United States
Environmental Prote ion
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-86/007
April 1986

EPA

Superfund Record of Decision:

Hollingsworth, FL

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The Hollingsworth Solderless Terminal Company (HSTC) site is located in Fort Lauderdale, Broward County, Florida. The 3.5-acre site was in operation from 1968 until the company closed the facility on October 1, 1982. HSTC manufactured solderless electrical terminals. The manufacturing process included heat treatment in molten salts baths, degreasing, and electroplating. For approximately eight years, HSTC disposed of wash water and process wastewater contaminated with trichloroethylene (TCE), and/or ~vy metals into drainfields adjacent to the manufacturing plant. Disposal practices the site have been clearly documented; however, the amounts of TCE disposed of and the exact locations and duration of disposal remain undocumented. The waste TCE was used both as a degreasing solvent and for cleaning floors, equipment, etc. Primary contaminants at the site include TCE, vinyl chloride, trans-1,2-dichloroethene, and to a lesser extent, nickel, tin, and copper.

The selected remedial action for this site includes: excavation, aeration and replacement onsite of volatile organic contaminated soils and the recovery of contaminated ground water from the sand zones of the aquifer, with treatment and reinjection into the aquifer. Capital cost for the selected remedial action is estimated to be $653,730 with O&M costs approximately $364,215 per year.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Hollingsworth, FL Contaminated Media: gw, soil Key contaminants: Trichloroethylene (TCE), vinyl chloride, trans-1,2-Dichloroethene, heavy metals, VOCs		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report) None	21. NO. OF PAGES 50
	20. SECURITY CLASS (This page) None	22. PRICE

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Record of Decision
Remedial Alternative Selection

Site: Hollingsworth Solderless Terminal Company
Fort Lauderdale, Florida

DOCUMENTS REVIEWED

I am basing my decision primarily on the following documents describing the analysis of cost-effectiveness of remedial alternatives for the Hollingsworth Solderless Terminal Company site.

Feasibility Study for Hollingsworth Solderless Terminal Company.

Feasibility Study Work Plan for Hollingsworth Solderless Terminal Company (summarizes all previous remedial investigation efforts)

Summary of Remedial Alternative Selection

Responsiveness Summary

State of Florida review comments

Staff recommendations

DESCRIPTION OF SELECTED REMEDY

The selected remedy includes:

- Excavation, aeration and replacement on-site of volatile organic contaminated soils at the east drainfield of plant #1.
- Recovery of contaminated groundwater from the sand zones of the aquifer, treatment and reinjection into the aquifer.

When this remedy is complete, there will be no continuing operation and maintenance requirements.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that the aeration of soils and recovery, treatment and reinjection of groundwater at the Hollingsworth Solderless Terminal Company site is a cost effective remedy and provides adequate protection of public health, welfare, and the environment. The State of Florida has been consulted and agrees with the approved remedy.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

APR 10 1986

Date

Jack E. Ravan

Jack E. Ravan
Regional Administrator

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY SITE
FORT LAUDERDALE, FLORIDA

BACKGROUND

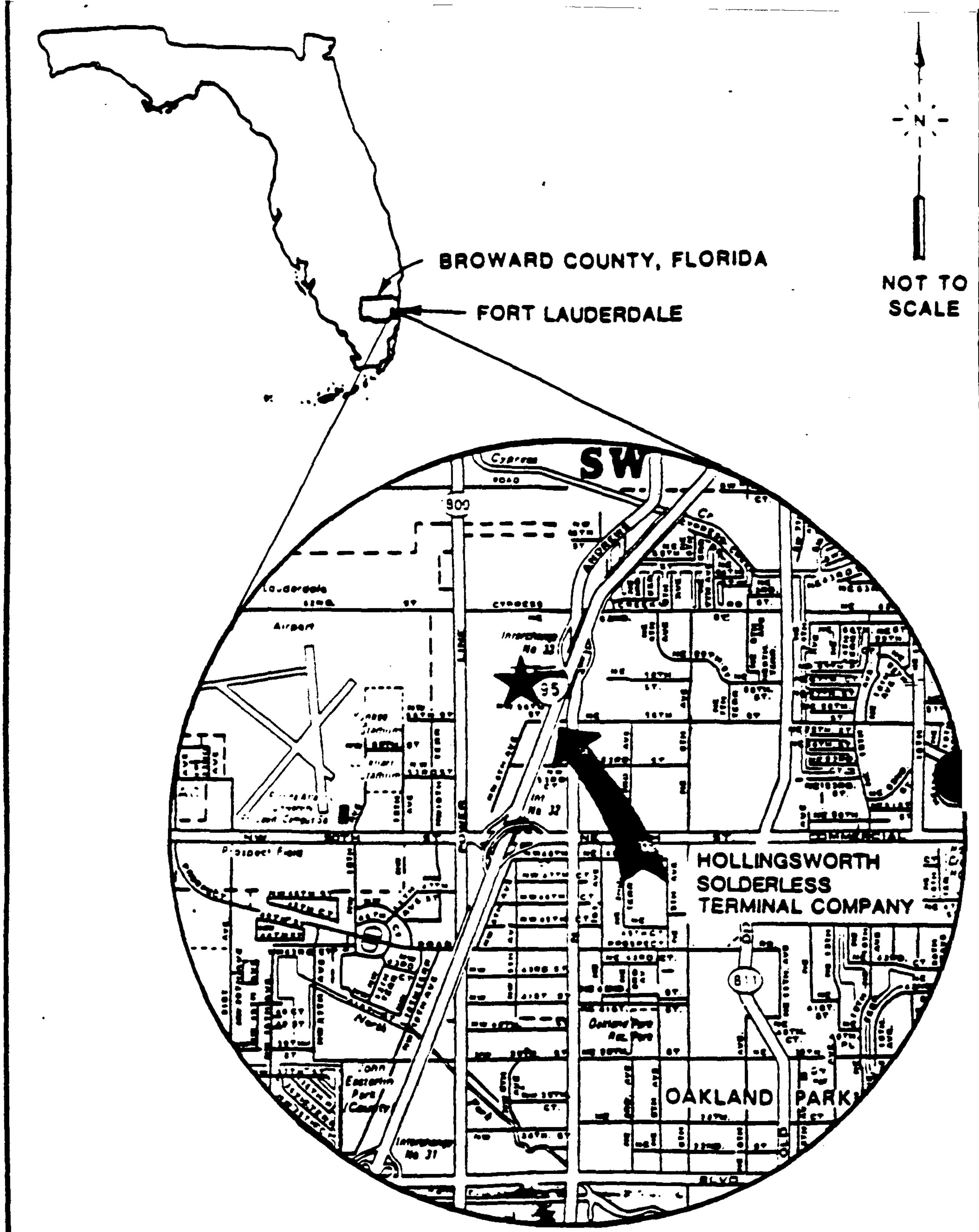
Introduction

The Hollingsworth Solderless Terminal Company (HSTC) Site was proposed for inclusion on the National Priorities List (NPL) in October 1981 and was included on the first official NPL published in December 1982. The HSTC Site has been the subject of a Focused Feasibility Study (FFS) conducted by the REM II, Region IV Contractor, Camp Dresser & McKee Inc. (CDM). A formal remedial investigation was not conducted at the site due to the large amount of site investigation data previously collected. However, additional site-specific soil and ground water quality studies and a ground water modeling study were conducted by CDM prior to initiation of the feasibility study in order to describe current site conditions.

A single decision document has been prepared to summarize remedial alternative selection for remediation of the HSTC Site, and is presented herein.

Site Location and Description

The HSTC Site is located at 700 NW 57th Place in Fort Lauderdale, Broward County, Florida, as illustrated in Figure 1. The site encompasses approximately 3.5 acres. HSTC operated at this location from 1968 until the company closed the facility on October 1, 1982. The HSTC facility consisted of two buildings separated by NW 57th Place. The entire facility is bounded on the north and east by asphalt alleyways, to the south by NW 57th Court, and to the west by other properties which run west to Powerline Road. The HSTC facilities have been labeled Plant No. 1 (the southern structure) and Plant No. 2 (the northern structure). Plant No. 1 was the manufacturing plant where contaminants were generated and discharged into the various drainfields. Plant No. 2 was strictly an assembly and storage



