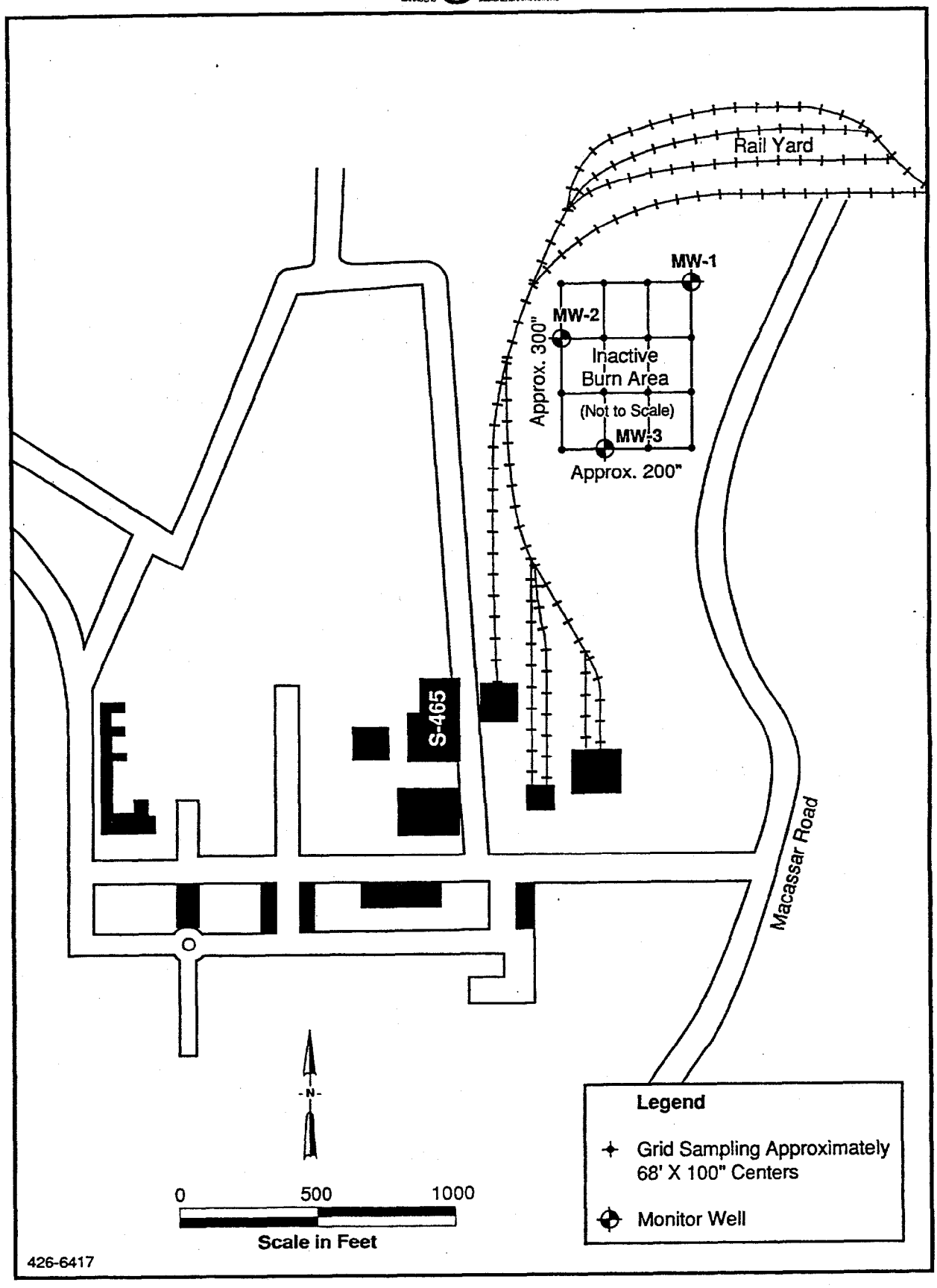


FIGURE 5-2 SITE 1: INACTIVE BURN AREA
NWS EARLE, COLTS NECK, NJ

Data Summary

The IAS provides limited site information. The report concludes that the propellants burned at the site do not pose a potential threat to public health or the environment.

Subsequent to the IAS, the NJDEPE conducted a survey of the site. An OVA and an HNu photoionization detector were used to measure relative levels of contamination. Readings of 2 to 3 parts per million (ppm) were noted at various locations throughout the site. As part of WESTON's health and safety requirements for the 12 June 1989 site visit, a calibrated HNu survey was conducted of ambient air at this site. No levels of organic vapors were detected above the background level established off site and upwind. Volatile compounds are not anticipated contaminants at Site 1.

The following data are required to accurately determine the status of this site:

- Location of disposal site boundaries.
- Presence/absence of contaminants.
- Extent of contamination, if present.

Plan of Action

The following activities are proposed for the site:

- Historical Aerial Photograph Review — Photographs will be reviewed to identify the boundaries of the disposal and burn area.

- Soil Sampling — Sixteen soil borings will be completed in a grid pattern across the site (see Figure 5-2). As presented in Table 5-1, eight samples will be collected from the surface (0.5 feet), and eight samples will be collected from 0.5 to 1.5 feet. Samples from each boring will be analyzed for explosives and TPH. Where possible, selection of the sample to be submitted for analyses will be based on visible evidence of contamination.

- Groundwater Sampling — These monitoring wells will be installed and groundwater samples will be collected and analyzed for those compounds presented in Table 5-3.

5.4 SITE 6: LANDFILL WEST OF NORMANDY ROAD

Site Description

This 4-acre landfill in the waterfront area (see Figure 5-3) was used for the disposal of refuse from waterfront area operations from 1943 to 1965. Materials disposed at this site were burned before covering. The IAS reasoned that given the nature of the activities in the waterfront area, it is expected that the wastes disposed at this site include dunnage lumber (typically untreated pine), glass, paper, packing material, and small amounts of paint and solvent wastes. Small amounts of preserved wood (e.g., pentachlorophenol impregnated) may also have been disposed of here, but such activity could not be verified. Transformers and oil filters may also have been discarded at the site. Because no ships were homeported at NWS Earle during the lifetime of this landfill, general shipboard refuse would have been limited.

Data on the quantities of waste disposed at this site are not available. However, on-site interviews conducted by Fred C. Hart and Associates, Inc. indicate that the annual loading of this landfill was less than 2,500 tons of refuse.

This landfill site may have been a salt marsh before waste disposal began. Since the landfill was closed, the waterfront recreation building has been constructed on top of the filled land. The Station Public Works Department has no record of problems associated with the construction and use of this building.

This site is adjacent to a tidal marsh and within close proximity to Sandy Hook Bay. Surface drainage from the site will flow into the marsh and eventually into the bay. The site is in an area of sandy soils that offer a conduit for migration of potential contaminants to the groundwater. However, area residents are supplied by the public water supply system, and there is no known use of the uppermost aquifer in the vicinity. Any contaminants that may

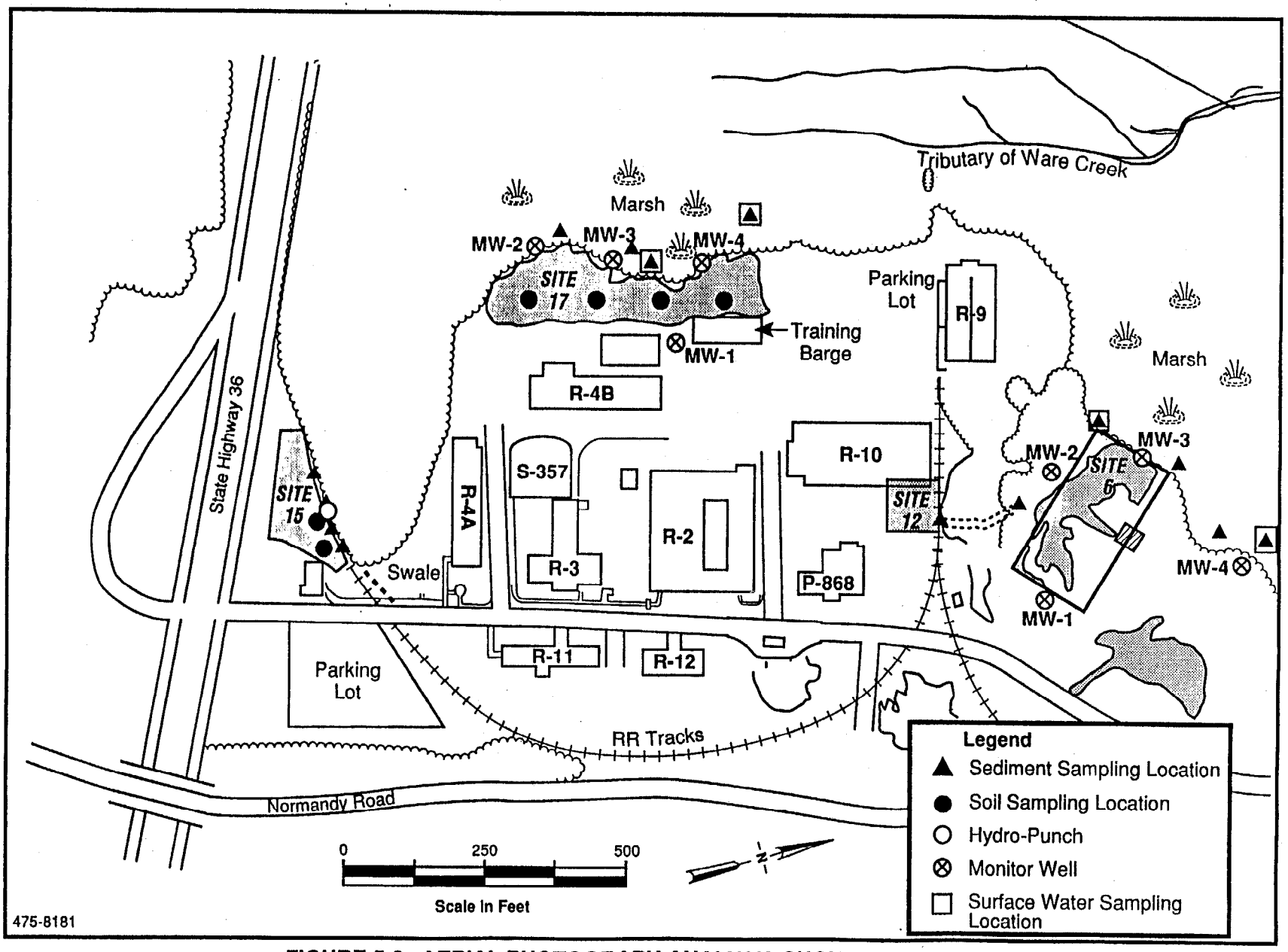


FIGURE 5-3 AERIAL PHOTOGRAPH ANALYSIS SHOWING SURFICIAL CHARACTERISTICS OF SITES 6, 12, 15, AND 17, NWS EARLE, COLTS NECK, NJ

migrate to groundwater appear to be discharged with base flow to either the marsh area or the bay area.

Identification of Possible Site Contaminants

The IAS provides limited information concerning the landfill. Information provided includes the type of materials and approximate volumes disposed at the site. The landfill's location was defined on plan view, but the coordinates given appear in contradiction to current knowledge of the site. The report concludes that the bulk of wastes disposed at the site were inert and their presence would not produce health effects or significant environmental impacts. Due to the varied nature of materials disposed within the landfill and the lack of detailed documentation of disposal operations, specific contaminants cannot be identified.

Data Summary

An HNu/OVA survey similar to that performed at Site 1 was conducted by the NJDEPE; the reported HNu readings range from 14 to 2,000 units. As part of WESTON's health and safety requirements for the 12 June 1989 site visit, a calibrated HNu survey was conducted of ambient air at this site. No levels of organic vapors were detected above the background level established off site and upwind. Further investigations are needed to identify the boundaries of the landfill and to determine the presence or absence of contaminant releases to groundwater.

Plan of Action

The following activities are proposed for Site 6:

- Historical Aerial Photograph Review — The review of photographs taken prior to the construction of the recreational facility may aid in defining the landfill boundaries.
- Boring Log Review — The foundation boring logs prepared during construction of the recreation buildings may reveal additional information

concerning the specific geology beneath the site, approximate depth to groundwater, and the location and contents of the landfill.

- Soil Borings — Two soil borings will be completed to the water table at two of the downgradient well locations and will be sampled and analyzed for full TCL and TAL compounds.

- Sampling Points — Three wells will be installed downgradient of the landfill adjacent to the tidal marsh to collect groundwater samples and measure water levels. One well will be installed upgradient.

- Groundwater Sampling — Groundwater samples will be collected from the completed monitor wells and analyzed for the full TCL and TAL compounds.

- Sediment and Surface Water Sampling — Four sediment and two surface water samples will be collected in the tidal marsh area adjacent to the base at the landfill (see Figure 5-3). Samples will be analyzed for full TCL and TAL compounds, TSS, TOC, and Hardness.

5.5 SITE 8: LANDFILL EAST OF S-186

Site Description

This 1-acre site was used from 1943 to 1965 for dunnage disposal (see Figure 5-4). The IAS states that the dunnage was "typically" made with untreated lumber. The quantity of wastes disposed of is not known, but estimates of total dunnage quantities of 900 to 1,500 cubic yards per year indicate that approximately 20,000 to 30,000 cubic yards of material were dumped at this site. During the 12 June 1989 field visit the site could not be identified due to lush vegetation growth.

Identification of Possible Site Contaminants

Contaminants typically are not associated with untreated lumber.

Data Summary

The Fred C. Hart and Associates, Inc., IAS provides limited information concerning the site. No plan view of the site was provided, and the rough coordinates given do not pinpoint the location of the disposal site. The field visit could not identify the location of the site. The report does state that the material disposed within the landfill was "typically" untreated lumber. Following the IAS, the NJDEPE conducted an HNu/OVA survey in association with a RCRA site inspection. No elevated readings were obtained. The IAS concludes that the materials at the site were inert and, therefore, not a threat to public health or the environment. The NJDEPE RCRA site inspection writeup recommends no further action on this site.

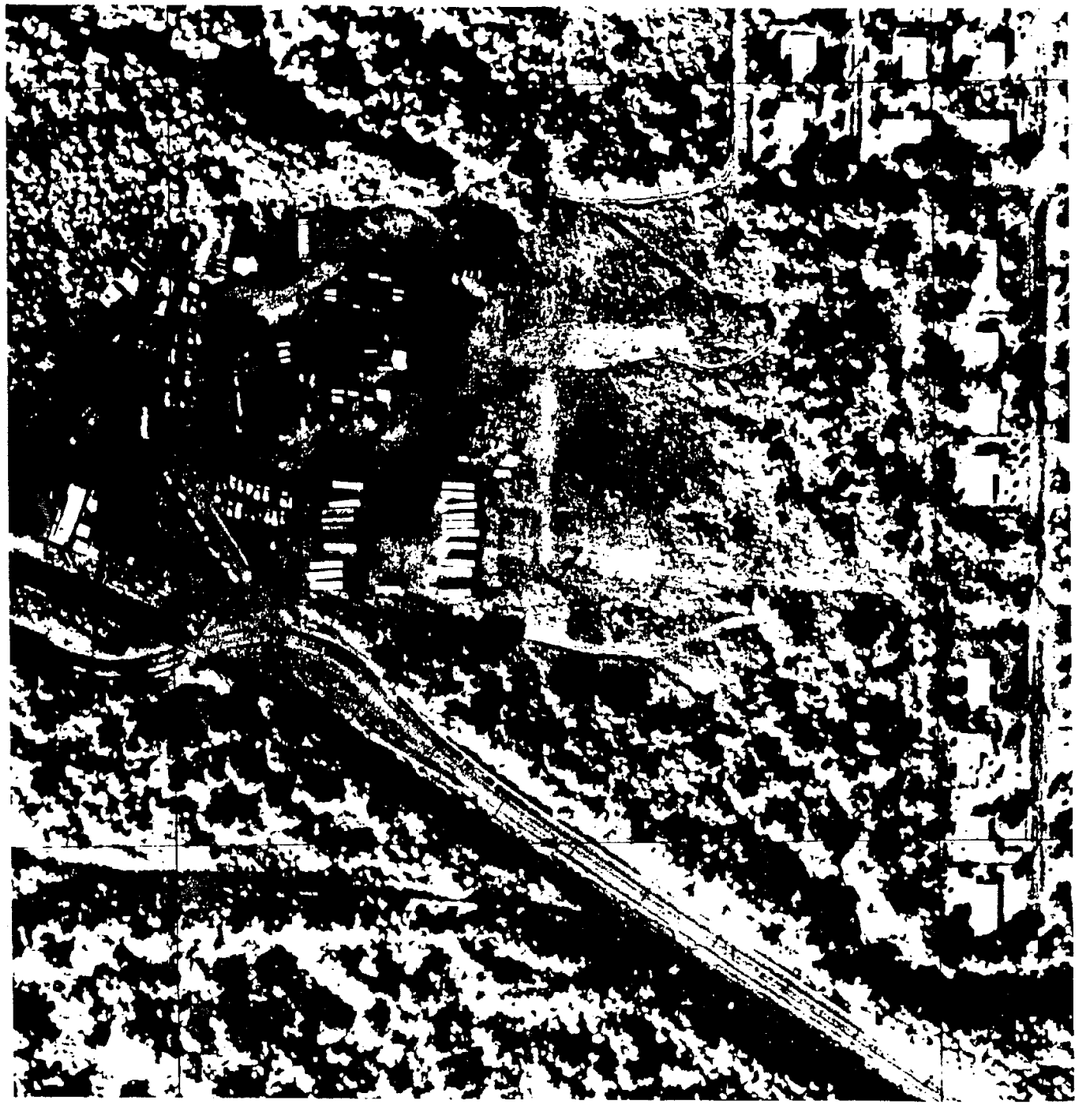
Plan of Action

Site 8 was investigated under a separate work plan in August 1991 to "fast track" a decision on the site. The Navy plans to put a paved parking lot on the site for long-term use by shipboard personnel. Results of that investigation will be presented in a separate letter report and included in the SI report.

5.6 SITE 9: LANDFILL SOUTHEAST OF "P" BARRICADES

Site Description

This 3-acre site was used for disposal of dunnage lumber from 1967 to 1972 (see Figure 5-5). Lumber was stacked and burned and then covered. The IAS states that no records exist of dunnage quantities disposed at this site. However, estimates of total dunnage generation of 900 to 1,500 cubic yards per year indicate that approximately 4,500 to 7,500 cubic yards of lumber were disposed at this site.



1977 aerial photograph showing Site 8 - Dunnage Disposal Landfill northeast of building S-186. Weathering effects and re-establishing vegetation evident in previously disturbed areas.

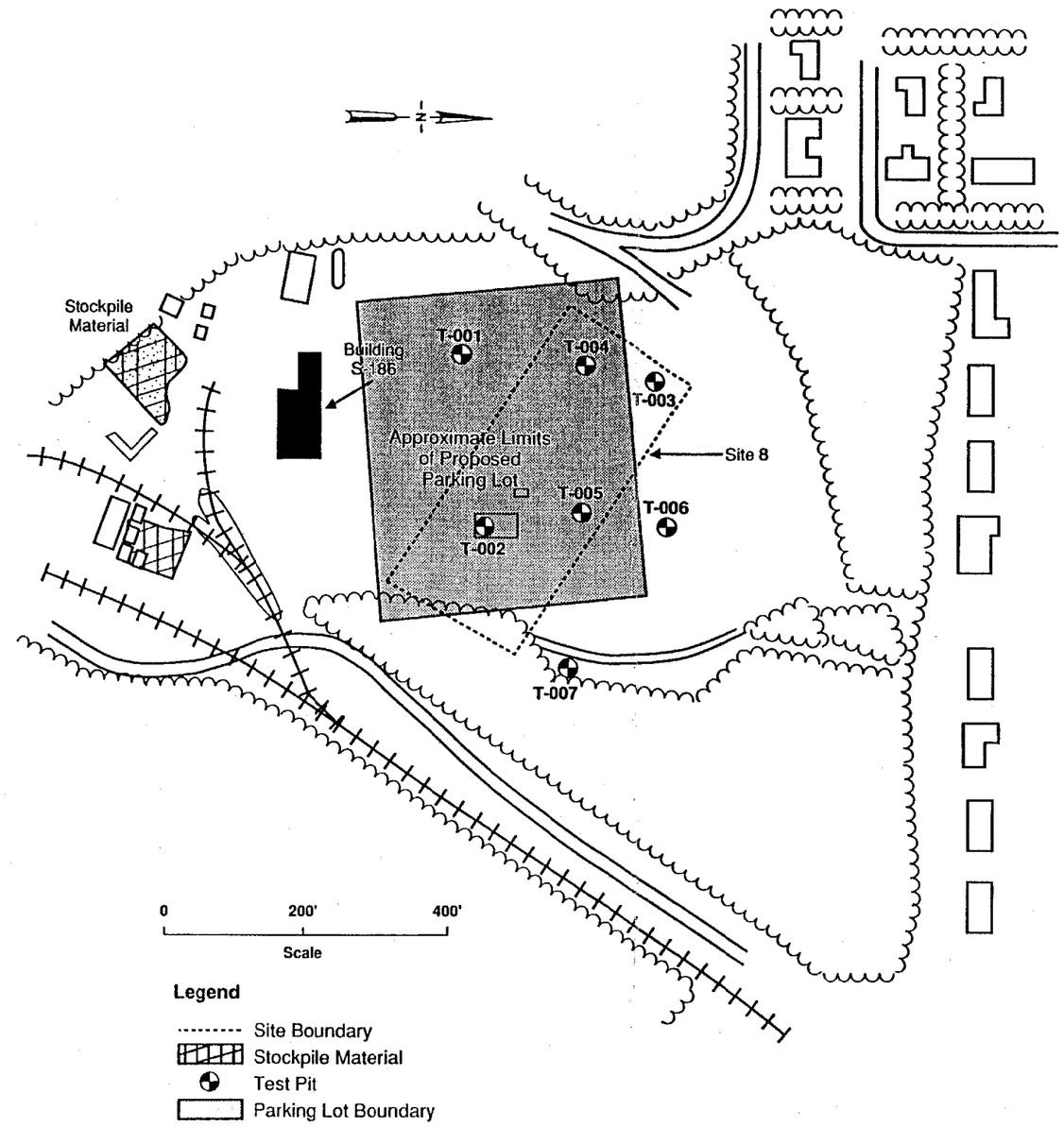


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FIGURE 5-4 SITE 8: LANDFILL EAST OF S-186

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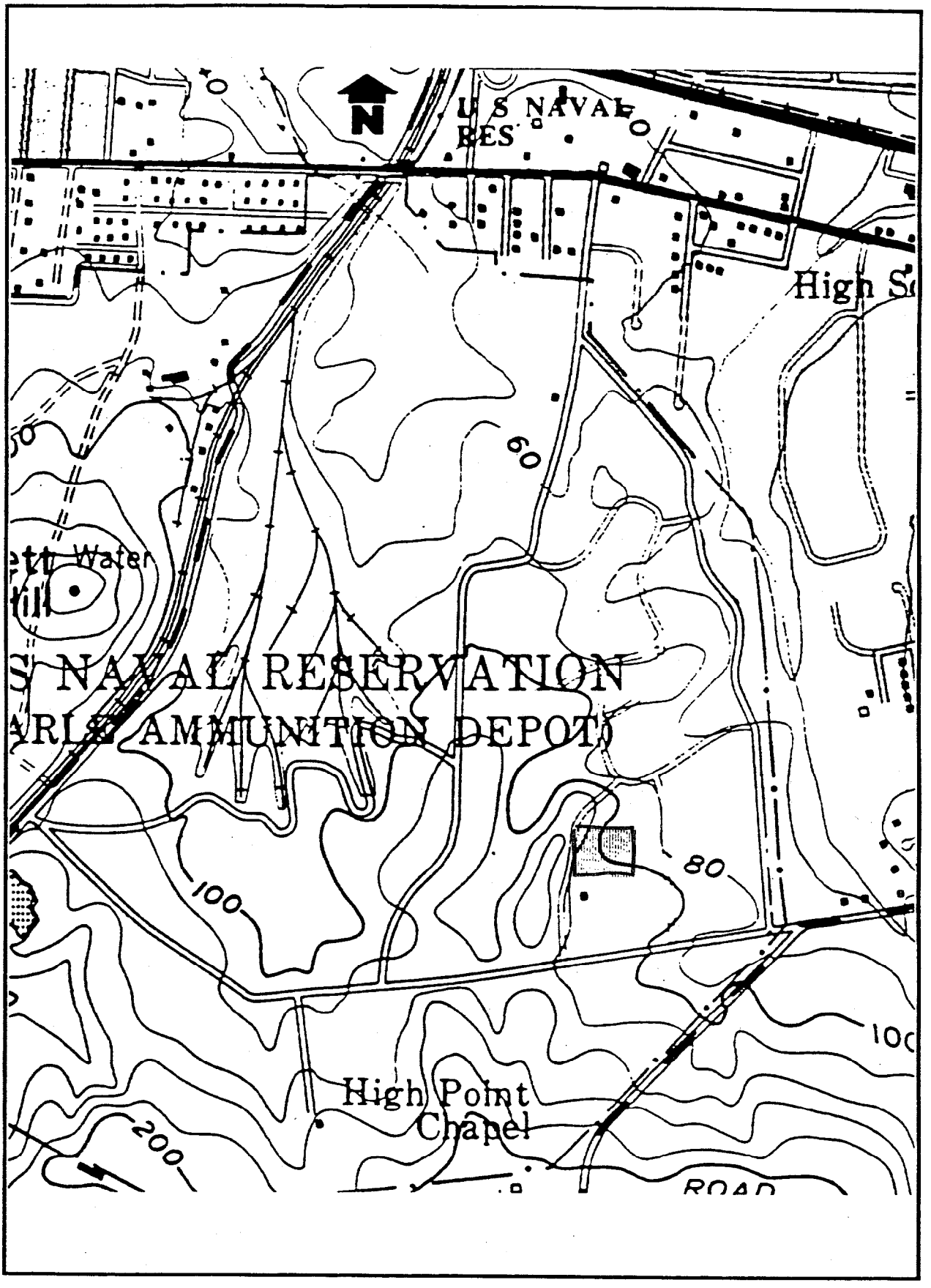