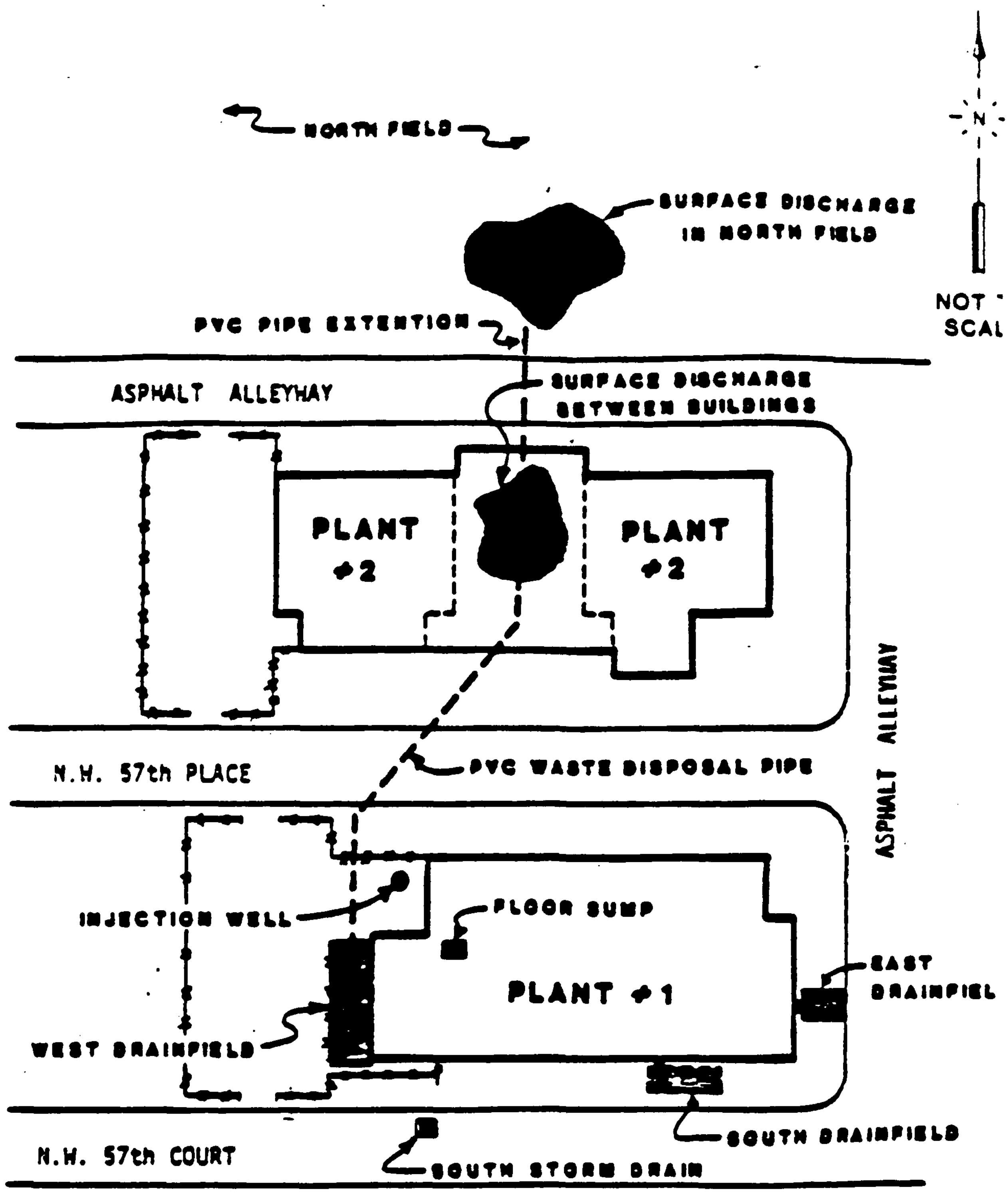
REM II

GENERAL LOCATION MAP

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY

FORT LAUDERDALE, FLORIDA

FIGURE NO. 1



REFERENCE: ECOLOGY AND ENVIRONMENT, INC. - DECEMBER 1982

REM II

HSTC SITE LAYOUT

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY

FORT LAUDERDALE, FLORIDA

FIGURE 2

facility which did not utilize wet processes. Figure 2 shows the relative between the two structures and the various waste disposal areas associated with the operation. The building which once was designated as Plant No. 1 has been subdivided and is currently being rented to a variety of small industrial/commercial tenants. The building designated as Plant No. 2 is currently vacant.

Land use in the vicinity of the HSTC Site is a mix between commercial, industrial, and residential. The area immediately surrounding the site has a high density of medium and light industry. The Fort Lauderdale Executive Airport is located approximately one-quarter mile to the west. Seaboard Coastline Railroad is located east of the site, and Interstate 95 (I-95) is a few hundred feet beyond the railroad. There is a large residential community on the east side of I-95. In general, this area of Fort Lauderdale is heavily developed and is experiencing increasing development pressure. The area surrounding the commercial/industrial complex around the Hollingsworth property and the Executive Airport and well field is rapidly becoming a medium to high density residential area.

The nearest wells that are part of the City of Fort Lauderdale's primary water supply, the Prospect Well Field, are located approximately two miles to the west of the HSTC Site. The Prospect Well Field includes 38 functional wells (see Figure 3) located around the Fort Lauderdale Executive Airport and Prospect Lake. The closest wells to the HSTC Site are Wells 8 and 12. All of the easternmost wells are within 0.25 and 0.5 miles of the HSTC Site. Wells 1, 4, 10, and 13 are no longer used or in existence (wells 1 and 4 are not shown in Figure 3). These wells are either contaminated or were destroyed by lawn maintenance equipment. Although functional, most of the wells in the Executive Airport area are used only during periods of extreme conditions. Most of these wells are contaminated with volatile organic compounds from a variety of industrial sources in the area. The locations of the well field wells are shown in Figure 3.

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY

FORT LAUDERDALE, FLORIDA

PROSPECT AREA WELL LOCATION MAP

REM II

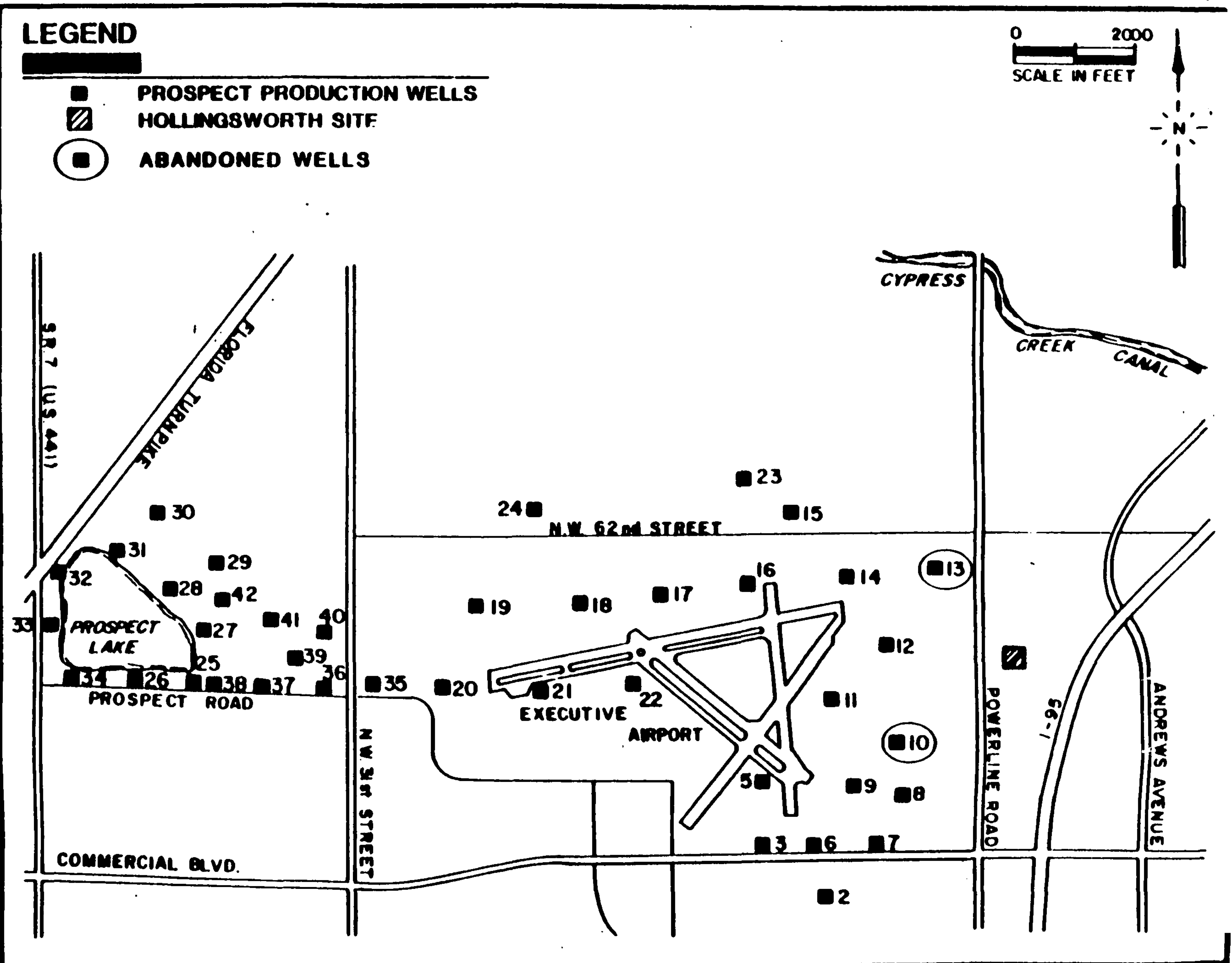


FIGURE NO.

3

The Biscayne Aquifer, which is a highly permeable, wedge-shaped, unconfined shallow aquifer composed of limestone and sandstone, underlies the site and is the primary source of drinking water for 3 million residents of South Florida. Both the Executive Airport and Prospect Lake wells tap the Biscayne Aquifer for water supply. The top of the aquifer is near the natural ground surface and its base is approximately 250 feet below ground surface in the area of the site. The upper 60-70 feet of the aquifer are primarily composed of fine to medium grained sands. This zone is underlain by a transition zone of cemented shell and sandstone and finally by the limestone which forms the major water producing zone of the Biscayne Aquifer. The regional direction of ground water flow is southeast.

The Atlantic Ocean is located approximately five miles to the east of the site and the Everglades lie about 10 miles to the west. Cypress Creek Canal is located approximately 1.5 miles north of the site and Middle River Canal is located about 2 miles to the south. The average rainfall for this area is approximately 60 inches per year, much of which comes in short, intense thunderstorms during the summer months. The site is located within the 100 year flood plain and is topographically flat.

Site History and Enforcement Activities

From 1968-1982, HSTC was in the business of manufacturing solderless electrical terminals, consisting of a conductive metal portion and a plastic sleeve. The terminals were designed to attach by means of crimping rather than by soldering. The manufacturing process included heat treatment in molten salts baths, degreasing, and electroplating. The primary contaminants of concern at the site include trichloroethene (trichloroethylene), vinyl chloride, trans-1,2-dichloroethene, and to a lesser extent, nickel, tin, and copper.

For approximately eight years, HSTC disposed of wash water and process wastewater contaminated with trichloroethene (TCE), and/or heavy metals into drainfields adjacent to the manufacturing plant (see Figure 2). Disposal practices at the site have been clearly documented; however, the amounts of TCE disposed of and the exact locations and duration of disposal remain undocumented. The waste TCE was used both as a degreasing solvent and for cleaning floors, equipment, etc.

As early as 1977, the Broward County Environmental Quality Control Board (BCEQCB) was aware of the HSTC operation and began investigating HSTC disposal practices. Between 1977 and 1980, HSTC supplied information to BCEQCB concerning disposal practices, effluent quality, and proposed modifications to their operation, designed to effect compliance with BCEQCB standards. The full potential for ground water contamination at the HSTC Site was not realized until 1980 when BCEQCB discovered the use of an injection well for waste disposal during a routine site inspection. BCEQCB was initially the lead regulatory agency. The Florida Department of Environmental Regulation (FDER) became aware of the problems at HSTC when the county requested assistance from EPA under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) program in June 1981. At that time, HSTC also applied for RCRA interim status (Permit No. FLD 004119681) for their electroplating operation. This permit was never utilized and was allowed to expire. HSTC had no other regulatory permits. In November 1981, HSTC filed for Chapter 11 status under the Federal Backruptcy Code.

Pursuant to CERCLA procedures, a Remedial Action Master Plan (RAMP) was commissioned by EPA in 1982 as the first step toward site cleanup. The RAMP was prepared by the Region IV CERCLA contractor, Ecology and Environment, Inc. (E&E), of Decatur, Georgia, based on data supplied by HSTC consultants In addition to the RAMP, several investigations were conducted by consultants to HSTC. These investigations were partially controlled by the Federal court system, under provisions of Chapter 11 of the Federal Bankruptcy Code. The HSTC consultants include Enviropact, Inc. (Enviropact) of Miami Springs, Florida, and Geraghty & Miller, Inc. (G&M) of West Palm Beach, Florida.