FIGURE 5-5 SITE 9: LANDFILL SOUTHWEST OF "P" BARRICADES
NWS EARLE , COLTS NECK, NJ

Identification of Possible Site Contaminants

Similar to Site 8, this landfill was used for the disposal of dunnage lumber; it has not been established whether the lumber was treated or untreated. It is possible that pentachlorophenol and arsenic contaminants derived from treated wood may be present.

Burning of lumber at the site was also reported. The use of an ignition source, such as oils, suggests the possible presence of petroleum hydrocarbons.

Data Summary

The IAS provides limited information about the site. No plan view of the site was provided, and the rough description and coarse coordinates given do not adequately identify the location of the landfill. The IAS states that dunnage lumber was disposed of, but it is not known whether the lumber was treated or untreated. The NJDEPE conducted an HNu investigation as part of the RCRA site investigation. Readings of 90 units at the edge of the landfill, decreasing toward the center, were reported. The WESTON HNu survey conducted as part of the health and safety requirements during the 12 June 1989 visit showed no readings above the background level established 300 feet from the landfill during a walkover of the site. Additional information is needed to determine the exact boundaries of the landfill.

Plan of Action

The following activity is proposed for the SI at Site 9. To define the general limits of the landfill and obtain samples for chemical analyses, a backhoe will be used to excavate a minimum of six test pits at Site 9. Three or four test pits will be excavated in the northeastern corner of the site. This area is downslope, and the potential for possible contamination migrating off site is greatest in this area. At least one test pit will be unslope. For characterization purposes, one pit will be in the approximate center of the site.

The test pits will be excavated to a maximum depth of 10 feet BGS. Excavated material will be stockpiled around the test pit. The soil stratigraphy will be described and logged in a field notebook, noting color, content, texture, moisture, depth to groundwater, and odor or staining if present. Photographs of each test pit will also be recorded.

Soil sampling will be conducted in accordance with the RI Health and Safety Plan (WESTON, 1990). Soil sampling will follow the procedures outlined in EPA Region II CERCLA Quality Assurance Manual (October 1989) and the RI Quality Assurance Project Plan (WESTON, 1990).

No test pits will be entered by field personnel. All sampling will be conducted using the backhoe bucket and a shovel as needed. Six soil samples will be collected from selected test pits around the site. One background sample will also be collected from the upslope test pit. The samples will be collected in the fill material and analyzed for full TCL organics, TAL metals, arsenic, and TPH. If no fill is encountered, the samples will be collected from just above the soil/water interface. Upon completion of each pit, excavated materials will be backfilled into the pit and compacted with the backhoe bucket. The backhoe bucket will be steam cleaned before excavation of the first pit, between sampling locations and test pits, and following completion of the last pit.

Sample handling, documentation, analytical, and QA/QC procedures will be in accordance with the RI Quality Assurance Project Plan (WESTON, 1990). The information gathered from this investigation will be incorporated into the SI report.

5.7 SITE 12: BATTERY STORAGE AND HANDLING AREA, WATERFRONT AREA

Site Description

This site is an area located behind the new recreation building (Building R-14) at the waterfront area. The site is shown in Figure 5-3. This site was used as a transhipment staging area for forklift batteries being sent off site for reclamation and recharge. During

operations, it is possible that acid electrolyte spills occurred in small quantities. The period of activity and total quantity handled are unknown.

The concerns associated with this site focus on the possible presence of battery acid residue in the soil on and adjacent to this site. The IAS states that it was observed during visual inspection that the site drains into a tidal marsh. Drainage on the pad leads to a storm sewer. Past storage areas for the batteries are not precisely known. No batteries are currently stored at this site.

Identification of Possible Site Contaminants

Contaminants associated with battery acid include acid electrolytes and lead. The IAS reasoned that any acidic liquids contaminating the site would be neutralized by the buffering capacity of the sea water in the marsh.

Data Summary

Additional information is needed to determine whether the site is currently affected as a result of battery acid disposal.

Plan of Action

The following activities are planned for the SI at Site 12:

- Historical Aerial Photograph Review — Photographs will be reviewed to determine the location of the handling area reported in the IAS.
- Sediment Sampling — Two sediment samples will be taken; one sample will be obtained in the storm drain at the inflow. If the storm drain discharges to the marsh, a sediment and surface water sample will be taken at the outflow. The two sediment samples will be analyzed for VOCs, TAL metals and cyanide, TOC, TSS, and Hardness. If lead concentrations fall within normal background ranges, no further action will be recommended.

5.8 SITE 13: DEFENSE PROPERTY DISPOSAL OFFICE STORAGE YARD

Site Description

The Defense Property Disposal Office (DPDO) storage yard is located near the rail classification yards. The approximate site location is shown in Figure 5-6. The IAS states that activities conducted at this site included the storage of scrap metals and forklift batteries. Minor spills of battery acid (on the order of 10 gallons per year or less) may have occurred at the site during the handling of batteries (e.g., batteries may have tipped over). In addition, PCBs-containing transformers were stored at this site in open rail cars before being transported to the controlled storage area (QH-8). Transformer cases were periodically inspected for damage, and larger transformers were stored in empty torpedo barrels. Interviews conducted during the IAS indicate that no leakage occurred.

Plan of Action

The NJDEPE RCRA site inspection writeup recommends no further action be undertaken. However, based on further discussions with the Agencies, the Navy agrees to conduct the following activities at this site:

- Soil Sampling – A total of six soil samples will be collected. Samples will be collected from 0 to 3 feet and analyzed for semivolatile organic compounds (SVOCs), PCBs, and TAL metals and cyanide.

- Sediment and Surface Water Sampling – Two sediment and three surface water samples will be collected in the drainageway (see Figure 5-6) and will be analyzed for those compounds presented in Table 5-2.

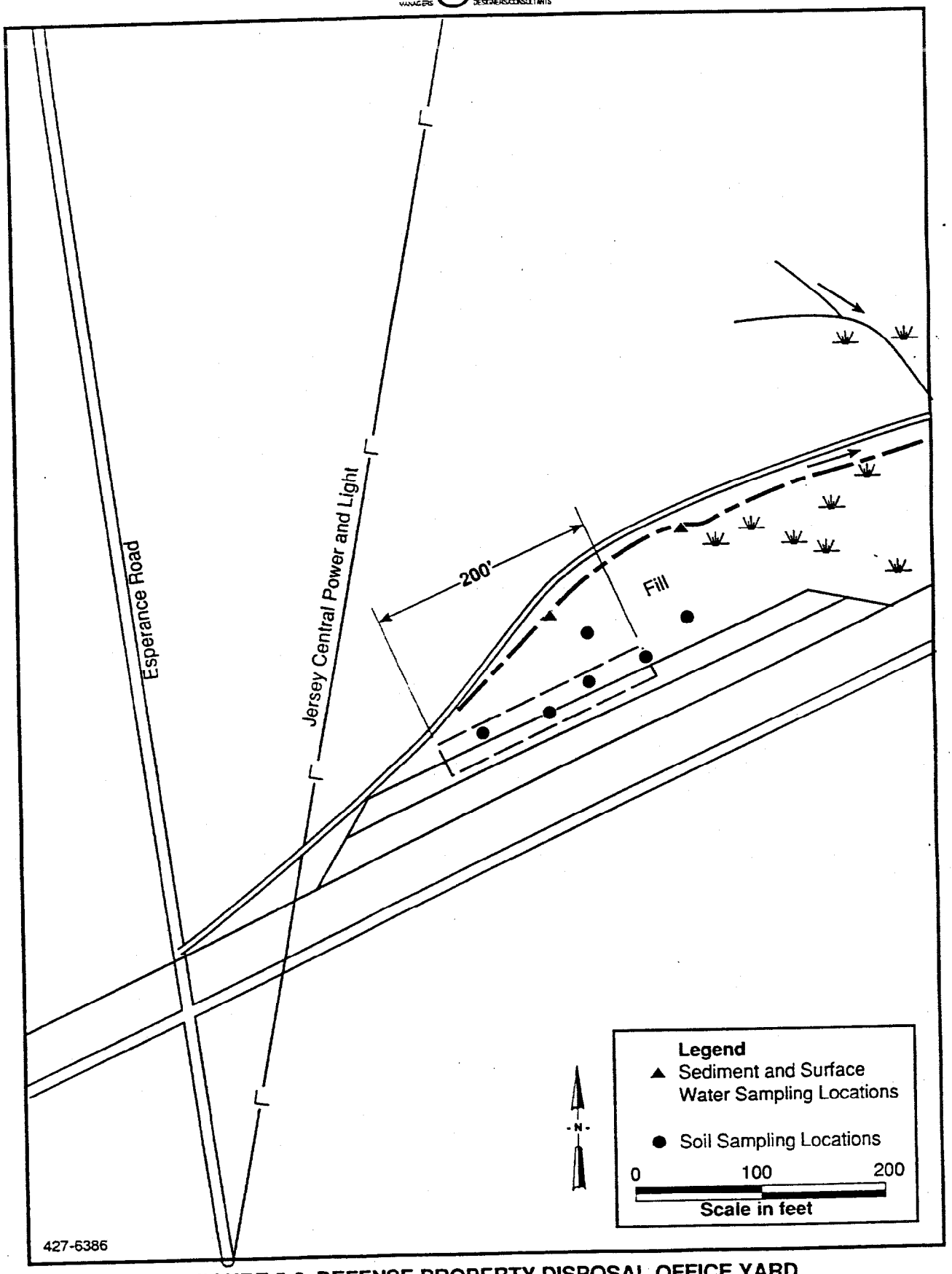


FIGURE 5-6 DEFENSE PROPERTY DISPOSAL OFFICE YARD NWS EARLE , COLTS NECK, NJ

5.9 SITE 14: DEFENSE PROPERTY DISPOSAL OFFICE WAREHOUSE

Site Description

The DPDO warehouse, Building C33, is a 16,000-square foot storage building for items awaiting processing. This building is shown in Figure 5-7. On-site interviews conducted by Fred C. Hart and Associates, Inc., and confirmed during the 12 June site visit, indicate that a mercury spill of one to several ounces occurred inside this building in 1970. Cleanup operations were conducted, but further information on the extent of the spill and subsequent cleanup is unavailable in the IAS. Interviews conducted during the 12 June 1989 site visit confirm that the spill was inside the building and that the mercury was cleaned up by vacuuming.

Identification of Possible Site Contaminants

A mercury spill of one to several ounces occurred in this building. Cleanup occurred, and therefore, the site is not considered contaminated.

Plan of Action

Since the spill, of very limited quantity, occurred inside the building and was cleaned up, no further action is required at this site.

5.10 SITE 15: BILGE WATER DISPOSAL SITE NEAR WATERFRONT SOUTH GATE

Site Description

According to interviews conducted by Fred C. Hart and Associates, Inc., during the inspection of NWS Earle, a site along the railroad tracks at the main entrance to the waterfront area was used for disposal of an unknown quantity (possibly over 5,000 gallons)

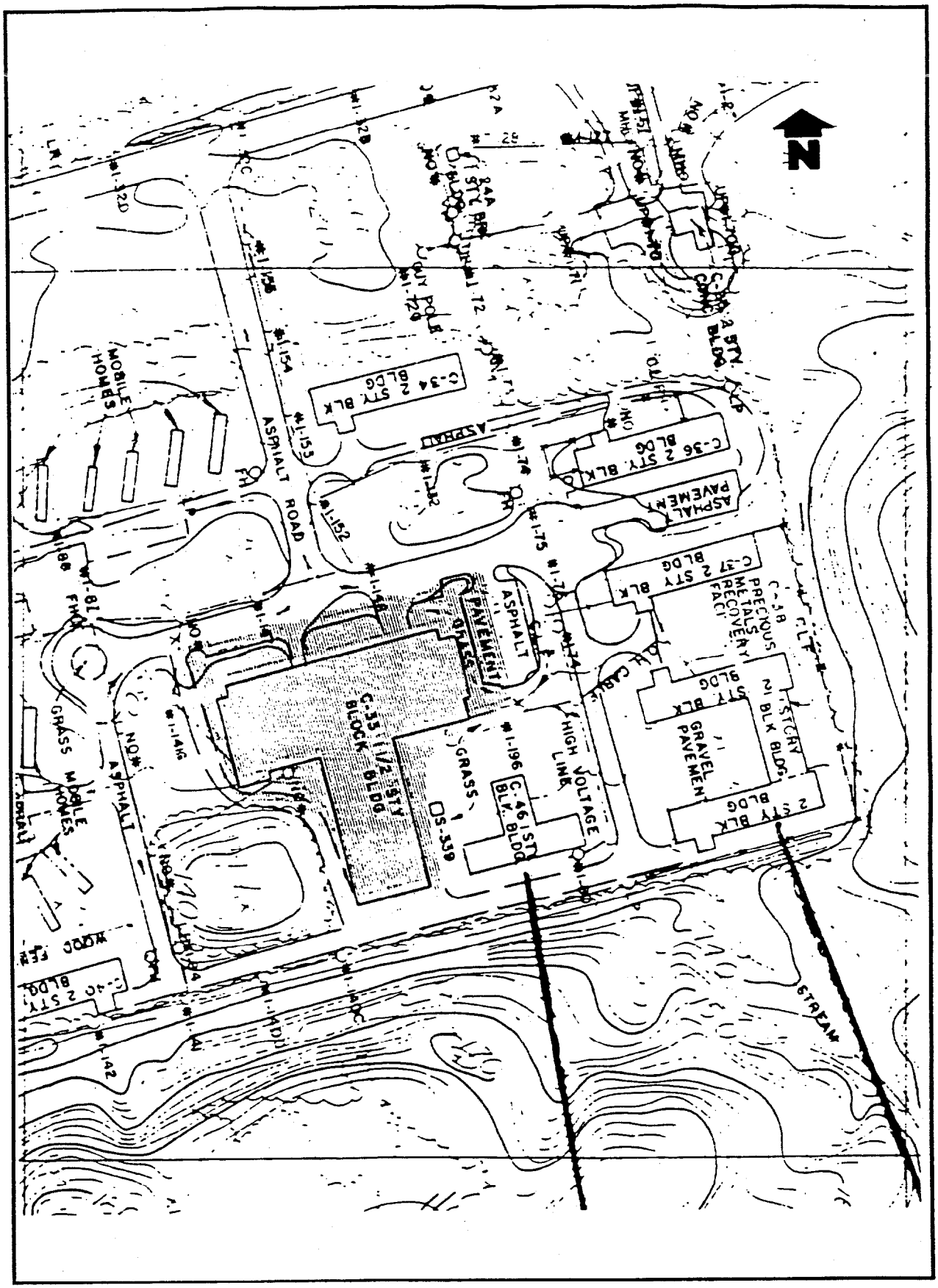


FIGURE 5-7 SITE 14: DEFENSE PROPERTY DISPOSAL OFFICE WAREHOUSE
NWS EARLE , COLTS NECK, NJ

of oily bilge water, ranging from 1 to 25% oil, from ships homeported at the base during the early 1970s. However, the location of this disposal was not apparent from close inspection of the suspected area. A parking lot constructed in 1978 covers a portion of this area. The area suspected to be the site is shown in Figure 5-3.

Identification of Possible Site Contaminants

The contaminants associated with the oily bilge water are petroleum hydrocarbons.

Data Summary

The IAS provides limited information about the disposal site location, amount of sludge, and the components of the sludge. Further investigation is needed to determine the exact disposal location and whether contamination exists.

Plan of Action

The following activities are proposed for the site:

- Hydro-Punch© — One groundwater sample will be collected by a Hydro-Punch© sampler device and analyzed for TCL full-scan compounds.
- Soil Sampling — Two soil borings will be completed to the water table in the railroad siding (see Figure 5-3). Samples will be analyzed for SVOCs.
- Sediment Sampling — Four sediment samples will be collected in the drainageway adjacent to the railroad siding and analyzed for SVOCs.

5.11 SITE 16: FUEL LINE CONNECTING BUILDINGS C-20 AND C-50

Site Description

This underground fuel line was used to transport diesel fuel from an underground fuel storage tank located adjacent to Building C-20 to a dispensing station (pump) located behind

Building 19 or 20, a distance of approximately 400 feet. A leak in the fuel line was discovered in June 1977 when soil residues were discovered in the locomotive fuels; use of the pipeline was discontinued. Subsequent excavation uncovered the location of the leak, and it was determined that the amount of diesel fuel lost was minimal (less than 50 gallons). The location of this fuel line is shown in Figure 5-8. Because the leak was discovered quickly and the amount of fuel lost was estimated to be minimal, this site was not recommended for further study by the IAS.

Plan of Action

The following activities are proposed for the SI at Site 16 and will assess the sufficiency of procedures that have already been used to clean up the spill:

- Personnel Interviews — These interviews will assist in confirming the exact location of the spill cleanup activities. Historical photographs will also be examined, if available.

- Soil Borings — A total of six soil borings will be completed, three on either side of the pipeline, in the locations that have the highest probability of containing contaminants (see Figure 5-8). As presented in Table 5-1, samples will be taken from the pipe depth to the water table and will be analyzed for SVOCs and TPH.

5.12 SITE 17: DISPOSAL AREA BEHIND TRAINING BARGE, WATERFRONT AREA

Site Description

This site is currently used as a disposal area by waterfront area personnel (see Figure 5-3). The materials disposed of include forklift vehicles; empty paint cans; construction debris such as wood, concrete, and asphalt; waste equipment such as old valves; and similar relatively inert materials. During physical inspection of the site conducted by Fred C. Hart and Associates, Inc., an empty drum (55 gallons) was observed. However, there was no evidence of stressed vegetation. The RCRA site inspection conducted by the NJDEPE recommended referral to the NJ Division of Solid Waste.

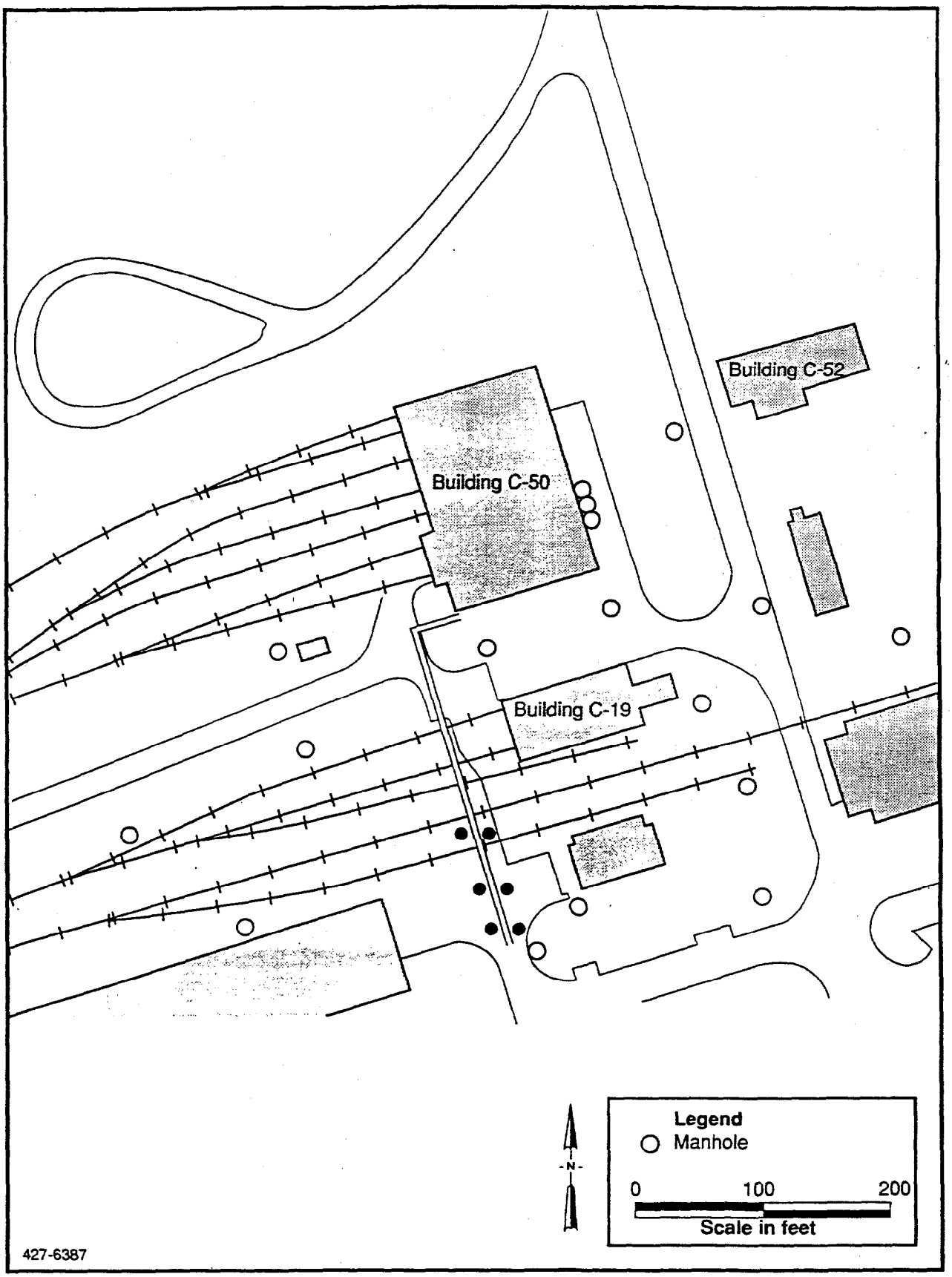


FIGURE 5-8 SITE 16: FUEL LINE CONNECTING BUILDINGS C-19 AND C-50
NWS EARLE, COLTS NECK, NJ

Identification of Possible Site Contaminants

Due to the lack of documentation and the wide variety of materials thought to be disposed at the site, the exact contaminants cannot be determined.

Data Summary

The boundaries of the disposal area and the presence or absence of contaminants in groundwater will be determined during this investigation.

Plan of Action

The following activities are proposed for Site 17:

- Groundwater Sampling — Four monitor wells will be installed (see Figure 5-3) and groundwater samples will be collected and analyzed for the parameters shown in Table 5-3.
- Soil Borings — Four soil borings will be completed to the groundwater table and samples will be collected at specified intervals and analyzed for TAL metals and cyanide, shown in Table 5-1.
- Sediment and Surface Water Sampling — Sediment and surface water samples will be collected at the locations shown in Figure 5-3 and analyzed for TCL and TAL compounds TOC, TSS, and Hardness as presented in Table 5-2.

5.13 SITE 23: PAINT CHIP DISPOSAL AREA ADJACENT TO BUILDING D-5

Site Description

Building D-5 has been used at least since the early 1970s for reworking (i.e., repainting and stenciling) major items of ordnance, such as torpedoes and aerial bombs. The IAS concludes that, based upon the appearance of the site, the amount of paint dumped in this area was not large enough to constitute a significant environmental or public health hazard.

The NJDEPE RCRA site inspection report recommends that no further investigation of the site is necessary. The site is shown in Figure 5-9.