To date, field investigations and other studies of this site have included:

- Installation and sampling of 20 temporary, onsite (PVC) monitor wells
- Installation and sampling of nine permanent offsite (stainless-steel) monitor wells
- Collection and analysis of 41 surface and subsurface soil samples for metals
- Collection and analysis of 13 subsurface soil samples for volatile organics
- Installation of 10 shallow, temporary observation wells for water table measurements
- Contaminant transport modeling of pollutants discharged onsite, in relation to nearby well fields

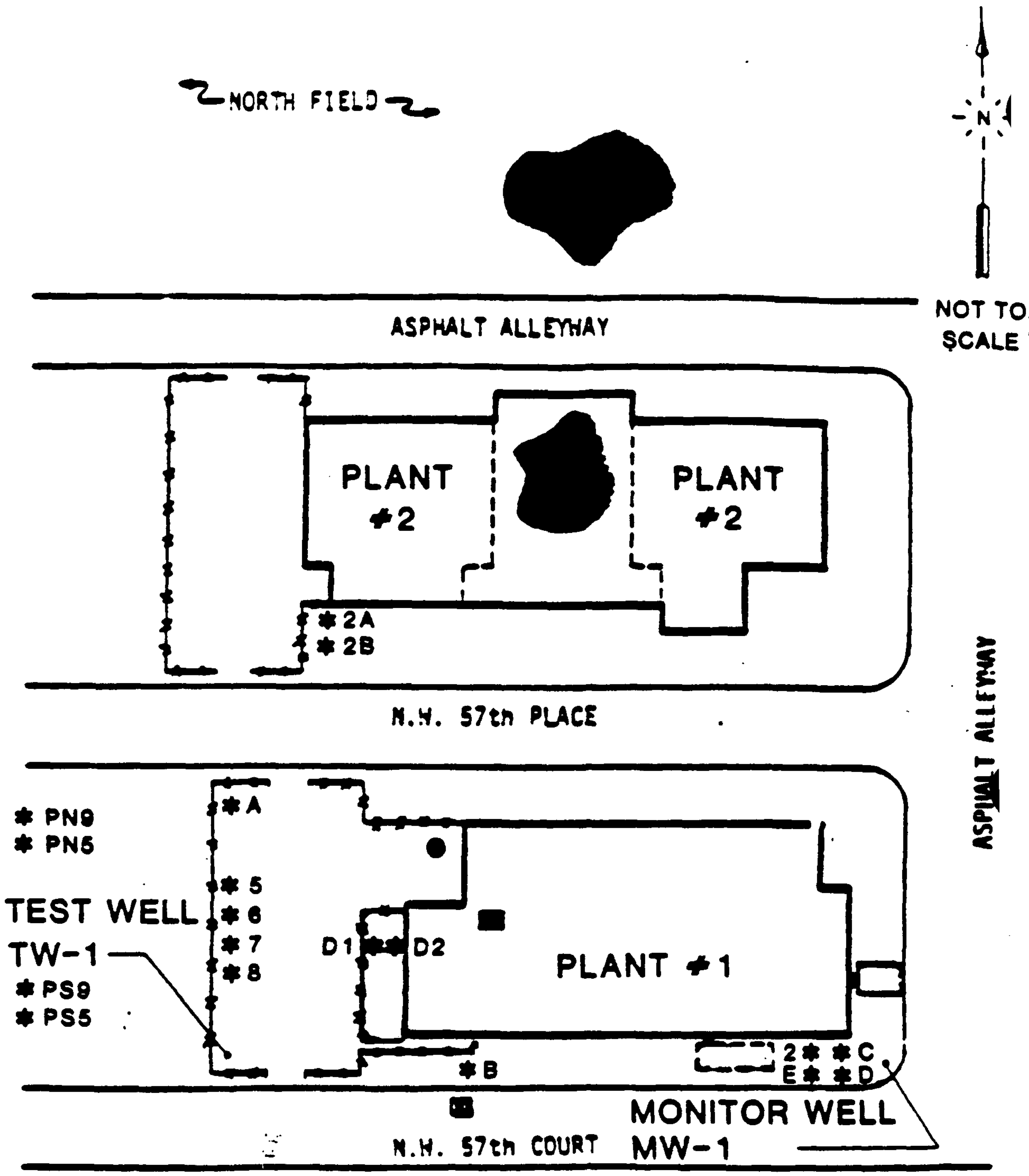
Enforcement Analysis

Hollingsworth Solderless Terminal Company owned and operated the facility from 1968 until manufacturing operations were ceased in october 1982. The company has been operating as a Debtor-in-Possession under the provisions of Chapter 11 of the United States Bankruptcy Code since November 6, 1981. The site was placed on the National Priority List in October 1981. Since that time the company has attempted to be responsive to Agency requirements for a Remedial Investigation/Feasibility Study, but has fallen short, probably due to financial considerations. The Agency completed the work begun by the company to investigate the site and has completed the feasibility study. The company maintains that a no-action remedy would be the appropriate site response, however they have indicated they may be willing to conduct or fund a portion or all of the remedy if certain conditions are met.

Upon the finalization of the Record of Decision, the Agency intends to formally notify the company of the selected remedy and initiate negotiations with them for the conduct of the remedy. Negotiations with the company will not exceed 60 days, thereafter if the company does not formally commit to perform the remedy with assurances that adequate funding is available to complete the remedy in a timely manner, EPA will proceed with a Fund financed Remedial Design/Remedial Action.

Current Site Status

In 1981 and 1982, 18 monitor wells were installed on the HSTC property to investigate ground water contamination problems at the site as shown on Figure 4. These wells were generally 20, 50, 75, and/or 100 feet deep; no offsite wells were installed. In 1983, a monitor well (MW-1) and test well (TW-1), both of which are approximately 250 feet deep, were installed for conducting pumping/aquifer tests. Ground water data from all of these wells showed that TCE was present at concentrations ranging from <1.0 microgram per liter (ug/l) to 4,300 ug/l; dichloroethene was present at concentrations ranging from <1.0 ug/l to 2,160 ug/l, and trichloroethane was not present. In general, the highest concentrations of contaminants were found in samples collected from the 50 and 75-foot depths. Contaminants were not found in the test well. However, all three of the aforementioned contaminants were present in samples collected from depths between 106 and 230 feet during construction of the monitor well, which is located next to the east well cluster. Multiple depth sampling was performed during construction of both the test well and monitor well. Metals (copper, tin, nickel, lead, and zinc) were analyzed for, but were not present at measurable concentrations in ground water samples collected from any of the shallow or deep wells. Since no offsite ground water samples were analyzed, the extent of offsite contamination, at that time, was unknown.



✱ MONITOR WELL

REFERENCE: ECOLOGY AND ENVIRONMENT, INC. - DECEMBER 1982

REM II

FIGURE NO.

ONSITE MONITOR WELL LOCATIONS

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY

FORT LAUDERDALE, FLORIDA

Also during 1981 and 1982, soil samples were collected from the known contaminated areas and analyzed for copper, tin, nickel, and lead. Most of the samples contained various combinations of the metals at individual concentrations in the 1-10 milligram per kilogram (mg/kg) range. However, a number of the samples contained metals at concentrations in the 100-1,000 mg/kg range. A majority of these samples came from worst case locations (i.e. near the discharge point in the electroplating wastewater drainfield and the overflow discharge points). In the fall of 1984, Enviropact collected soil samples from the overflow area north of Plant 2 and analyzed them for total and extractable copper, lead, nickel, and tin. In a majority of the samples, metals levels were below detection (1 mg/kg), for both total and extractable metals. In the remaining samples, metals concentrations were in the 1-10 mg/kg range, which are concentrations that are likely to be found in soil under normal or ambient conditions. In particular, the concentrations of lead and nickel, the two most toxic metals that have been found onsite, were within the range of ambient conditions.

Due to the fact that the toxicity of tin, and copper, is low, and the fact that these metals in addition to nickel should readily precipitate from solution and become bound as hydroxides and/or carbonates in the limestone formation, they do not present an environmental or public health threat via the water supply. Even if these contaminants reached the water supply wells, they would be readily removed by the water treatment process. Lead, which was also found at the site, does not readily leach from soils and the concentrations present in the soils are well below levels established as cleanup criteria (1,000 mg/kg) for other hazardous waste sites in south Florida (e.g., Pepper's Steel and Alloys) where lead is a primary contaminant. The cleanup criterion is based on the leachability of lead and predicted concentrations in the ground water.

In early 1985, nine additional offsite monitor wells were installed around the HSTC Site. These wells and seven of the older monitor wells were sampled and the samples were analyzed for the priority pollutant volatile organic compounds, including those previously found onsite. The new wells were installed in three clusters of three wells (25, 55, and 100 feet deep). Two of the well clusters are located downgradient of the site, one about 500 feet to the southeast, and one approximately 200 feet to the southwest. Contaminants were not present in any of the offsite, downgradient wells. The third new well cluster, which was located slightly upgradient of the site, showed contamination in the 55-foot well. This is most likely due to contaminants which were discharged between the Plant 2 buildings and to the field north of Plant 2. Of the seven older wells sampled, the four wells (cluster of 25, 50, 75, and 100 foot wells) at the southeast corner of Plant 1, next to the east drainfield, showed volatile organic contaminations at concentrations similar to those reported in 1981 and 1982. The primary difference between the two data sets is the presence of vinyl chloride at substantial concentrations (200-6,000 ug/l) in samples collected from the 25, 50, and 75-foot wells of the east well cluster during the 1985 sampling event. Apparently, vinyl chloride analyses were not performed on samples collected in 1981 and 1982. Vinyl chloride is a known carcinogen, and it is a common contaminant of the industrial-grade TCE used as the degreasing agent for various plant operations by HSTC. Vinyl chloride was not present in any of the samples taken from the offsite monitor wells.

The recent ground water analyses indicate that the contaminants, which were originally introduced on the ground, have migrated a short distance primarily in a vertical direction, through the upper sand zone of the aquifer. Migration of these contaminants is apparently being retarded at a depth of 50-70 feet below land surface (bls), in a zone where the formation changes from sand to sandstone and cemented shell. Since the current concentrations are very similar to previous concentrations, it appears that contaminants have not migrated substantially in the horizontal or vertical directions through the sand zone. This type and rate of movement is typical in settings, such as this, where the ground surface and ground water gradient are essentially flat and where a majority of the surrounding area is impervious. In the limestone or production zone of the aquifer which occurs at approximately 100 feet bls, water moves much more rapidly (300-600 feet per year compared to 5-80 feet per year in the sand portion of the aquifer), readily diluting and transporting contaminants offsite. Considering the concentrations of contaminants in relation to the vast water bearing and storage capacity of the Biscayne Aquifer, the absence of measurable levels of contaminants in the production zone at the site is not unexpected.