Identification of Possible Site Contaminants

According to the IAS, materials used in the reworking process included zinc chromate primer, "Witegard" (corrosive alkaline material), and paint thinner. Although most of these materials were hauled off site by a private contractor, all of these materials may be present within the paint spill. Contaminants resulting from these materials include the following:

- Metals (Pb, Zn, Cu, Cr) derived from the paints.
- Volatiles — paint thinner.
- Naphthenates — paint dryer.
- Toluene — paint thinner.
- Xylenes — paint thinner/paint remover.
- Methylene chloride — paint thinner.

Data Summary

Although the materials present at the site are well documented, the specific boundaries of the disposal area and the actual presence of contamination are not. The SI will identify the boundaries of the site.

Plan of Action

The following activities are proposed for the SI at Site 23:

- Hydro-Punch© — One groundwater sample (Figure 5-9) will be collected by a Hydro-Punch© sampler device and analyzed for TCL full scan and TAL metals.

- Soil Sampling — Soil samples will be taken to determine whether contamination is present in the soils underlying the area of operations. A total of eight subsurface samples (see Figure 5-9) will be collected within the area where paint spillage is visible. Six samples from 0- to 3-foot intervals will be

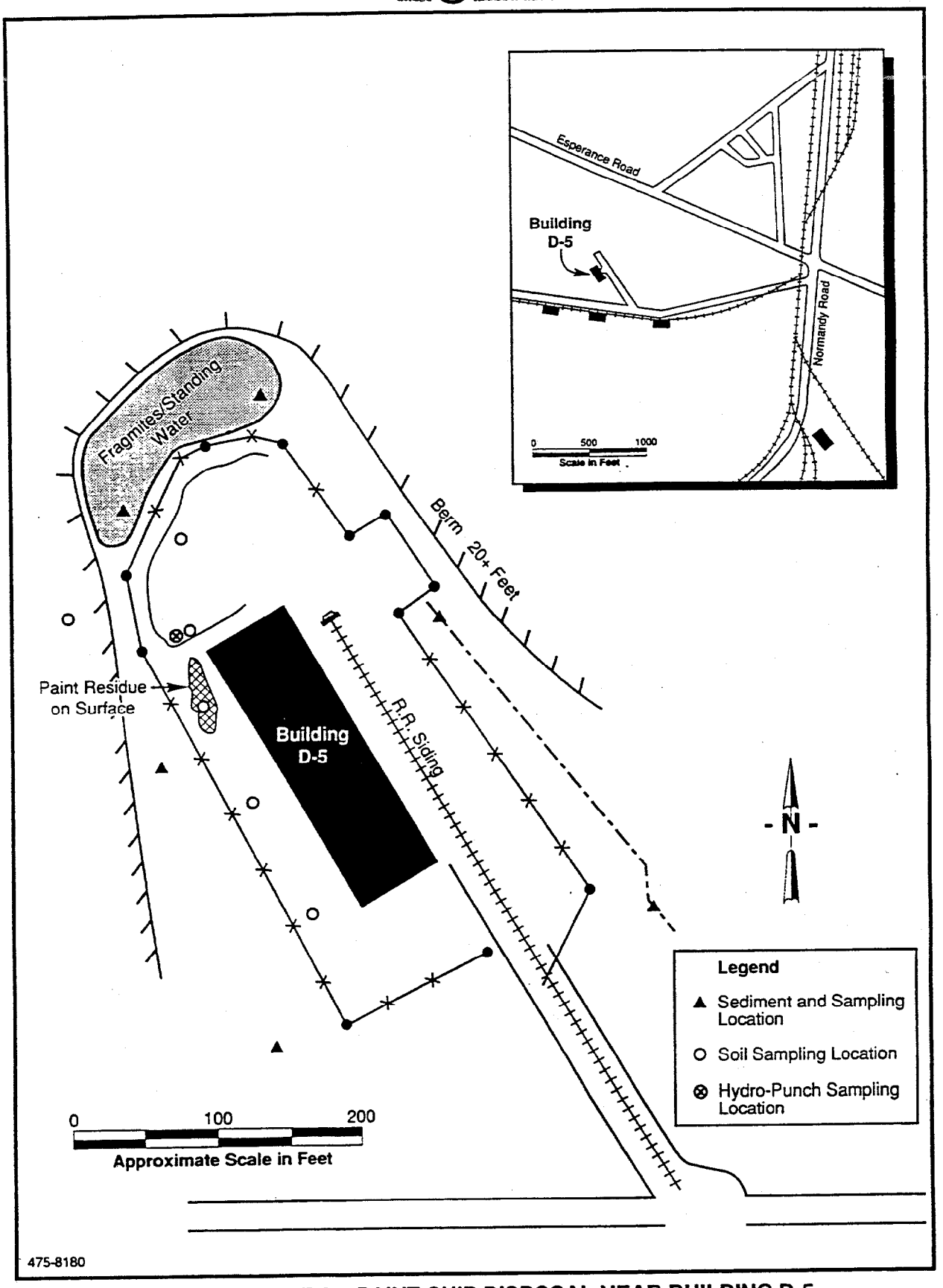


FIGURE 5-9 SITE 23: PAINT CHIP DISPOSAL NEAR BUILDING D-5
NWS EARLE, COLTS NECK, NJ

analyzed for Pb, Zn, Cu, Cr, and Cd. Two samples will be analyzed for TCL full scan.

- Sediment Sampling — A total of 10 sediment samples (see Figure 5-9) will be collected at 6 locations from the marsh and drainages immediately adjacent to the site and will be analyzed for those compounds presented in Table 5-2.

5.14 SITE 24: CLOSED PISTOL RANGE

Site Description

This closed small arms practice range contains lead- and copper-jacketed bullets in the impact berm. Estimating that approximately 200 rounds of 180-grain, 0.45 caliber ammunition are required per person to maintain annual pistol qualification and that no more than 50 personnel would maintain qualification per year, the annual loss of lead would be approximately 250 pounds in the form of bullets. Fred C. Hart and Associates, Inc. conclude in the IAS that, in that form and those amounts, lead does not pose a significant threat to the environment or to public health. The NJDEPE RCRA SI recommends that no further investigation of this site be undertaken. The approximate boundaries of the site are shown in Figure 5-10.

Identification of Possible Site Contaminants

Possible site contaminants are primarily lead.

Data Summary

The location of the target area and the types of contaminants present are well documented. The NJDEPE RCRA SI recommends no further site investigation be performed. However, further investigation of the pistol range will be conducted to determine whether these metals constitute an environmental risk.

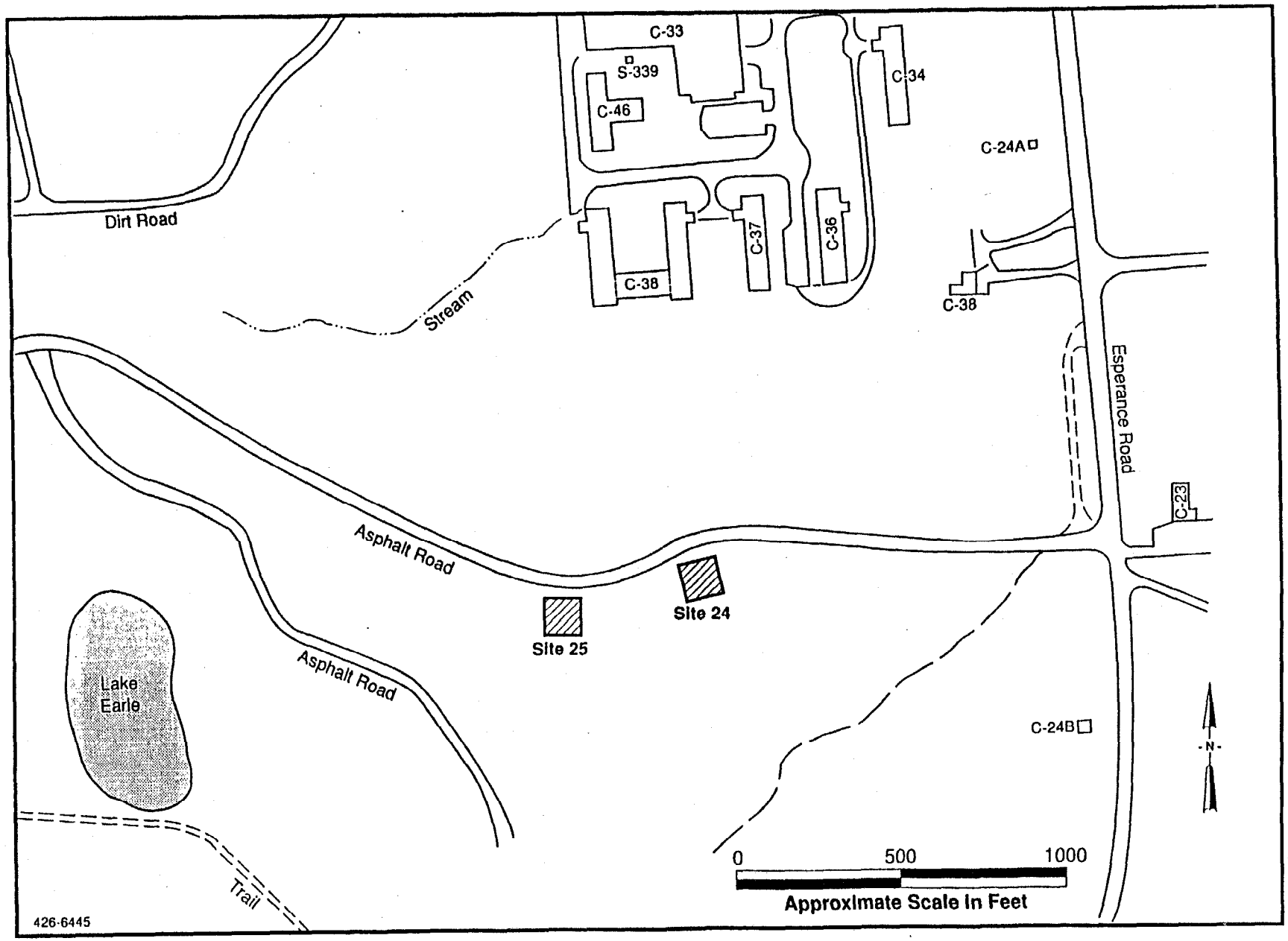


FIGURE 5-10 SITES 24 AND 25: CLOSED PISTOL RANGES
NWS EARLE, COLTS NECK, NJ

Plan of Action

- Soil Sampling — Four soil samples will be collected with a hand auger in the berm below the target area in line of fire (see Figure 5-11). These samples will be analyzed for Pb, Zn, Cu, Cr, and Cd.

- The results of the soil sample analyses at Site 24 will indicate whether the lead and soil in the target area could be categorized as a RCRA waste and whether leaching of metals may be occurring.

5.15 SITE 25: CLOSED PISTOL RANGE — TREATED RAIL TIES

Site Description

This site is a former small arms range, located near Site 24, and is similar in nature to Site 24. Fred C. Hart and Associates, Inc. estimated that approximately 200 rounds of 180-grain, 0.45 caliber ammunition are required per person to maintain annual pistol qualification and that no more than 50 personnel would maintain qualification per year. The annual loss of lead at this site was estimated to be approximately 250 pounds in the form of bullets. Fred C. Hart and Associates, Inc. conclude that in that form and those amounts, lead does not pose a significant threat to the environment or to public health. Site boundaries are shown in Figure 5-10.

Identification of Possible Site Contaminants

The possible site contaminants are the metals derived from the spent cartridge cases and bullets, including lead, copper, and zinc.

Data Summary

The NJDEPE RCRA site inspection recommends no further investigation of this site.

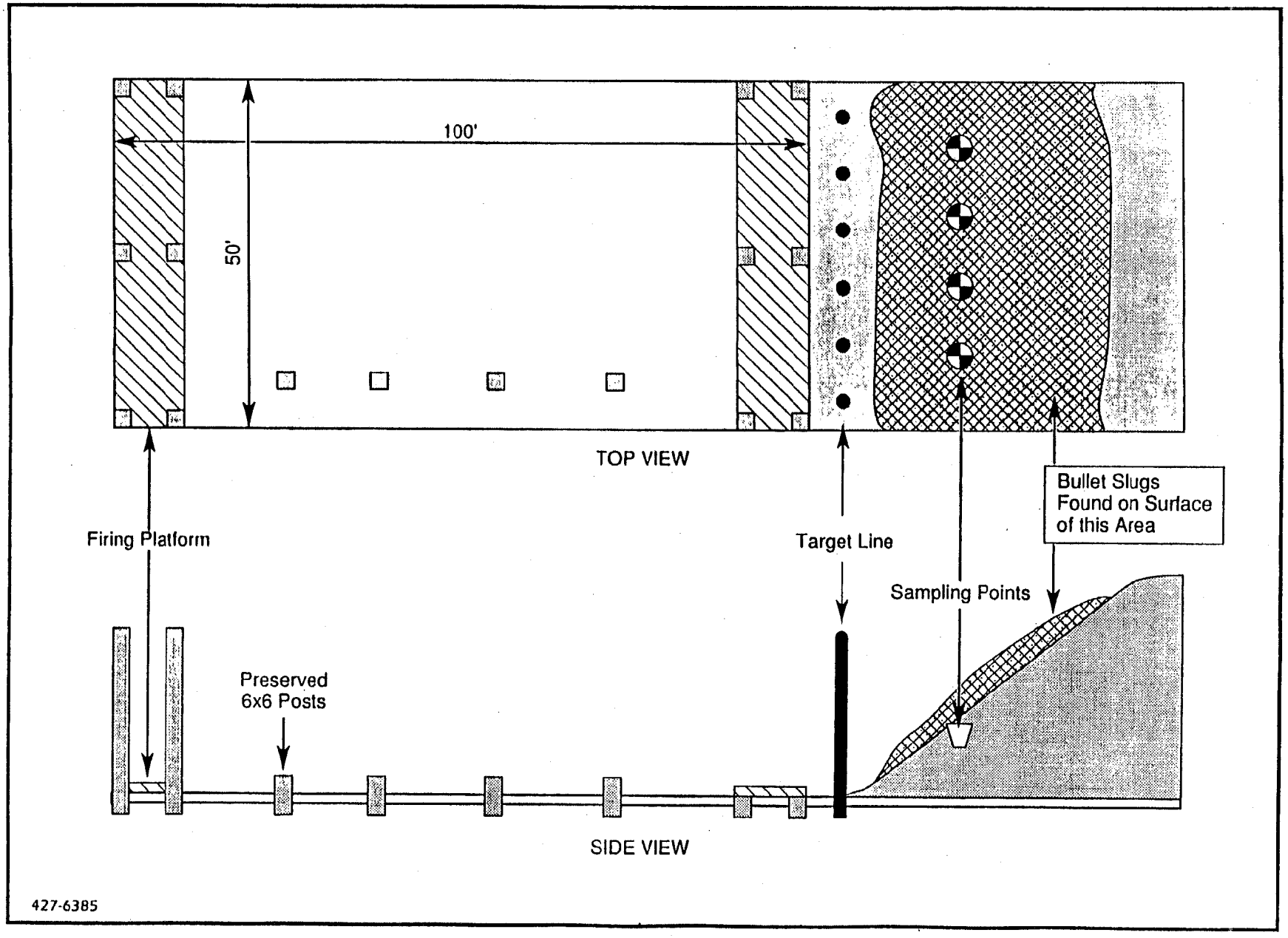


FIGURE 5-11 SITE 25: PISTOL RANGE (INACTIVE)
NWS EARLE, COLTS, NECK, NJ

Plan of Action

The following activities are planned for the SI at Site 25.

- Soil Sampling — Consistent with Site 24, four soil samples will be collected with a hand auger in the berm below the target area in the line of fire. The samples will be analyzed for Pb, Zn, Cu, Cr, and Cd.

5.16 SITE 27: PROJECTILES REFURBISHING AREA

Site Description

At this location, (see Figure 5-12) projectiles were refurbished by shot-blasting, repainting, and restenciling. Waste materials resulting from this process include oil-contaminated rags, paint chips, blasting shot, and toluene. Currently, these materials are transported off site by private contractors. However, prior to 1978, they were retained on site in dumpsters.

Identification of Possible Site Contaminants

The observation of paint chips and spent blasting shot along with evidence of on-site disposal practices suggest the possibility that residues from these site operations are present. The contaminants identified resulting from the waste materials include the following:

- Metals (Pb, Zn, Cu, Cr) originating in blasting shot and paint.
- Toluene occurring in paint thinner.
- Volatiles derived from paint thinner.

Data Summary

The IAS provides information concerning the location of the site, the operations and materials used, and possible contaminants. The study also concludes that the materials

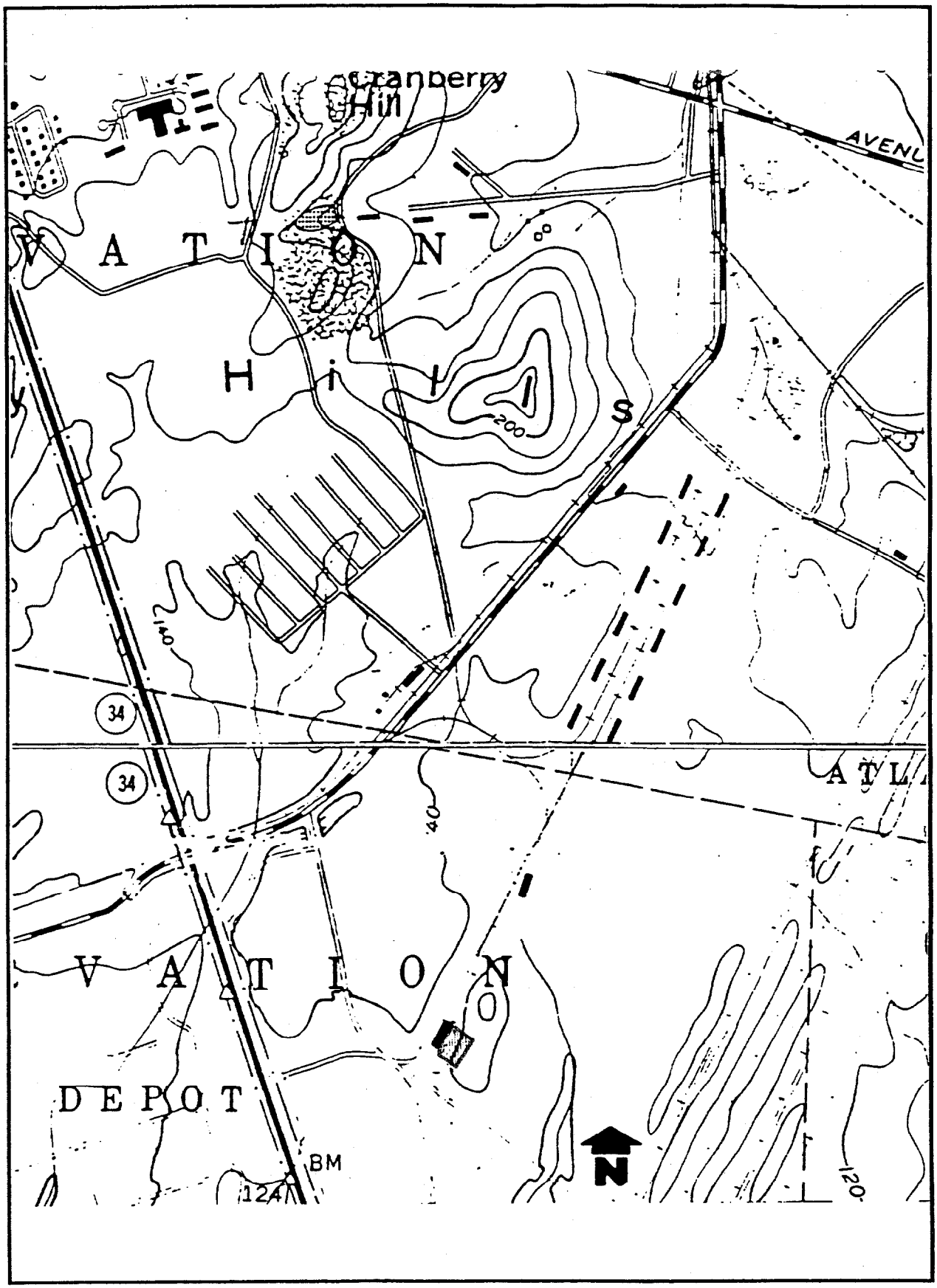


FIGURE 5-12 SITE 27: PROJECTILES REFURBISHING AREA
NWS EARLE , COLTS NECK, NJ

dumped within the site (paint chips, blasting shot) are relatively inert and do not pose a significant threat to the environment or public health.

An HNu survey conducted by NJDEPE recorded high responses up to 1,900 ppm. WESTON conducted an HNu survey as part of the health and safety requirements for the 12 June 1989 site visit. The instrument was calibrated off site and brought on site with no elevation in readings. The instrument probe was placed in various animal burrows and in cracks and crevices of the Conex boxes on site without elevation of the readings. One area of dried paint was overturned, and the fresh soil underneath was measured without elevated readings.

Plan of Action

The following activities are proposed for the SI at Site 27:

- Soil Sampling — A total of 10 soil samples (see Table 5-1) will be obtained from the disposal area. These soil samples will be collected from 0 to 6 and 6 to 18 inches below the surface. All samples will be analyzed for TCl full scan and TAL metals and cyanide.
- Sediment Sampling — A total of 10 sediment samples will be collected adjacent to the disposal areas. Samples will be analyzed for the analytes summarized in Table 5-2.

5.17 SITE 28: WASTE OIL TANK

Site Description

The underground waste oil storage tank located behind Building C-14 had overflowed during 1982, with one to several gallons of oil spilled on the ground surface (see Figure 5-13). At the time of the 1986 NJDEPE RCRA site inspection, this site was undergoing a state-approved closure. The RCRA site inspection report recommends no further action at this site.

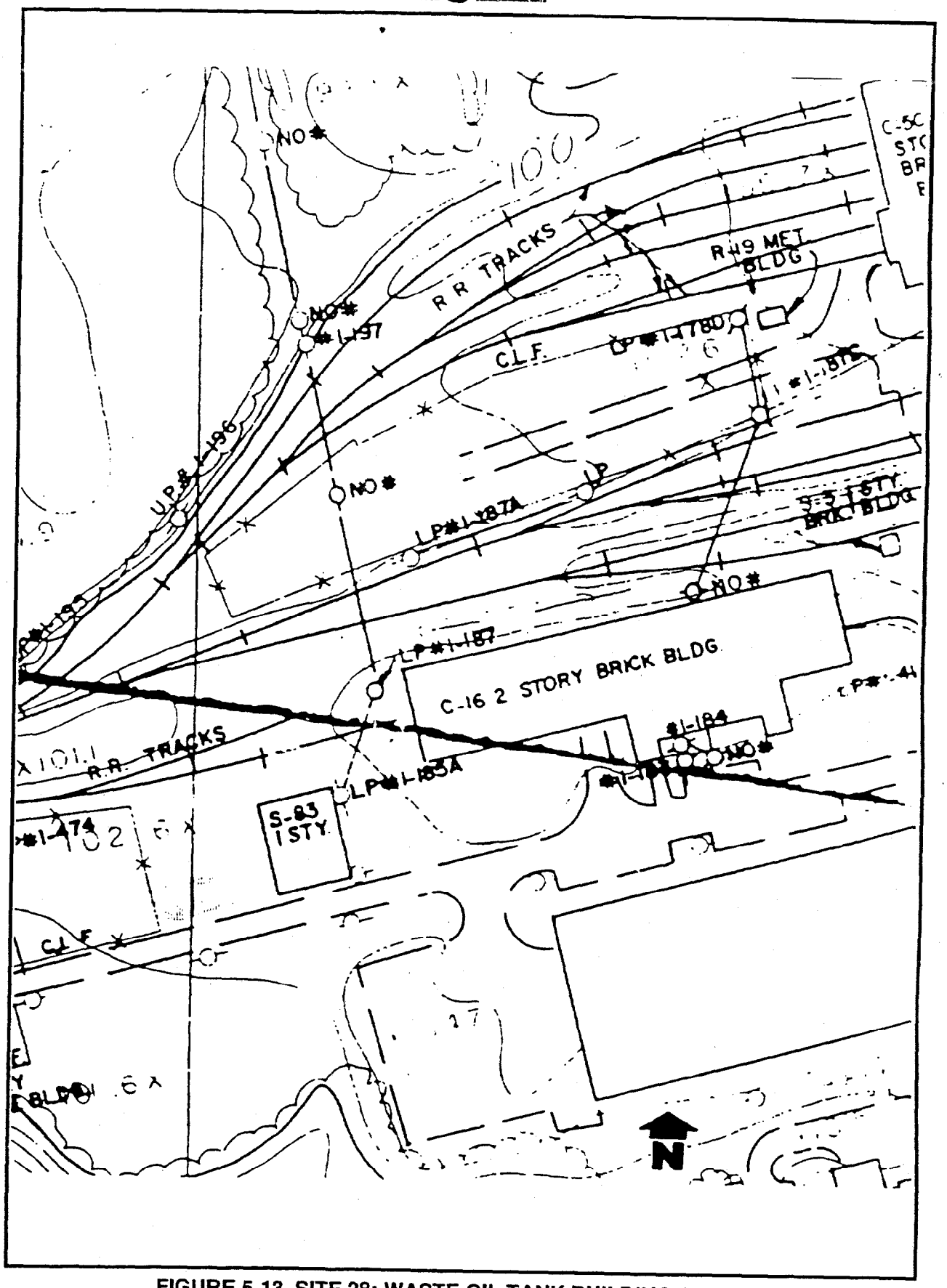


FIGURE 5-13 SITE 28: WASTE OIL TANK BUILDING C-16
NWS EARLE , COLTS NECK, NJ

5.18 SITE 29: PCBs SPILL SITE, BUILDING C-16

Site Description

This site, in the storage yard north of Building C-16, was the location of a 1981 PCBs spill from a vandalized transformer. Within 5 days of the occurrence of the spill, over 120 cubic feet of contaminated soil was excavated and transported for off-site disposal. All visible evidence of the oil spill (e.g., discolored soil) was removed during this cleanup operation.