In the past, attention has been focused on the fact that the HSTC Site lies within close proximity to the City of Fort Lauderdale's Prospect Well Field. A number of the easternmost Executive Airport wells have been abandoned due to the presence of volatile organic contaminants, including those found at the HSTC Site. However, recent investigations and site inspections by the Broward County Environmental Quality Control Board have identified at least 12 companies surrounding the Executive Airport that use degreasing solvents and dispose of their wastes in a manner that may be directly impacting water quality in the Executive Airport wells.

In late 1984, CDM performed contaminant transport modeling of the HSTC Site in relation to the nearby city wells. A number of pumping and discharge scenarios were investigated. The model presumed the worst case, most conservative set of parameters and still showed that the HSTC Site could not be a source of contamination of the well field. Some of the other industrial sources identified by BCEQCB were factored into additional model runs and these data showed that any of a number of the other sources could be sources of contamination of the well field. Currently, the Executive Airport wells are used only under extreme conditions; the Prospect Lake wells operate at approximately 30 million gallons per day, and supply drinking water for 150,000 to 200,000 residents and industries of the City of Fort Lauderdale, Florida.

The results of the public health evaluation indicate that currently there are no complete pathways for exposure of the public by direct contact, ingestion, or inhalation of contaminants from the Hollingsworth Site, but that the potential for future exposure does exist. The primary route of potential future exposure is via installation of private wells or industrial supply wells downgradient of the site. The primary contaminants of concern for exposure via this route are vinyl chloride, TCE, and trans 1,2-dichloroethene. Based on the potential for future use of contaminated ground water and the fact that the Biscayne Aquifer is a sole source drinking water aquifer, the cleanup goals for ground water remediation at this site were based on both the 10^{-6} cancer risk factors and the State of Florida primary drinking water standards. These standards are summarized as follows:

Ground Water

Contaminant (ug/l)	10^{-6} Life-Time Cancer Risk Factor	State of Florida Drinking Water Criterion	Proposed Maximum Concen-tration Levels (MCLs)*	HSTC Cleanup Goal
Vinyl chloride	2.0	1.0	1.0	1.0
Trichloroethene	3.2	3.0	5.0	3.2
trans 1,2-Dichloroethene	None	None	70.0	70.0

* FR. Vol. 50, November 1985.

Because there is no 10^{-6} cancer risk factor or state drinking water criterion for trans 1,2-dichloroethene, the proposed MCL for this compound has been adopted. It should be noted that the trans 1,2-dichloroethene will be removed by the preferred treatment process to levels well below the cleanup goal to within the 1-10 ug/l range.

The public health evaluation assumed that exposure to contaminated soil could be either by ingestion or by dermal contact. Both copper and tin were present in a few soil borings at concentrations above backgound levels. Inorganic tin and copper, at the concentrations found in the west drainfield, are unlikely to present health problems under a most probable ingestion scenario of 50-100 mg/day soil by children, or under worst-case scenarios of ingestion of up to 500 mg/day. Ingestion of an excessive quantity (500-5,000 mg) of soil contaminated with copper at concentrations present in the west drainfield (1,000-10,000 mg/kg) might pose a slightly increased health risk, namely irritation of the mucous membranes and possibly gastric upset. Because the west drainfield is surrounded by a fence and the fact that the property is isolated from residential areas, the likelihood that a child would ingest contaminated soils at the HSTC site is negligible. Nonetheless, cleanup goals were developed for metals contaminated soils at the HSTC site. However remediation of metals contaminated soils is considered an element of site remediation that exceeds applicable cleanup criteria due to the concentrations present and the negligible risk.

The cleanup goals for soil contaminated with metals have been established based on the concentration of the metals in leachate from the soils (as determined by an EP toxicity test), as negotiated between FDER and EPA in 1983. The limit for each metal in the leachate has been set at 10 times the concentration of the appropriate state water quality criterion. The cleanup goal for soils contaminated by volatile organics, primarily the soils in the east drainfield, is 1 mg/kg in the soil. However, testing in 1984 showed that the current concentrations of VOCs in the soils in and underlying the east drainfield do not exceed this level. The primary concern and reason for remediation of this VOC contaminated drainfield is the presence of volatilized contaminants in the void space of the drainfield and the shallow zone underlying the pavement. Remediation focuses on venting these trapped vapors by a passive system, in a manner that minimizes exposure of workers and the public, and also minimizes the cost of treatment. During the process additional soil testing will occur to verify that soil concentrations are below 1.0 mg/kg. The standards and goals for soils remediation can be summarized as follows:

Soils

Contaminant	Maximum Contaminant Concentration in Leachate from Onsite Soils	State of Florida Water Quality Criterion	HSTC Cleanup Goal
Copper	21.7 mg/l*	1.0 ug/l	10.0 mg/l
Nickel	0.3 mg/l	0.1 ug/l	1.0 mg/l
Lead	0.2 mg/l	0.05 ug/l	0.5 mg/l
Total VOC	Not Applicable	None	1.0 mg/kg

* This value was reported for a sample collected from the Gaidry property in 1982. The area was resampled in 1984 and the highest concentration of copper in the leachate was 0.2 mg/l.

All of these cleanup goals were used as a basis for developing and evaluating the various remedial alternatives. Several of the alternatives include removal and offsite disposal of the metals contaminated soil despite the fact that the levels of contaminants at the site do not currently exceed the cleanup goals. Remediation of metals contaminated soils at this site is considered an element that exceeds requirements for site remediation.

Since ground water contamination at this site is the primary concern, determining the extent of contamination and establishing a target zone for ground water remediation were important elements of the feasibility study.

The existing database indicates that movement of VOCs in ground water within the surficial sands is primarily in the downward direction. This conclusion follows the reasoning that VOCs are relatively insoluble in water and heavier than water such that, in the absence of significant horizontal ground water flow or obstructions to vertical movement, the VOCs will slowly sink until they reach a geological barrier or a zone of ground water of the same density. Further, it is presumed that once the VOCs penetrate the limestone aquifer where ground water flow is significantly greater, the contaminants are rapidly dispersed in both the vertical and horizontal direction. The more rapid horizontal movement of water in the production zone of the aqifer also enhances the vertical gradient via a "chimney effect."

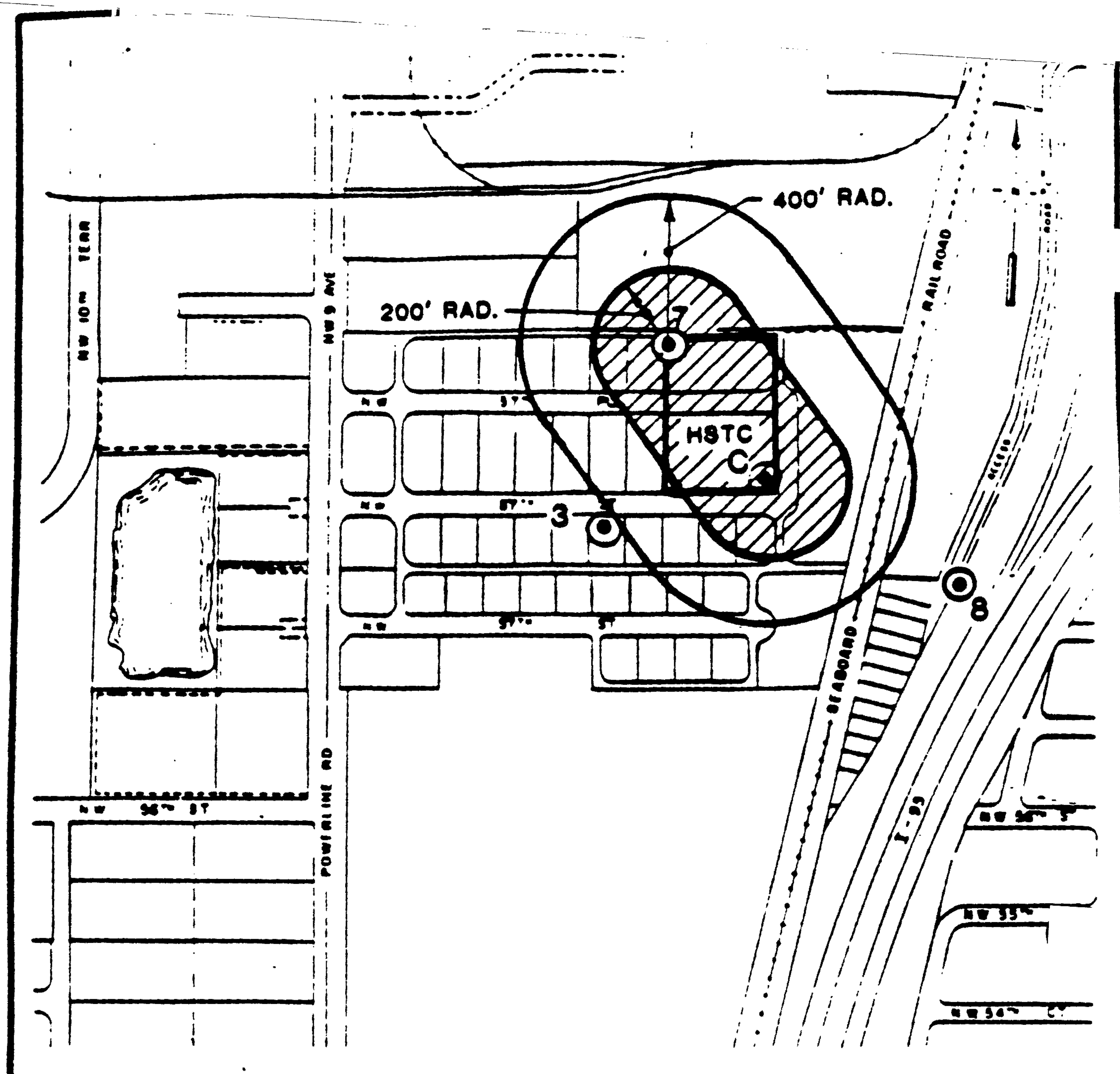
The localized areas of ground water contamination onsite are potential sources of offsite ground water contamination. Remedial action to remove these zones of known ground water contamination before mixing with the ground water in the underlying limestone aquifer were examined. Removal of ground waters from the principal water bearing zone of the Biscayne Aquifer (100-250 foot zone) in the vicinity of the site was determined to be not feasible or necessary for the following reasons.

o The relatively high transmissivity of the Biscayne Aquifer promotes rapid dispersion and dilution of contaminants.