Identification of Possible Site Contaminants

Contaminants resulting from the spill include PCBs and petroleum hydrocarbons.

Plan of Action

The following activities are planned for SI Site 29:

- Review of Documentation — Records of the cleanup, hazardous waste manifests, and removal action work plans will be reviewed to confirm the removal of all contaminated soil.
- Soil Sampling — Five soil samples will be collected at depths from 6 to 18 inches below ground surface. Samples will be analyzed for PCBs and TPH as presented in Table 5-1.

SECTION 6

REPORTING

A report will be prepared documenting the findings of the work undertaken and to present conclusions and recommendations for the sites. Site maps to accurately show sampling locations, visible drainage pathways, boundaries and other important features will be prepared from available plans and field notes. Sampling locations will be referenced by tape and compass to obvious features such as building corners, road intersections, manholes, etc. Laboratory data will be reported in tabular format.

A draft report will be submitted for Navy and Agencies review and comments. The draft will be followed by a final report that will incorporate these comments and responses as appropriate.

SECTION 7

SCHEDULE

The schedule for the activities described in this Work Plan are presented in Figure 7-1.

FIGURE 7-1

SCHEDULE FOR COMPLETION OF THE SITE INVESTIGATION
NWS EARLE, COLTS NECK, N.J.

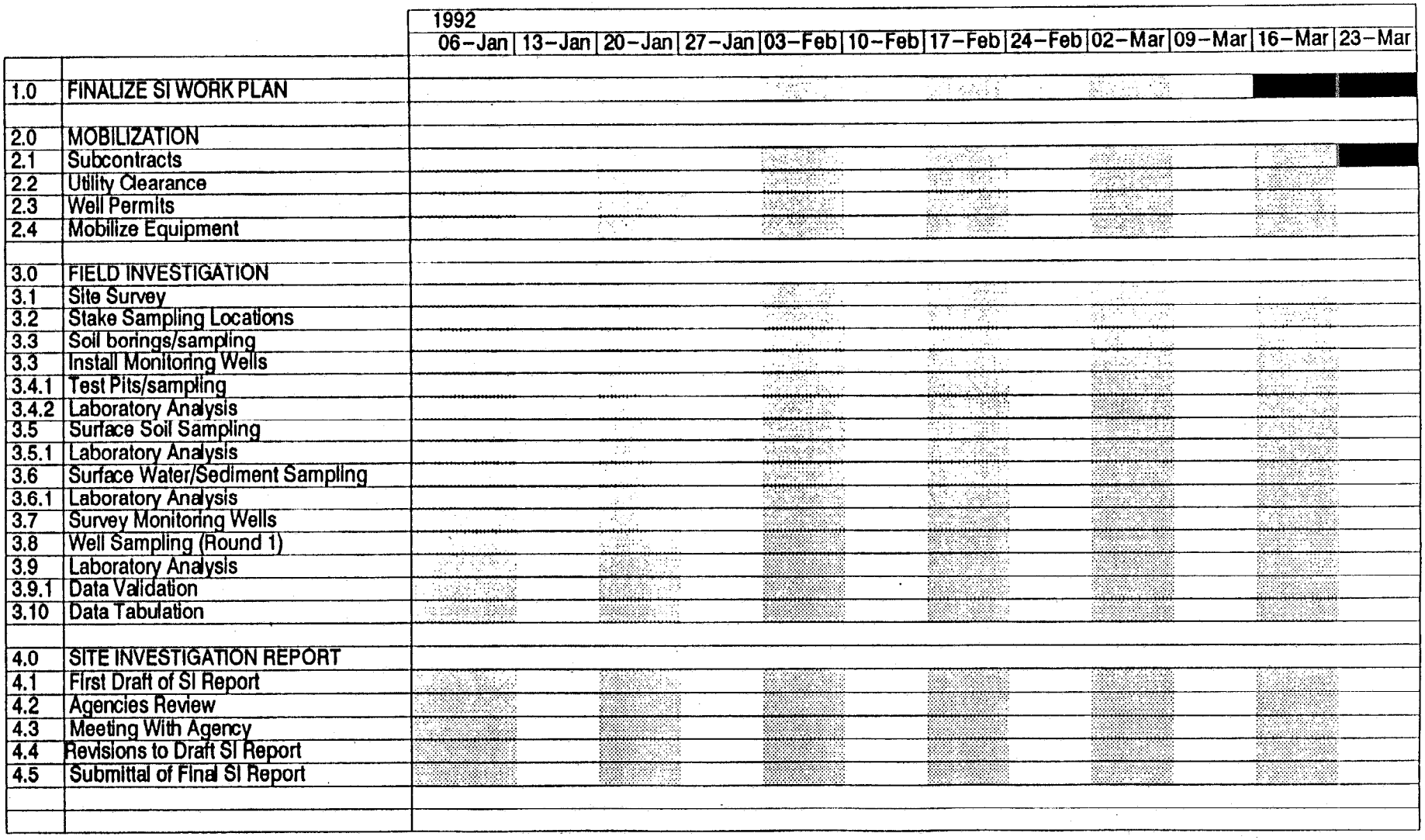


FIGURE 7-1 (Cont.)

SCHEDULE FOR COMPLETION OF THE SITE INVESTIGATION
NWS EARLE, COLTS NECK, N.J.

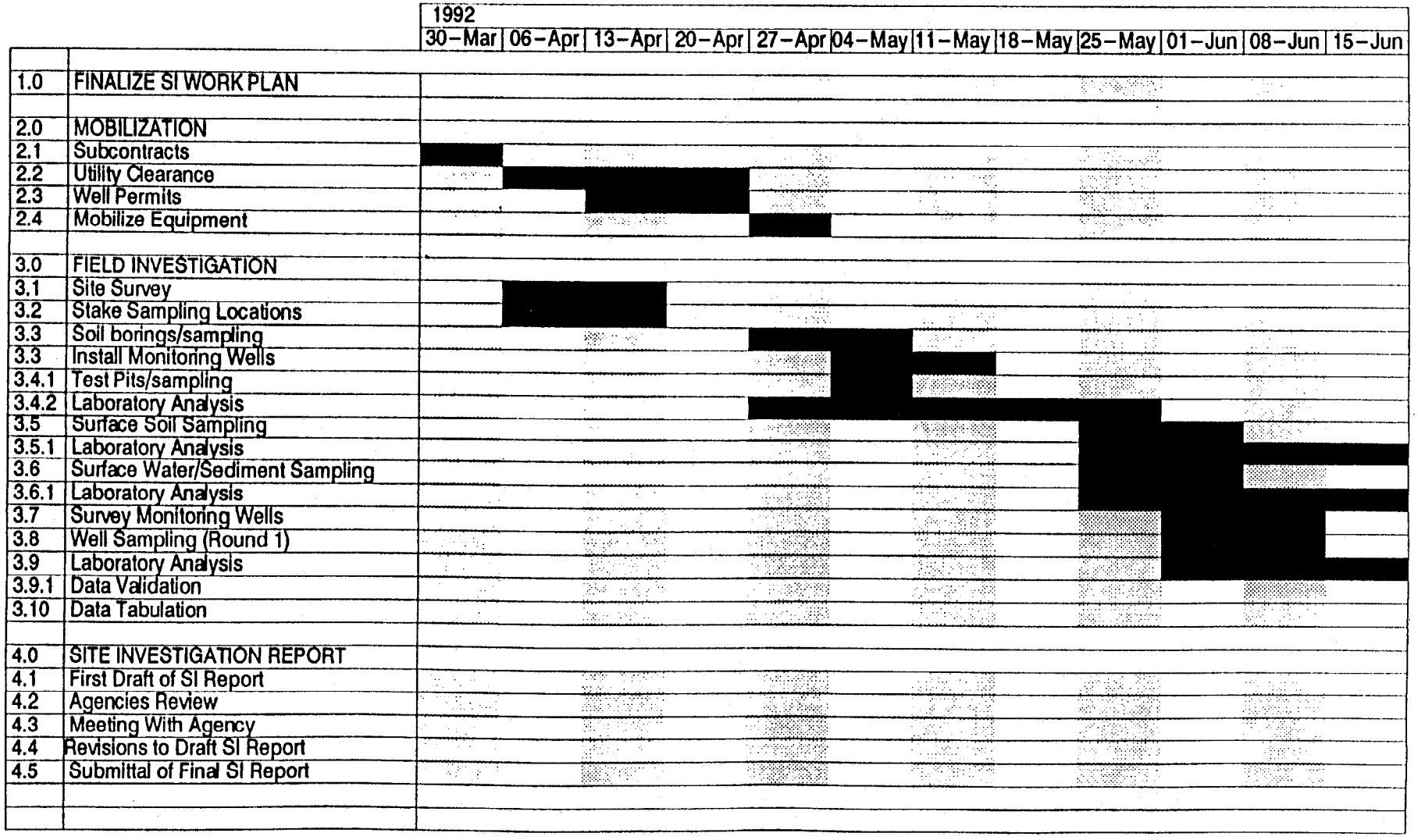


FIGURE 7-1 (Cont.)

SCHEDULE FOR COMPLETION OF THE SITE INVESTIGATION
NWS EARLE, COLTS NECK, N.J.