- o Attempts to adequately remove VOC contamination from the Biscayne Aquifer would require a regional water treatment program. This site is currently a minor contributor to that contamination problem.
- o The concentrations of contaminants in the 100-250 foot zone of the aquifer onsite have been shown to be at or below the applicable cleanup goals.

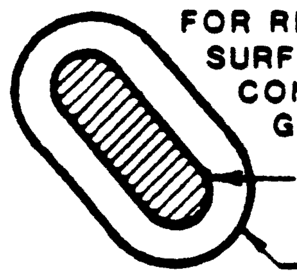
The area targeted for ground water remediation can be defined as the areal and vertical extent of contamination by VOCs at concentrations above background concentrations and the ground water cleanup goals. The maximum depth to which volatile organic contamination was most recently detected in the ground water is 75 feet. The depth of the target area for ground water remediation has been defined as the top of the limestone aquifer at the sand-limestone interface. The average depth to the top of limestone is approximately 75 feet in the vicinity of the site.

The areal extent of contamination is poorly defined because of variations in the degree of ground water contamination at different locations and depths. Based on the most recent ground water quality data, the offsite monitor well clusters 3 and 8 shown in Figure 5 show no contamination. Therefore, it is reasonable to assume a minimum and maximum areal extent of surficial ground water contamination based on the known clean zones and the known contaminated areas, and application of engineering judgement concerning aquifer characteristics and the behavior of the contaminants at this site. Based on this analysis, two zones have been identified as target areas for ground water remediation. These two target areas are shown in Figure 5. The inner target area was constructed by drawing a 200-foot radius circle around the onsite monitor wells 7 and C, which are the two 50-foot monitor wells that were found to be contaminated and are the two locations proposed for ground water collection. The larger target area was constructed by assuming a 400-foot radius of contamination around each well. The final configurations of the target zones were drawn to encompass the circles at both well locations and define one area for each radius. The target areas encompass the entire area of the plant site without including areas shown to have no detectable contamination.



LEGEND

LOCATION OF MONITOR WELLS
8



TARGET AREA BOUNDARY FOR REMEDIAL ACTION ON SURFICIAL CONTAMINATED GROUNDWATER

MINIMUM ESTIMATED EXTENT OF CONTAMINATION

MAXIMUM ESTIMATED EXTEN OF CONTAMINATION

SCALE: 1" = 400'

REM II

TARGET AREAS FOR GROUND WATER REMEDIATION

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY

FORT LAUDERDALE, FLORIDA

FIGURE 5

It is probable that the 400-foot radius selected as the boundary between contaminated and uncontaminated ground water is larger than the actual areal extent of contamination. Based on the available monitoring data, contaminant properties, and soil and aquifer characteristics, the movement of VOCs in the surficial sands is more likely to be in a vertical rather than a horizontal direction. Thus, a smaller area (200-foot radius) for ground water remediation has been included as a reasonable estimate of the probable extent of contamination.

Alternatives Evaluation

The primary objectives of the feasibility study are to:

- o Prevent further migration of contaminated ground water in the aquifer by cleaning up existing contamination in the aquifer
- o Remove the sources of contamination from overlying soils and drainfields

The following six remedial action alternatives were considered:

Alternative 1 - No action

Alternative 2 - Modified no action

Alternative 3 - Offsite disposal of VOC and metals contaminated soils at approved facilities with discharge of VOC contaminated ground water to city sewer system for treatment at a local WWTP

Alternative 4 - Onsite treatment of VOC contaminated soils with continued monitoring of the ground water

Alternative 5 - Onsite treatment of VOC contaminated soils and ground water with continued monitoring and recharge of treated ground water to aquifer

Alternative 6 - Onsite treatment of VOC contaminated soils and ground water with continued monitoring, recharge of treated ground water to aquifer, and excavation and offsite disposal of metals contaminated soils

Initial Screening of Alternative Technologies

An initial screening of applicable alternative technologies was performed to select those which best met the criteria specified in Section 300.68 of the National Contingency Plan (NCP). This initial screening is illustrated in Table 1.

Detailed Evaluation of Alternatives

After the initial screening, remaining technologies were assembled into six remedial action alternatives for further consideration. Table 2 provides a summary of actions involved and costs for each of the six remedial action alternatives which are described in greater detail to follow.

Alternatives 1 & 2: No Action and Modified No Action

The "no action" alternative was rejected because the harm that the contaminants could cause require that, at an absolute minimum, contaminants must be tracked and their location known to provide time to design and initiate a response to the impending exposure.

The potential impacts of both alternatives are identical except that with the modified no action alternative long-term monitoring would provide a mechanism for identifying future threats to existing receptors. Currently the monitor wells located to the southeast of the site between HSTC and the nearest residential area show that the ground water is free of VOCs. If at some time in the future, monitoring shows that contaminants are migrating toward the residential area, an effort can be made to notify the public and possibly restrict use of shallow wells in the area.

Both alternatives involve no soil excavation and no ground water treatment. With the modified no action alternative ground water from two of the existing stainless steel monitor wells in the vicinity of the site and one additional well to be installed further upgradient will be sampled and analyzed on a quarterly basis for an indefinite period to monitor the

TABLE 1

SCREENING ALTERNATIVE TECHNOLOGIES FOR
APPLICABILITY TO HOLLINGSWORTH SITE
HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY
FORT LAUDERDALE, FLORIDA
REM II

Possible Technology	Retained (R) or Eliminated (E)	Reason Eliminated
Soil Treatment or Disposal		
o Disposal/containment in onsite facility	E	Site lies in the 100-year floodplain; no suitable location; high water table
o Disposal offsite at a RCRA landfill	R	
o Onsite incineration	E	Not effective for a majority of the contaminated soils; not cost effective
o Encapsulation/capping	R	
o Onsite treatment		
- soil flushing	E	Low effectiveness and high cost
- steam stripping (in situ)	R	
- till and evaporate	R	
- venting	R	
Ground Water Containment/Extraction		
o Containment (slurry walls, etc.)	E	Infeasible due to depth to confining layer
o Extraction	R	
Ground Water Treatment		
o Activated carbon adsorbtion	R	(But, produces concentrated waste residue).
o Air stripping	R	
o Steam stripping	E	Too expensive and energy intensive

TABLE 1
(continued)

Possible Technology	Retained (R) or Eliminated (E)	Reason Eliminated
o Reverse osmosis	E	Not effective for volatile organics
o Ozonation	E	Technical infeasibility, cost and safety considerations
o Wet air oxidation	E	Not effective at low concentrations; energy intensive
Ground Water Disposal		
o Pump untreated water to nearest water treatment plant	R	
o Treat and discharge water to ocean	E	Too expensive, loss of fresh water
o Treat and discharge to nearest surface water	R	
o Treat and reinject water	R	
No action (modified)	R	

TABLE 2

SUMMARY OF POTENTIAL REMEDIAL ACTION ALTERNATIVES AND ASSOCIATED COSTS
HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY
FORT LAUDERDALE, FLORIDA
REM II

Alternative No.	Criterion	Components of the Remedial Alternative	Minimum Cost (present worth)	Maximum Cost (present worth)
1	No Action	None	0	0
2	No Action (modified)	Installation of one additional monitor well	$ 5,000	$ 5,000
		Long-term monitoring (30 years)	74,000	74,000
		Abandonment of onsite monitor wells	10,000	10,000
		TOTAL	$ 89,000	$ 89,000
3	Offsite Disposal	Abandonment of onsite monitor wells	$ 10,000	$ 10,000
		Excavation and offsite disposal of metals contaminated soils	253,434	253,434
		Excavation and disposal of VOC contaminated soils at EPA-approved landfill	61,136	61,136
		Recovery and discharge of VOC contaminated ground water to city sewer system for treatment	1,602,652	2,787,622
		TOTAL	$1,927,222	$3,112,192
4	Does not meet applicable criteria, but reduces threat	Abandonment of onsite monitor wells	$ 10,000	$ 10,000
		Onsite treatment of VOC contaminated soils (source control)	57,047	57,047
		Long term ground water monitoring (30 years)	79,000	79,000
		TOTAL	$ 146,047	$ 146,047

TABLE 2
(continued)

Alternative No.	Criterion	Components of the Remedial Alternative	Minimum Cost (present worth)	Maximum Cost (present worth)
5	Meets applicable criteria	Abandonment of onsite monitor wells	$ 10,000	$ 10,000
		Onsite treatment of VOC contaminated soils	57,047	57,047
		Onsite treatment of VOC contaminated ground water via air stripping	608,371	777,553
		Recharge of treated ground water	342,527	415,359
		TOTAL	$ 1,017,945	$1,259,959
6	Exceeds applicable criteria	Abandonment of onsite monitor wells	$ 10,000	$ 10,000
		Onsite treatment of VOC contaminated soils	57,047	57,047
		Onsite treatment of VOC contaminated ground water via air stripping	608,371	777,553
		Recharge treated ground water	342,527	415,359
		Excavation and disposal of metals contaminated soils	253,434	253,434
		TOTAL	$1,217,379	$1,513,393

offsite migration of pollutants. The 4-inch diameter, 90 to 100-foot deep, former injection well located onsite, will be abandoned by properly plugging and sealing the well with grout and bentonite to eliminate any future contamination from indiscriminant dumping of wastes, and to comply with state regulations. In addition, all of the existing onsite PVC monitor wells which are not suitable for long-term ground water monitoring will be abandoned according to state regulations.

With the no action and modified no action alternatives, contaminated soils and ground water will be left onsite in their present state. The cleanup objectives will not be met and the soils will continue to be a source of further contamination and the contaminated ground water will continue to migrate according to local gradients. The potential environmental impacts associated with these alternatives are limited to degradation of the shallow zone of the aquifer and possible exposure of listed endangered, threatened, and special status species in Broward County. The site will continue to violate the State of Florida ground water standards.

With regard to public health, two potential exposure routes of the public to contaminants at or migrating from the HSTC site are direct contact with contaminated soils and direct contact with contaminated ground water from private water supply systems. The potential for human contact with contaminated ground water at toxic concentrations from shallow private wells have been characterized as low, however, the possibility does exist. In addition, the presence of ground water contamination at this site would limit future use of the ground water resource in this area, a highly productive, sole source aquifer.

Implementing the "modified no action" alternative will not involve obtaining permits, although certain EPA requirements have to be met. Ground water monitoring of both upgradient and downgradient wells will be required, and fences and warning signs at the site will have to be maintained. The presence of contaminants onsite will have to be recorded on the property deed which could limit future use or redevelopment of the property if either no action alternative is selected.

The following is a summary of costs for this alternative:

	Capital Costs	1st Year Operation and Maintenance (O&M) Costs
New Monitor Well	$ 5,000	
Abandon Onsite Wells	10,000	
Quarterly Sampling Analysis		$ 7,800
Totals	$15,000	$ 7,800
Total present worth cost @ 10% discount rate for 30 years of monitoring =	$73,500	
Total present worth cost =	$88,500	

Alternative 3: Offsite Treatment or Disposal

A remedial action relying completely upon offsite treatment and disposal requires soil excavation and disposal at an approved landfill. This alternative is based on excavation and hauling of approximately 50 cubic yards of soils contaminated with VOC's to an EPA-approved landfill and 955 cubic yards of soils contaminated with low concentrations of leachable metals to a local landfill. This alternative also includes recovery and and discharge of ground water to a local sewage treatment plant for offsite treatment. In addition, all of the onsite monitor wells and the injection well would be properly abandoned.

Excavation of contaminated soils, supplemented with qualified supervision and laboratory analysis of soils, is an effective method for removal of all contaminated soils onsite. Shallow excavation work should not require dewatering which eliminates requirements for dewatering equipment and handling of contaminated ground water.

The recovery of contaminated water within the estimated target area for decontamination by pumping alone (at 1,000 gallons per minute (gpm)) will require the disposal of a maximum of 1,600 million gallons over a 3.5 year period or a minimum of 800 million gallons over a 1.5 year period. The ground water recovery system is estimated to consist of two, 10-inch diameter wells with pumps and controls. Recovered ground water will be fed to the sewer system by gravity flow.

Collection and treatment of contaminated ground water will continue until the influent ground water meets the cleanup goals or until the system fails to be effective. Contaminated soils will be excavated down to levels to meet the cleanup criterion for each contaminant of concern. Excavated soils will be replaced with clean fill material to restore the site to its original condition.

The primary environmental impact associated with this alternative is the loss of fresh water/ground water from an area where salt water intrusion on the public water supply is a serious concern. Dewatering of the area will not affect any environmentally sensitive areas, such as wetlands, although it may temporarily result in vegetative stress in the near vicinity of the site. The impact on the native vegetation is expected to be minimal and recoverable.

The potential for public health effects associated with Alternative 3 occurs primrily during offsite transportation and handling of the contaminated soils and to a lesser extent, transport of the ground water to the treatment plant. Worker exposure during excavation of the VOC contaminated soils is also a consideration, however, actual exposure and risk can be easily controlled by following well established health and safety procedures and closely monitoring for ambient VOCs during the operation. Another factor that should be considered is the likelihood that the wastes will become contaminants in the new environment (disposal area) in the future, in the event that they are mismanaged.

The cost of ground water treatment and disposal offsite is primarily dependent on the sewer service charge by the City of Fort Lauderdale. A discharge of a minimum of 800 million gallons at a rate of $1.40 per gallon represent a total fee of $1.1 million. Other costs include installation and operation of the recovery system, installation of a force main to connect to the city sewer, and ground water monitoring on a monthly basis.

The following is a summary of the total present worth costs of Alternative #2:

	Capital Costs	1st Year O&M Costs
Recovery Well System	$ 99,659	$ 43,426
Abandon Onsite Wells	10,000	—
Untreated Water to WWTP	34,375	$1,046,623
Excavate & Dispose of all Contaminated soils	314,570	—
Totals	$ 458,604	$1,090,049
Total present worth cost @ 10% discount rate to be operated for 1.5 years to treat the minimum target zone =		$1,927,222
For the maximum target zone (3.5 yrs) =		$3,112,192

Alternative 4: Action to Reduce Threat

Implementation of this alternative includes abandoning (grouting and sealing) the existing 4-inch injection well and all onsite PVC monitor wells, excavation and treatment of VOC contaminated soils onsite, and continued ground water monitoring.

The preferred remedial alternative for treating VOC contaminated soils is excavation, ventilation, and replacement. The expected length of time of ventilation to completely remove VOCs from the soil is dependent upon several factors. Under ideal conditions, i.e., a warm, sunny, and breezy day, the process may require only a few hours of exposure. Under less than ideal conditions, the process may take a few days. Nonetheless, the time of completion is relatively fast and the process can be expected to be effective because of the volatile nature of the substances. The remedy represents a method for eliminating a potential source of ground water contamination. At the same time, any soil contaminated by substances not amenable to this treatment could be easily segregated for disposal offsite.

The environmental impacts of implementation of this alternative include vapor emissions and the potential for contamination of stormwater runoff. Vapor emissions will not present a problem to local residents because of dispersion and the travel distance to the nearest receptors. Adequate provisions to prevent stormwater runon and runoff will be required and may include stand-by coverings for the soil spreading area and curbing to eliminate the runon of storm water from adjacent areas. Given proper precautions there are no adverse health effects associated with this alternative.

This type of treatment process may not be specifically regulated by local agencies because of its relatively unique approach, although local regulatory approvals for utilization of city or county right-of-ways will be necessary. No forseeable problems are anticipated, provided that adequate controls and specifications are included as part of the contract documents for this activity.

The following is a summary of the costs associated with this alternative:

Abandon Onsite Wells	$ 10,000
Excavate and Treat VOC Contaminated Soils	57,047
Continued Ground Water Monitoring (present worth)	79,000
Total Present Worth Cost	$146,047

Alternative 5: Meet the Minimum Required Criteria

Elements of Alternative 5, which conforms to the minimum cleanup goals, are: properly abandoning the existing injection well and all other PVC wells onsite, treatment of VOC contaminated soil onsite, treatment of VOC contaminated ground water onsite, and recharge of treated ground water near the site. Many of the components of Alternative 5, such as abandoning wells, treatment of soils, and monitoring of effluents and emissions have been discussed in the text of the first three alternatives. Therefore, analysis of remedial actions involved in Alternative 5 will focus on treatment and disposal of contaminated ground water.

The preferred technology applicable to Alternative 5 for ground water treatment is air stripping. An air stripping system will perform extremely well given conditions at the HSTC Site. Removal of volatile organic contaminants from water at low influent concentrations is common practice today. Removal of 99 percent of the contaminants is achievable. Due to the fact that the primary sections of an air stripping operation contain no moving parts and the reliability of the equipment is good, implementation of the stripping procedure provides a means of relatively rapid and inexpensive cleanup of the contaminated ground water problem at the HSTC Site. As proposed, the ground water treatment system will include two extraction wells located near the two wells which show the highest concentrations of contaminants. Each well will be pumping at a rate of approximately 500 gallons per minute. The ground water will be passed through the air stripping column and then recharged via a network of 10 shallow recharge wells located at the circumference of the target zone shown in Figure 5. Effluent from the treatment system will be monitored on a weekly basis.

Recharge of the treated ground water offers several benefits unique to this technology, including: reduction of the duration of treatment, minimal effects from drawdown during ground water recovery, and creation of a ground water boundary to deter inflow of contaminants from outside the target zone. Recharge of the treated water also preserves a significant volume of fresh water in an area that is subject to severe droughts and salt water intrusion. Recharge via shallow wells eliminates losses via evaporation. Recharge will raise the level of ground water in localized areas around the recharge wells, however this is not expected to have adverse impacts on surface drainage characteristics or vegetation. Wells will be carefully located to ensure that building foundations, roadways, or other facilities are not impacted by activities associated with ground water recharge. Since the ground water will be treated to comply with the cleanup goals before recharge, there will be no adverse environmental or public health impacts. The pumping and piping equipment associated with the recharge system is all conventional, relatively inexpensive, and will require minimum maintenance.

Operation of an air stripper poses no threat to individuals working on or near the treatment equipment, however, the issue of vapor emissions must be addressed. Considering that typical air to water ratios in air stripping columns are generally in excess of 10:1, the volume of air diluting the effluent stream will reduce organic emissions sufficiently until external air currents have the opportunity to dilute and disperse emissions to levels well below the exposure limits. Periodic monitoring will be conducted to ensure that emissions pose no risk to the public or environment.

Once initiated the ground water treatment system will operate until the concentration of contaminants measured in the influent to the system meets the cleanup goals or until an analysis of the system performance confirms that it is reaching the limit of its ability to withdraw contaminated ground water, e.g., the recovery is no longer effective. If the system reaches its limit of recovery of contaminants before the cleanup goals are met, an analysis of the need for further action will be conducted at that time.

The duration of remediation is expected to be between 1 and 2 years. The capital and O&M costs for implementing the ground water recovery, treatment, and recharge systems as described above, and the other elements of Alternative 5 are presented below, along with the total estimated present worth for treating the minimum (1 year) and maximum (2 years) target zones.

	Capital Costs	1st Year O&M Costs
Abandon Onsite Wells	$ 10,000	—
Recovery Well System	99,659	$ 43,426
Ground Water Treatment (Air Stripping)	$ 254,649	$210,637
Recharge System	$ 232,375	$110,152
Excavate and Treat VOC Soils	$ 57,047	—
Totals	$ 653,730	$364,215

Total present worth cost @ 10% discount rate for 1 year to treat the minimum target zone (1 year)	=	$1,017,945
For the maximum target zone (2 years)	=	$1,259,959

Alternative 6: Exceed the Minimum Required Criteria

Remedial actions included in Alternative 6 are abandonment of the existing injection well and onsite monitor wells, onsite treatment of soils contaminated with VOCs, onsite treatment of ground water contaminated with VOCs and subsequent recharge of ground water via shallow wells, and excavation and removal of metals contaminated soils for offsite disposal.

All aspects of this alternative were discussed in texts of the first four alternatives. The addition of remediation of metals contaminated soils exceeds the cleanup goals for the project and therefore Alternative 6 exceeds the minimum criteria.

The following is a summary of capital and O&M costs for this alternative:

	Capital Costs	1st Year O&M Costs
Abandon Onsite Wells	$ 10,000	—
Recovery Well System	99,659	$ 43,426
Ground Water Treatment (Air Stripping)	$ 254,649	$210,637
Recharge System	$ 232,375	$110,152
Excavate and Treat VOC Soils	$ 57,047	—
Offsite Disposal of Metals Soils	$ 253,434	—
Totals	$ 907,164	$364,215

Total present worth cost @ 10% discount rate to treat the minimum target zone (1 year)	=	$1,271,379
For the maximum target zone (2 years)	=	$1,513,393

Recommended Remedial Action

A critical part of the feasibility study is to evaluate the remedial alternatives and identify the most appropriate and cost effective alternative which meets the remedial response objectives. In addition to the response objectives, several other important factors are used to evaluate each alternative. These factors include: level of cleanup, reliability, special engineering considerations, implementability, environmental effects (air, surface water, ground water, and soils), capital costs, operation and maintenance costs, institutional considerations, and the time required for implementation. A detailed evaluation was conducted by Camp Dresser & McKee Inc. and is presented in the feasibility study report. This evaluation is summarized in Table 3.