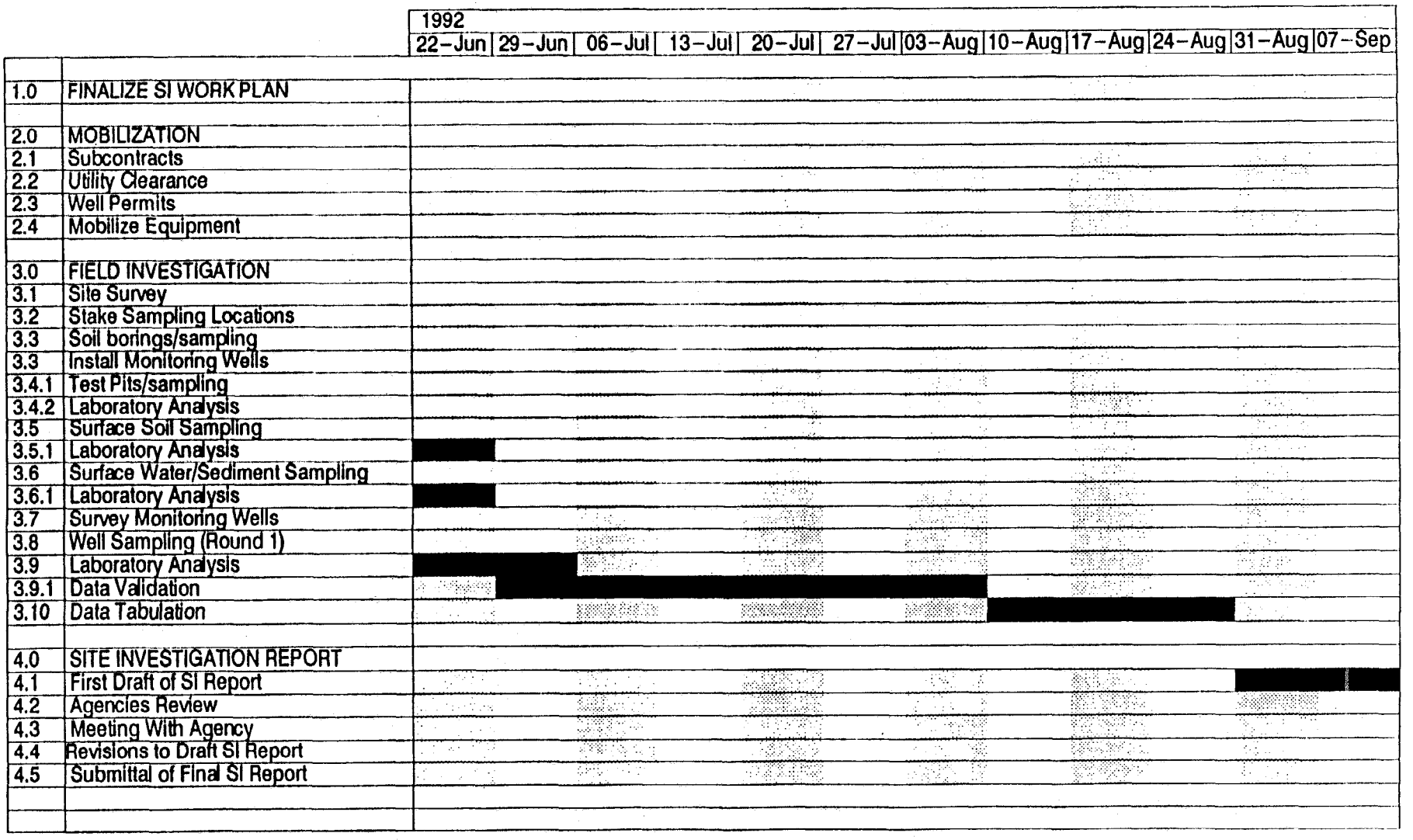


FIGURE 7-1 (Cont.)

SCHEDULE FOR COMPLETION OF THE SITE INVESTIGATION
NWS EARLE, COLTS NECK, N.J.

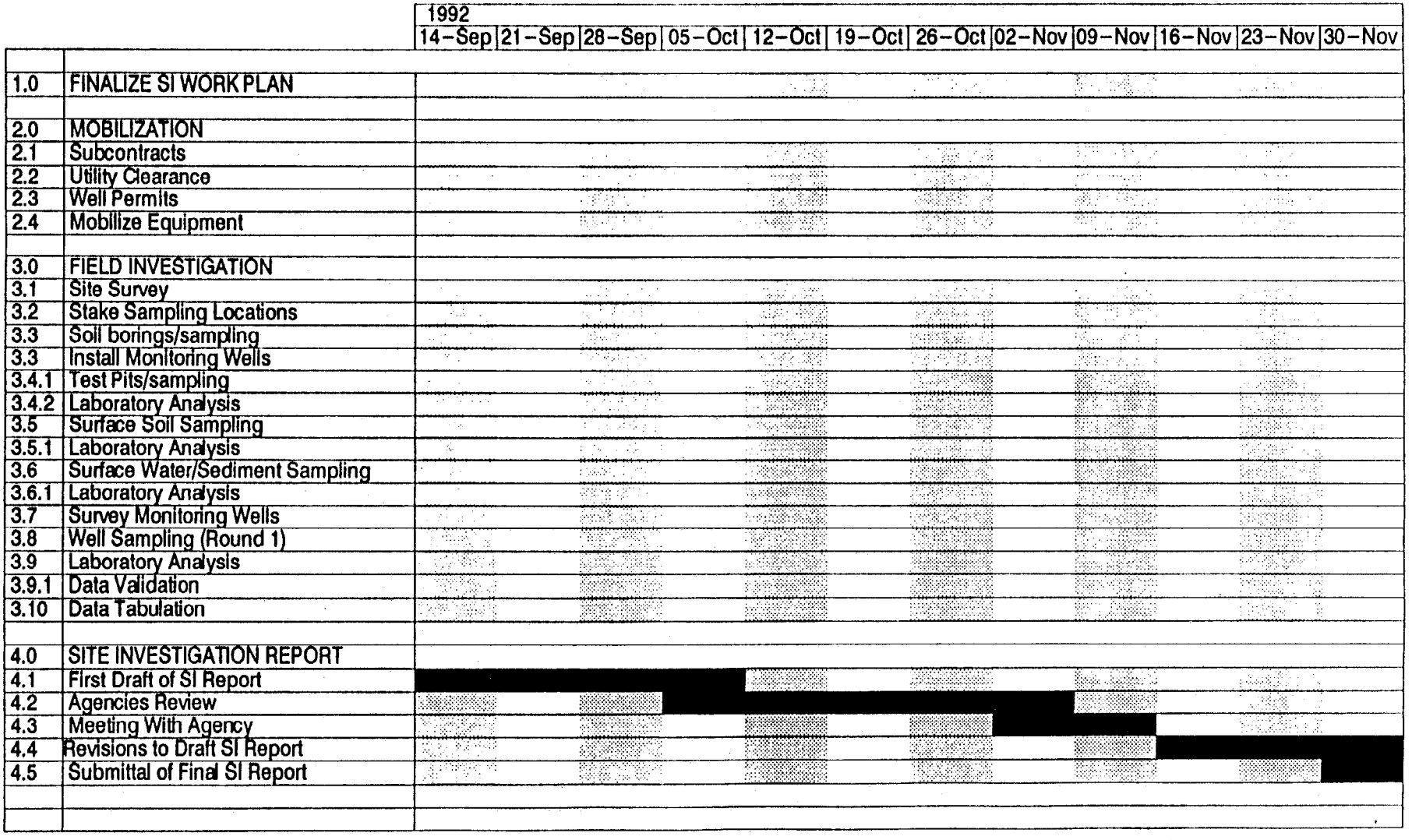


FIGURE 7-1 (Cont.)

SCHEDULE FOR COMPLETION OF THE SITE INVESTIGATION
NWS EARLE, COLTS NECK, N.J.

		1992				1993			
		07-Dec	14-Dec	21-Dec	28-Dec	04-Jan	11-Jan	18-Jan	25-Jan
1.0	FINALIZE SI WORK PLAN								
2.0	MOBILIZATION								
2.1	Subcontracts								
2.2	Utility Clearance								
2.3	Well Permits								
2.4	Mobilize Equipment								
3.0	FIELD INVESTIGATION								
3.1	Site Survey								
3.2	Stake Sampling Locations								
3.3	Soil borings/sampling								
3.3	Install Monitoring Wells								
3.4.1	Test Pits/sampling								
3.4.2	Laboratory Analysis								
3.5	Surface Soil Sampling								
3.5.1	Laboratory Analysis								
3.6	Surface Water/Sediment Sampling								
3.6.1	Laboratory Analysis								
3.7	Survey Monitoring Wells								
3.8	Well Sampling (Round 1)								
3.9	Laboratory Analysis								
3.9.1	Data Validation								
3.10	Data Tabulation								
4.0	SITE INVESTIGATION REPORT								
4.1	First Draft of SI Report								
4.2	Agencies Review								
4.3	Meeting With Agency								
4.4	Revisions to Draft SI Report								
4.5	Submittal of Final SI Report								

GLOSSARY

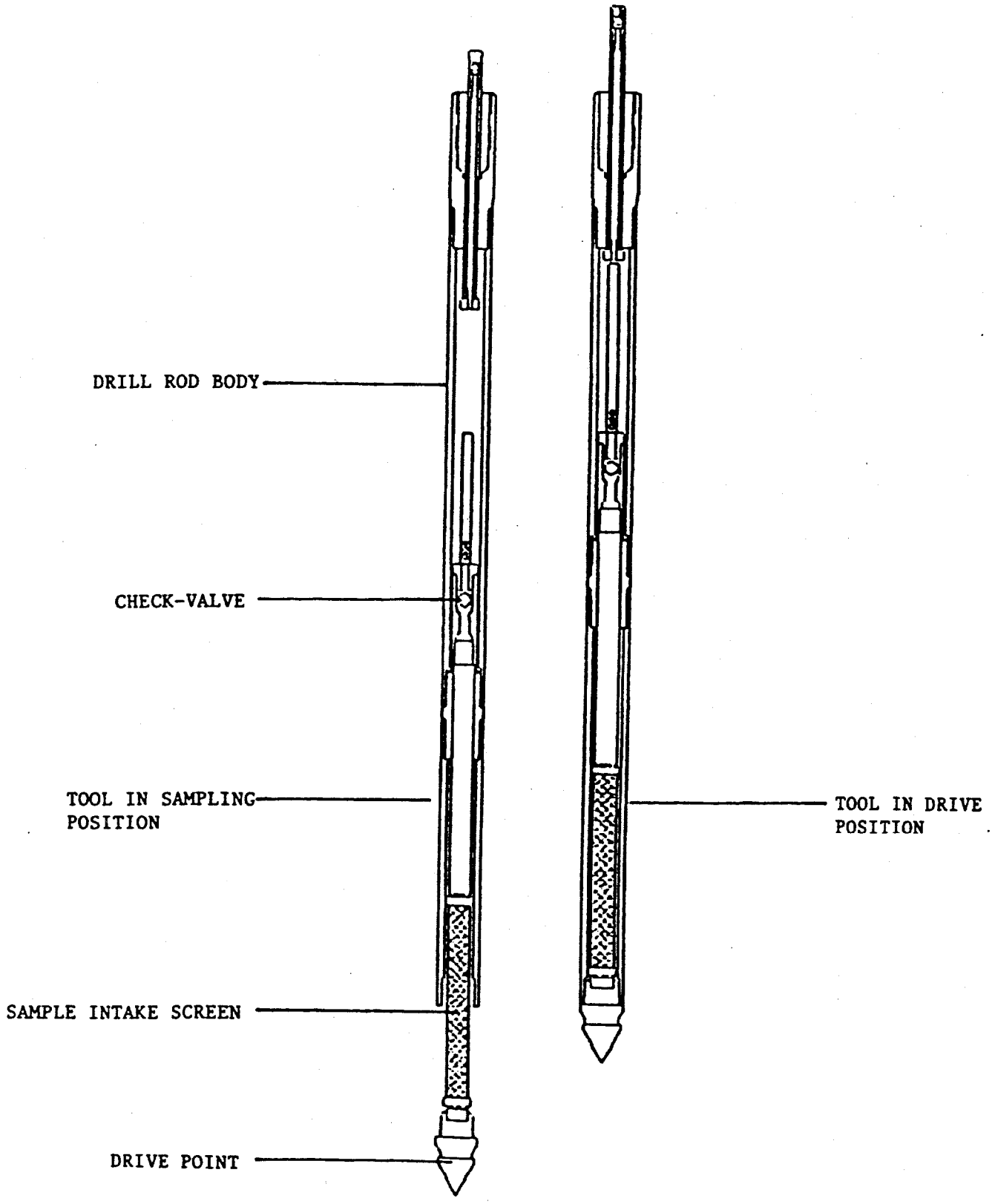
BGS	Below ground surface
CMs	Corrective measures
CO	Carbon monoxide
CS	Confirmation study
DPDO Yard	Defense Property Disposal Office Yard
DPDO Office	Defense Property Disposal Office Warehouse
EPA	U.S. Environmental Protection Agency
gpd	Gallons per day
gpm	Gallons per minute
HSP	Health and Safety Plan
IAS	Initial Assessment Study
IRP	Installation Restoration Program
MSL	Mean sea level
NACIP	Navy Assessment and Control of Installation Pollutants
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NJDEPE	New Jersey Department of Environmental Protection and Energy
NWS Earle	Naval Weapons Station Earle
ODS	Ordnance Demilitarization Site
OSHA	Occupational Safety and Health Administration
PA	Preliminary assessment
ppb	Parts per billion
ppm	Parts per million
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RAP	Remedial Action Plan
RI/FS	Remedial investigation/feasibility study
SCS	United States Soil Conservation and Stabilization Service

SI	Site inspection
SVOCs	Semivolatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
TEI	Total economic impact
TPH	Total petroleum hydrocarbons
USGS	United States Geological Survey
VOCs	Volatile organic compounds
WESTON	Roy F. Weston, Inc.

APPENDIX A

SCHEMATIC DIAGRAM OF HYDRO-PUNCH© SAMPLER

WESTON.



SCHEMATIC OF HYDRO-PUNCH© ASSEMBLY