The "no action" and "modified no action" alternatives are unacceptable solutions to the problems at the Hollingsworth Site, since they do not meet the remedial response objectives nor state law and may result in public exposure to contaminants. The shallow ground water at the site is contaminated with a carcinogenic, organic compound that poses a potential future threat to public health and the environment.

Alternative 3, which involves offsite disposal, would meet the objectives of the response, however, the cost is considerably higher than other alternatives that also meet the objectives and would result in a significant loss of fresh water and temporary dewatering of the area.

Alternative 4 does not meet the objectives and provides minimal remediation via source control. The existing ground water contamination would not be addressed except by continued monitoring.

Alternative 5 is the preferred alternative because it meets the cleanup goals and the objectives of the remedial response for the lowest cost using proven technology.

TABLE 3

HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY
FORT LAUDERDALE, FLORIDA
RLM II

Alternative	Capital ($1,000)	1st yr. O&M ($1,000)	Present* Worth ($1,000)	Public Health Consideration	Environmental Effects	Technical Consideration
2	15	74	89	Does not meet any of the remedial response objectives. Possible future contamination of residential water supply and public water supply. Present public health threat low, however, future worst-case situation indicates unacceptable level of risk.	Potential migration of contaminated ground water offsite may result in contamination of private irrigation wells. Presence of contaminants might impact future use of the ground water.	Does not comply with state law
3	458	1,090	1,927 3,112	Meets remedial response objectives. Reduces public health threat at the site, but creates potential for exposure during transportation to an offsite disposal area.	Permanent loss of substantial quantity of fresh water. Relocation of contaminants with the long-term potential for environmental release. Potential adverse effects from dewatering the area via offsite disposal of ground water.	VOCs will be removed during transit to the treatment plant and during pre-treatment. O&M for ground water recovery system.
4	146	--	146	Does not meet the remedial response objectives. Possible future contamination of private irrigation wells and public water supply from existing ground water contamination. Eliminates source of VOC contamination. Low to moderate risk of worker exposure during soil treatment.	Potential migration of contaminated ground water offsite may result in contamination of private irrigation wells. Presence of contaminants might impact future use of the ground water.	Must make provision for runoff containment/diversion. Passive treatment with minimum energy requirements. Rapid effective treatment.
5	653	364	1,018 1,260	Meets all remedial response objectives. Reduces public health threat to acceptable levels. Moderate risk associated with worker exposure during soil treatment. Low to moderate potential risk to workers during soil treatment results in low level air emissions of VOCs.	Removes source of ground water contamination. Alleviates current and future potential for offsite migration of contaminants and contamination of private or public water supply wells. Conserves fresh water by recharge.	Proven technology which operates at high removal efficiency. Short treatment period; one time cleanup, no waste residue for treatment or disposal.

TABLE 3
(continued)

Alternative	Capital ($1,000)	1st Yr. O&M ($1,000)	Present* Worth ($1,000)	Public Health Consideration	Environmental Effects	Technical Consideration
6	907	364	1,271. 1,513	Exceeds remedial response objectives by removing metals contaminated soils. Eliminates every potential public health effect. Low to moderate potential for worker exposure during soil treatment. Results in low level air emissions of VOCs. Additional low risk exposure of workers during excavation etc. of metals contaminated soils.	Removes all source of contamination. Alleviates all current and potential future offsite migration of contaminants via ground water and eliminates potential contamination of private and public water supply wells. Conserves fresh water by recharge. Restores all areas of the site to clean condition. Offsite disposal of metals contaminated soils could result in environmental release in the future.	Proven technology which operates at high treatment efficiency. Short treatment period; one time cleanup. No waste residue for treatment or disposal.

* Two costs are based on treatment of ground water within the minimum and maximum target zones. For Alternative 2, the times are 1.5 and 3.5 years. For Alternatives 4 and 5, the times are 1 and 2 years.

Alternative 6 meets and exceeds the objectives and is exactly the same as Alternative 5, except that it includes excavation and offsite disposal of all metals contaminated soils. Based on the types and levels of metals present, removal of these soils is not warranted since the public health risks are minimal.

Community Relations

Two public meetings were held to inform the public of activities at the HSTC Site. Fact sheets were prepared for both meetings. The second meeting was held to present the Draft Feasibility Study Report and to allow for public comment. The public comment period was extended by two weeks to allow additional time for review and comment. A responsiveness summary outlining the results of public comment is enclosed. An information repository was established at the main branch of the Broward County Public Library in Fort Lauderdale, Florida. When approved, this Record of Decision will be sent to the repository.

Consistency with Other Environmental Laws

The recommended remedial action protects public health and welfare, and the environment. It is consistent with other related environmental laws and requirements such as RCRA, Air Quality Standards, and Executive Orders related to floodplains and wetlands.

As explained earlier, the HSTC Site contains elevated levels of VOCs in the ground water. These levels may pose a threat to public health and the environment, especially since ground water is used for drinking water purposes. The recommended treatment would bring the quality of the water withdrawn from the study area to levels at or below those set by the clean-up goals to protect public health. Thus, the recommended remedial action will be environmentally sound with respect to ground water protection and drinking water quality.

With respect to air quality standards, the recommended alternative will generate VOC emissions from air stripping towers. However, these emissions will be far below the levels allowed by the State of Florida (60 lb/hr or 15 tons/yr). A simple air quality dispersion model was used to calculate the dispersion of VOC emissions from the air stripping column. The results showed that even under worst case atmospheric conditions, the concentration of VOCs is substantially less than the threshold limit values for the volatile organic compounds found onsite. The air stripping facility will be located in a commercial industrial area, at least a quarter of a mile from the nearest residence. A 40-foot stack will be used for discharge from the air stripping unit to enhance dilution and dispersion and minimize the potential for exposure of the public.

The HSTC Site lies within the range of several threatened, endangered, and/or special status species; however, none are known to frequent the area. The site is, like almost all of Broward County, located in the 100-year floodplain. However, several flood control structures in the area minimize and control flooding, including the area proposed for air stripping facilities. Also, building permits are issued by Broward County only if the ground at the proposed structures is raised above the 100-year flood elevation before the structure is built on it. In this case, the elevation of the existing surface at the construction sites will need to be raised by only 1 to 2 feet to ensure that the air stripping treatment facilities are not built on the 100-year flood plain.

To the extent that contaminated ground water flows to or is in contact with area surface water, it causes no known violation of any water quality standards.

Operation and Maintenance

In addition to the $653,730 estimated capital costs required for the recommended alternative, operation and maintenance (O&M) costs will be incurred for the 1 to 2 year life of the project. O&M costs pertain to the operation of the air stripping treatment facilities, the ground water recovery system, and the ground water recharge system. These include costs for labor (operator time), energy (power costs), materials and supplies, and equipment placement (fans and pumps). Total estimated O&M costs are $364,215 per year. The recommended air stripping treatment systems will be operated until monitoring of influent (recovered) ground water quality confirms that all cleanup goals have been met, or until an analysis of the data shows that the recovery system is no longer effective.

Schedule

Activity	Date	Duration
Initiate Remedial Design	Upon reauthorization of CERCLA	6 months
Begin Remediation	10 months after notice to proceed	-
Operate Remedy	-	1-2 years

RESPONSIVENESS SUMMARY
DRAFT FEASIBILITY STUDY REPORT
HOLLINGSWORTH SOLDERLESS TERMINAL COMPANY SITE
FORT LAUDERDALE, FLORIDA

INTRODUCTION

The Draft Feasibility Study Report on the Hollingsworth Solderless Terminal Company (HSTC) Site, Fort Lauderdale, Florida was submitted for public review and the subject of a public meeting held on August 23, 1985 in the main branch of the Broward County public library in Fort Lauderdale, Florida. Following the public meeting, the public comment period began. Typically, the public comment period for a draft feasibility study report is three weeks; however, at the request of the responsible party, the comment period was extended an additional two weeks until September 27, 1985. The following is a summary of the questions and issues raised both at the public meeting and in written comments received from the responsible party and others. The questions or issues and answers presented herein have been organized into general topics and are being addressed on that basis.

1. Cleanup Goals or Criteria
   The cleanup goals for ground water established in the draft feasibility study report were based on both the state drinking water criteria and the 10^{-6} life time cancer risk factor. These criteria are applied to the site because the aquifer at the site is classified as a drinking water aquifer. The cleanup goals for soils were based on state water quailty criteria and the results of EP toxicity testing. Standards were set at levels in the leachate at 10 times the appropriate water quality criterion.

2. Introduction of Pollutants into the Air from the Air Stripping Tower
   Preliminary air modeling of the situation at the HSTC Site and extensive modeling studies done at other air stripping sites in south

Florida have shown that the level of contaminants emitted into the air from air stripping columns is typically well below the current Clean Air Act standards and does not present a public health threat.

3. <u>Locating Monitor and/or Recharge Wells on Private Property</u>
In the past, EPA has had good success in obtaining permission from property owners to conduct activities or construct wells which have been shown to be in the public interest. A number of the recharge wells may be located on city, county, or state right-of-ways, in which case negotiations will be undertaken with the appropriate agency.

4. <u>The Area-Wide Ground Water Contamination Problem</u>
An area-wide ground water contamination problem in the Executive Airport area does not relieve the responsible party of responsibility for cleaning up the contaminants at its site. The EPA, in coordination with the State and Broward County, has a substantial program underway at this time to identify other contributors to ground water contamination in this area. The comment that EPA has listed area-wide ground water contamination on the NPL in Dade County is incorrect.

5. <u>The Contractor for Site Remediation</u>
EPA would like to use one of the firms that is already under contract so that remediation can proceed as quickly as possible.

6. <u>What Area will be Cleaned Up</u>
The purpose of remediation is to mitigate ground water contamination at the site. For planning purposes, two areas were identified in the feasibility study. These two areas describe minimum and maximum target zones for ground water remediation based on the data which show that certain wells on site are contaminated. The ground water collection and treatment system will be operated in a manner such that once the concentration of contaminants in the influent meets the criteria, treatment will be discontinued. Therefore, only that area

where ground water contamination exists will be cleaned up, even though hypothetical areas that may be much larger than the actual zone of contamination have been identified for planning purposes.

7. Depth of Recharge Wells

The recharge wells to be used to reintroduce treated water back into the ground water system will be approximately 20 feet deep. Shallow recharge wells such as these are commonly used in south Florida for storm water, and heating and air conditioning system water disposal.

8. Length of Project

Based on the hypothetical target zones of contamination identified in the draft feasibility study and a withdrawal and treatment rate of 1,000 gallons per minute, it will take approximately 1 year to collect and treat the ground water within the minimum target zone, and approximately 2 years to collect and treat the ground water within the maximum target zone, which is considered to be the maximum possible extent of contamination. These time frames are based on use of the reinjection system design presented in the report. Reinjection of ground water outside the zone of contamination creates a mound of ground water which forces ground water toward the collection wells and shortens the total time to collect and treat the ground water within the target zone. The actual length of the project will depend upon the actual zone of contamination as described under Item 6. As soon as the influent ground water quality meets the criteria, remediation will cease.

9. The Hazard Ranking System (HRS) Score

At the time the HSTC Site was placed on the NPL, it was appropriately scored and the score was adequate for its inclusion on the NPL. There was an official public comment period provided for comment on the listing. Response actions taken after NPL listing do not result in a rescoring of the site.

10. Ingestion versus Dermal and Inhalation Exposure of Residents with Shallow Irrigation Wells Downgradient of the Site

It is true that the analysis under the public health evaluation did include consideration of the ingestion criterion versus the dermal and inhalation criterion. The ingestion criterion must be used in a case like this where there is a possibility that children or anyone else might come into contact with or actually drink water from the irrigation system. There is no way to absolutely preclude this from happening; therefore, the more conservative criterion was applied in the analysis.

11. Consideration of Other Sources of Contamination to the Ground Water in the Hollingsworth Area

The objective of this study was to evaluate the HSTC Site as a source of contamination and to determine a method to adequately clean up that contamination. It is clear which areas have been contaminated by Hollingsworth and only those areas have been included in the feasibility study for remediation.

12. Fouling of the Air Stripping System

The use of air stripping columns for removal of volatile organics from ground water is a proven technology that is widely being applied in this field. The fact that over time, air stripping columns decrease in efficiency of removal of contaminants is a maintenance problem. Maintenance costs were included in the feasibility study to cover proper monitoring and scheduled maintenance of the system to prevent production of effluent which does not meet the cleanup criteria.

In this system, the water will be withdrawn from a depth of approximately 60 to 70 feet. This is the lower sand zone, a zone above the production zone or the limestone aquifer. The total dissolved solids level in this zone is somewhat less than the production zone of the aquifer, therefore the tendency for fouling is diminished. Further, there are a number of techniques that can be used to reduce the fouling problem in both the air stripping system and recharge system. One of these methods includes the introduction of low concentrations of hydrogen peroxide into the influent. The hydrogen peroxide keeps iron in solution through the air stripping column and reduces fouling; it also helps to keep iron in solution throughout reintroduction via the recharge system. The peroxide itself readily decomposes to water and oxygen and it does not represent a contaminant. The use of hydrogen peroxide has the added benefit of actually cleaning the air stripping system due to creation of bubbles on the surface of the columns which effectively scrub the air stripping columns. Hydrogen peroxide also prevents or reduces the growth of biological organisms. There are other techniques to reduce fouling that can be applied depending upon the specific water quality characteristics of the water in the zone to be treated. These determinations will be made during final design.

13. <u>Intrusion of Contaminants from Offsite</u>
The ground water collection, treatment and recharge system designed for the HSTC Site will minimize the possibility that contaminants from offsite will be collected by the system. The configuration of the recharge wells is designed to create a ground water barrier in the shallow zone. Reinjection of the water will create a mound of ground water or a ground water divide, which will prevent water from moving outside of the target zone into the recovery system. Water may still pass under the site in the production zone; however, the concentrations of contaminants in the production zone have been documented to be very low due to the high volume of water and dilution and further, this zone has not been slated for treatment. The recharge system is not expected to result in the spread of contaminants offsite. At the time the recharge wells are installed at each of the 10 locations, water samples will be collected and analyzed. If contamination is present at these wells, the wells will be relocated and the information will be passed along to the appropriate local agency for investigation into the source of contamination.

14. Accidental Spills within the Zone of Cleanup

To date there is no evidence that spills have occurred in the vicinity of the HSTC Site that may be influencing the presence of contaminants at that site. Therefore, there is no reasonable cause for concern that spills will occur in the future which may impact remediation of the site. Obviously, there is no way to police this entire area against accidential or intentional spills; however, the fact that this has not been a problem in the past indicates that in all likelihood it will not be a problem in the future.

15. Leaking in the Ground Water Recharge System

The water that will be transported from the treatment system to the recharge wells will be of drinking water quality. Therefore, if a leak should occur in the distribution system itself, no contamination or violation should occur. Damage due to the presence of water alone may be a consideration; however, over the short time period of this project, properly laid piping should not present a major problem of leaking, and further, maintenance costs have been included to cover periodic checking of the distribution system.

16. The Size of the Ground Water Treatment System

The air stripping system designed for this project has been optimized rather than over built, to minimize the length of time to recover and treat contaminated ground water at the site, thereby minimizing the operation and maintenance cost and the overall project costs.

17. The Ability of the Ground Water Recovery System to Recover Contaminants

Recovery of ground water contaminated with volatile organics, such as the trichloroethene found on the HSTC Site, has been successfully demonstrated at several sites across the country and is considered to be an effective technology for collection of these contaminants. The fact that trichloroethene is relatively insoluble and heavier than water does not prevent it from being recovered in the ground water.

The extraction wells have been located in the areas and at depths where the highest concentrations of contaminants have been found to optimize contaminant recovery.

18. Financial Conditon of the Hollingsworth Solderless Terminal Company

While the National Contingency Plan requires that EPA choose a cost effective site remedy, the financial condition of a potentially responsible party is not an element of this determination. CERCLA was adopted with recognition that responsible parties might not be able to afford the appropriate site remedy.

19. Sampling and Test Data

While all available data was used in evaluating this site, the most recent data depicting current site conditions was used to evaluate site remedies, rather than data that depicted conditions at some time in the past. An analysis of the results of the most recent episode of ground water sampling where samples were split between EPA and Enviropact showed that the results from both labs were consistent with the exception of the values for vinyl chloride. Enviropact failed to detect vinyl chloride in the samples, whereas the contract lab detected vinyl chloride at estimated concentrations ranging from 200 to 5,000 parts per billion. Otherwise, the data for each of the wells were very similar and within reasonable variation between two laboratories. Both laboratories found trichloroethene and dichloroethene in the intermediate depth well at the upgradient location. The probability that this is from offsite contamination is extremely low since contaminants deposited onsite have not migrated very far downgradient of the site. There are no known nearby sources of contaminants other than the discharge to the Gaidry property and the area between the two former Hollingsworth buildings (north plant). Because the ground water gradient at this site is extremely flat, dispersion may partially account for the fact that well #7 is contaminated. The ground water gradient varies by only 1/10 of an inch in this area.

Since Enviropact did not measure toluene and xylene, it is impossible to compare the two data sets with regard to these contaminants. There is no known source for these contaminants at the HSTC Site and therefore, it it likely that they are contaminants of the regional aquifer, probably from gasoline spills. These contaminants would be removed by air stripping, along with the volatile organic contaminants from the site. Therefore, they would not be a source of offsite contamination. The presence of other contaminants that may or may not be attributable to this site does not preclude the need to address contaminants that can be unequivocally linked to the HSTC Site.

20. Absence of Contaminants in the Production Zone of the Aquifer
The test well and monitor well onsite are completed into the production zone of the aquifer. This zone is extremely permeable and large volumes of water move through the site in this zone. Contaminants moving vertically into this zone would be greatly diluted. Thus, it is no surprise that contaminant concentrations are below detection limits. A similar explanation could be expected to apply to wells at the 100-foot depth. However, these results could not be directly compared to the shallower test results where contaminants are known to be moving through the sand zone. The fact that contaminants are below detection limits in the deeper zones does not eliminate the responsibility to clean up the contamination of the shallow zone, nor is it conclusive unless it is to indicate that once contaminants migrate into the production zone they are diluted and transported offsite.

21. Monitoring the Ground Water Treatment System
Once the air stripping unit has been properly set up and set into operation, monitoring of the treated ground water will occur on a weekly basis. This type of treatment unit is considered very reliable and hence, there is no justification for continuous monitoring. The only way the system can fail (given proper setup and maintenance) is if the pump goes out. In this case, an alarm will go off and the

system will automatically shut down. Therefore, untreated ground water will not be recharged. Time for proper maintenance has been included in the cost estimate.

22. Application of In Situ Aeration
In situ aeration was not considered in the feasibility study because it does not meet the criterion of being a proven engineering technology. The effects and effectiveness would be difficult to control and monitor. Further, this technique could potentially enhance offsite migration of contaminants.

23. Disruption of Hollingsworth's Tenants During Site Remediation
Although this may be a legitmate concern, it should be noted that during December 1984, 11 soil borings were performed on and in the immediate vicinity of the Hollingsworth property without any disruption of the tenants. In February 1985, monitor wells were installed around the site, also with no disruption of the tenants or their normal activities. The remediation work can be scheduled and conducted in a manner to minimize any inconveniences.

24. Delisting the Site Following Remediation
Some comments have raised the issue of when EPA will delete a site from the NPL. In general, a site will be removed from the NPL when the site remedy has been implemented and information confirms that it is performing as anticipated.

25. NCP Requirements and CERCLA Program Goals
Several comments were received relative to the National Contingency Plan (NCP) and whether the remedy proposed was consistent with it. One issue was that there are no drinking water wells in the path of contaminants, thus no action was appropriate. Several factors combine to demand rejection of the no-action scenario. the aquifer is the sole source of drinking water for the area. State standards are violated because of the contamination from the site. As a natural

resource, the aquifer is harmed. Water users are at risk, not only those users who are in the computer simulated path of contamination, but others as well. The computer simulation does not guarantee that contamination has not nor will not enter the Prospect Lake Well Field and thus be supplied to the public. Private wells for irrigation, or for drinking water, cannot be completely precluded from the area. Even forceful regulation is not 100 percent effective. There exist no effective natural or man-made barriers to contaminant migration. There exists no alternative source of potable water at this time or in the reasonable future except this aquifer. The contaminants detected include known carcinogens. A remedy is available which is safe, effective, technically feasible and reliable, and will provide reduced risks to public health and the environment.

The recommended technology has been applied at similar sites. Dade County plans a much larger air-stripping system for their water supply with confidence in its anticipated benefits. The environmental effects are far less than the benefits and are controllable. The cost is well within the range of other alternatives that provide less benefits to public health, welfare and the environment. The NCP (Section 300.68(j)) describes "The appropriate extent of remedy shall be determined by the lead Agency's selection of the remedial alternative which the Agency determines is cost effective (i.e., the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment).