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PRELIMINARY Public Health Assessment for

HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA
CERCLIS NO. FLD053502696
SEPTEMBER 23, 1993

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PRELIMINARY PUBLIC HEALTH ASSESSMENT

HELENA CHEMICAL COMPANY

TAMPA, HILLSBOROUGH COUNTY, FLORIDA

CERCLIS NO. FLD053502696

Prepared by

Office of Toxicology and Hazard Assessment
The Florida Department of Health and Rehabilitative Services
Under Cooperative Agreement With
The Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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TABLE OF CONTENTS

SUMMARY

The Helena Chemical Company Superfund site (Helena) is an active facility that formulates, stores, repackages, and distributes agricultural chemicals. Prior to 1981, Helena also manufactured pesticides at this site. Helena is in a mixed industrial/commercial/residential section of east Tampa, Florida. Past spills and waste disposal practices have contaminated on-site soil, sediments, and ground water with metals and pesticides. Due to the lack of environmental data, we are unable to establish an definite association between exposures in the 1940s and 1950s and health complaints of former residents.

Due to the lack of adequate sampling data for all of the contaminated media, we categorize this site as an indeterminate public health hazard. Incidental ingestion of toxaphene contaminated soil at this site by Helena workers, however, is a completed exposure pathway that over a lifetime may result in low to moderate increased risk of cancer. Incidental ingestion of off-site sediment by children, ingestion of contaminated fish from the Tampa Bypass Canal, and ingestion of contaminated Floridan aquifer ground water are potential exposure pathways. Testing of these media, however, has been inadequate to determine the extent of contamination and the public health threat. Although nearby private wells are not currently contaminated, long-term ingestion of Floridan aquifer ground water at the maximum arsenic concentration detected may result in a low to moderate increased risk of skin cancer.

We recommend Helena post hazardous waste warning signs and reduce worker exposure to toxaphene-contaminated surface soil. We recommend Helena collect and analyze at least four additional off-site sediment samples. If these samples indicate pesticide contamination has reached the Tampa Bypass Canal, we recommend Helena collect and analyze 5-10 fish samples from the canal. We recommend that the Florida Department of Environmental Protection add pesticides to the list of contaminants Helena must analyze for in the surficial aquifer. We recommend Helena install and sample at least four upper-Floridan aquifer monitor wells and determine the site specific ground water flow direction. We also recommend that nearby private wells be tested annually for site-related contamination. The Agency for Toxic Substances Disease and Registry's (ATSDR) Health Activities Recommendation Panel (HARP) has evaluated the data in this preliminary public health assessment and determined that the appropriate occupational health agency should consider worker education and medical evaluation and/or monitoring. HARP also determined that the ATSDR Division of Toxicology should consider substance-specific research for those site contaminants in completed exposure pathways that lack sufficient toxicological data.

ATSDR and/or the Florida Department of Health and Rehabilitative Services (HRS) will recommend the Occupational Safety and Health Administration or the National Institute for Occupational Safety and Health consider medical evaluation and/or monitoring of Helena workers. The Florida HRS will review additional site data as they become available.

BACKGROUND

In this preliminary public health assessment, the Florida Department of Health and Rehabilitative Services (Florida HRS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), evaluates the public health significance of the Helena Chemical Company Superfund site. Specifically, Florida HRS determines whether health effects are possible and recommends actions to reduce or prevent them. ATSDR is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to conduct public health assessments at hazardous waste sites.

A. Site Description and History

Helena Chemical Company (Helena) is an active facility in Tampa, Florida that formulates, stores, repackages, and distributes agricultural chemicals. Prior to 1981, Helena also manufactured pesticides at this site. In 1984 the Florida Department of Environmental Protection (DEP) inspected Helena and required quarterly monitoring of the surficial aquifer. From 1988 to 1990, the Environmental Protection Agency (EPA) investigated this site and found pesticide contamination in the on-site soil, sediments, and surficial aquifer. Based on the potential for human exposure via ingestion of contaminated ground water, EPA proposed this site to the Superfund National Priorities List (NPL) in February 1992 and finalized the listing in October 1992. EPA is planning a remedial investigation and feasibility study. Neither Helena or EPA have undertaken any site cleanup. Florida HRS, in cooperation with ATSDR, is preparing this public health assessment as required by the Superfund Amendments and Reauthorization Act of 1986 (SARA). SARA requires ATSDR to assess the public health threat at Superfund sites within a year of their proposal to the Superfund NPL. ATSDR has no previous involvement at this site.

Helena is at 2405 North 71st Street in Tampa, Hillsborough County, Florida, approximately 0.5 mile west of the Tampa Bypass Canal (Figures 1-4, Appendix A). It is in the Orient Park area on the east side of Tampa. The office, laboratory, and warehouses are on eight acres bounded on the north by 14th Ave., on the east by Orient Rd., on the south by the CSX railroad line, and on the west by 71st St. Helena also owns a vacant three-acre lot on 71st St., west of the main facility. Access to both of these lots is limited by a six-foot high chain-link fence topped with barbed wire. Although there is no on-site security, the gates are locked at night. The operating facility consists of an office, laboratory, liquid processing and repackaging warehouse, product storage warehouse, and several above-ground storage tanks. The site is relatively flat with a gradual slope to the southeast. The center of the site is paved while the rest is grass covered. A concrete ditch conveys stormwater run-off from the site to a 10,400 square foot, unlined retention pond. Overflow from this retention pond is east into a 0.5 mile stormwater run-off path along the railroad track which empties into the Tampa Bypass Canal.

From 1929 to 1967, the Flag Sulphur Company produced sulfur and other agricultural chemicals at this site. Former residents report clouds of dust from this site in the 1940s and 1950s would

regularly coat nearby cars and houses. They also report that children played in the multi-colored run-off from this site. Former residents also report that during the 1940s, facility employees disposed of sludge in an area devoid of vegetation just south across the railroad tracks from the main building. In 1967, Helena purchased this site and began manufacturing and distributing agricultural chemicals, including a number of pesticides. Table 1 lists the pesticides and other chemicals Helena produced or stored at this site (EPA 1991a). In 1979, Helena reported using 6,000 gallons of xylene and producing 66,000 gallons of liquid pesticides and 83,000 pounds of plant fertilizer per month (Bond 1979). From 1974 to 1981, Helena used a buried three-tank waste-water system to treat spills and run-off. In 1981 Helena ceased production of pesticides but continues to formulate, store, repackage, and distribute agricultural chemicals. Sometime between 1984 and 1988, Helena abandoned the three-tank waster-water treatment system. Stormwater run-off from the site is now collected in the unlined retention pond.

Table 1. Chemicals Produced, Stored, or Used by Helena

Acaricides - chlorobenzilate and others
Herbicides - dinoseb and the dimethylamine salt of 2,4-D
Insecticidal Petroleum Oil
Nematicides - 1,2-dibromo-3-chloropropane
Organochlorine and Organophosphate Pesticides - atrazine, gamma-BHC (Lindane), paraquat, tebuthiuron, glyphosate, oryzalin, toxaphene, parathion, methylparathion, mevinphos, naled, malathion, EPN, dimethoate, dimpylate, endrin, and chlordane
Solvent and Carriers - xylenes and diesel fuel oil
Liquid Fertilizer Components - chelating compounds, ferrous sulfate, manganese sulfate, magnesium sulfate, nitric acid, phosphoric acid, sodium hydroxide, and zinc sulfate

Ground water below this site is contained in two aquifers separated by a semipermeable layer of clay. The surficial aquifer is made up of about 11 feet of sand. The depth to water in this aquifer is usually about 2 to 7 feet below land surface, depending on the amount of rainfall. About once a year, during periods of extended heavy rainfall, however, the aquifer may actually become saturated and cause flooding. On-site water level measurements by Florida DEP (1990) and measurements at the nearby Stauffer Chemical Company site by their consultants (ERM 1991), indicate that ground water in the surficial aquifer flows to the south, southeast, and east. This aquifer is not used as a source of irrigation or drinking water due to its limited yield.

The surficial aquifer is separated from the deeper Floridan aquifer by about 15 feet of clay. The thickness of this clay and its ability to impede the flow of water between these two aquifers may vary across the site. Below this clay layer, water is contained in the Floridan aquifer. In Hillsborough County, the Floridan aquifer is made up of about 1,200 feet of porous limestone and is the primary source for drinking water. It is the source for the 500 foot deep production well at Helena and for nearby private wells. Regionally, ground water in this aquifer flows to the southwest toward McKay and Hillsborough Bays. The direction of ground water flow in the

Floridan aquifer below the site, however, has not been determined. Consultants for nearby Stauffer Chemical Company found that flow in the Floridan aquifer under their site is to the southeast toward the Tampa Bypass Canal (ERM 1991).

B. Site Visit

Randy Merchant of Florida HRS, the EPA Region IV remedial project manager, and the Hillsborough County environmental health director visited the site on September 10, 1992. They met with the plant manager and Helena's environmental consultants. They discussed past and current operations and toured the site. The plant manager explained that in the past, runoff was directed to three "treatment tanks" and an unlined retention pond in the southeast corner of the site. Between 1984 and 1988, Helena abandoned these "treatment tanks" and now collects all runoff in the retention pond. Overflow from this retention pond flows under Orient Park Rd. along the railroad track east toward the Tampa Bypass Canal. No environmental samples were collected during this visit. Mr. Merchant spent two hours on the site and made the following observations:

* Helena Chemical Company is an active facility.

* The site is surrounded by a six-foot high chain-link fence.

* There was no evidence of site trespass.

* Stormwater run-off appears to be toward a retention pond in the southeast corner of the property.

* There are no hazardous waste warning signs as required by Florida Statutes 403.704 and 403.7255 and Florida DEP Rule 17-736.

Mr. Merchant drove through the mixed industrial/commercial/residential area around this site. The nearest house is about 300 feet north of the site. The southern boundary of the Orient Park residential subdivision is about 600 feet north of the site. The Stauffer Chemical Co. Superfund site is about 50 feet southeast of Helena. Wheelblast, Inc., a sand blasting facility, is south of Helena across the railroad tracks. The area west of Helena is mixed industrial/commercial. Mr. Merchant observed people fishing from the bridge over the Tampa Bypass Canal 0.5 mile east of Helena.

On September 11, 1992, Mr. Merchant met with the Hillsborough County environmental health director and reviewed the Helena Chemical Company file. The Hillsborough County environmental health director estimates that most residents near the site are on municipal water supply. He did not know of any community health concerns about Helena Chemical Co. Mr. Merchant also reviewed the Florida DEP Helena Chemical Co. file and met with the hazardous waste section administrator who was also unaware of any community health concerns.

On May 19, 1993 Mr. Merchant attended an EPA sponsored public meeting regarding the remedial investigation/feasibility study for this site. Five to ten former residents expressed health concerns at this meeting and in subsequent letters and phone calls.

C. Demographics, Land Use, and Natural Resource Use

Demographics

According to 1990 census data, about 5,600 people live within 1.5 miles of this site, mostly in the Orient Park subdivision and along Broadway Avenue. These residents are mostly white (77%) with a black (15%) and Hispanic (8%) minority. The population is relatively young: the median age is 31 and 17% are under 10 years old. Most (57%) of the 2,200 homes in this area are owner occupied. The median yearly family income in this area is about $22,000 (BOC 1992).

Land Use

The area within about 1.5 miles of the site is mostly industrial/commercial/residential. The Stauffer Chemical Co. Superfund site is 50 feet southeast of Helena. The 62nd St. Landfill and Kassouf-Kimerling Superfund sites are about 2 miles west of Helena. A steel recycling facility, a secondary lead smelter, and the Uceto Railroad Yard are all within 1.5 miles of Helena. The nearest house is about 300 feet north of the site. The Kenly Elementary School and two day-care facilities are in the Orient Park subdivision about 0.5 mile northwest of the site.

Natural Resource Use

The Tampa Bypass Canal is located 0.5 mile east of the site. It discharges into McKay Bay 2.5 miles downstream. Florida DEP classifies the Tampa Bypass Canal and McKay Bay as Class-III surface waters (recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife). Although the canal and McKay Bay are not drinking water sources and commercial fishing is prohibited, individuals do catch and eat fish from both.

Ground water from the Floridan aquifer is the source of drinking water for most of Hillsborough County. The surficial aquifer is not used as a source of irrigation or drinking water due to its limited yield. The four supply wells for Seaboard Utilities, which serves 2600 connections, are 1.75 miles south-southeast of Helena. The two supply wells for USA Utilities, which serves 851 connections, are 2.25 miles north-northwest of Helena. The supply wells for the Shady Oak Trailer Park (1.25 miles, 40 trailers), the Paradise Mobile Home Park (2.25 miles, 307 trailers), and the Riverbreeze Motor Home Park (2.35 miles, 19 trailers) are all northeast of Helena (EPA 1991c).

Most of the houses in this area are served by a municipal water supply. An unknown number of homes, however, still use wells in the upper Floridan aquifer for drinking water, cooking, bathing, and irrigation. A more accurate survey of private wells in this area is needed. The

nearest private well is at 2512 Orient Rd., about 300 feet north of the site. A second is located at 2428 N. 70th St., about 1000 feet west of the site.

There is little agriculture or hunting in this area.

D. Health Outcome Data

We did not evaluate health outcome data for this site. See the Public Health Implications, Community Health Concerns Evaluation section for details.

COMMUNITY HEALTH CONCERNS

On May 19, 1993 Mr. Merchant attended an EPA sponsored public meeting regarding the remedial investigation/feasibility study for this site. Five to ten former residents expressed health concerns at this meeting and in subsequent letters and phone calls. We address these concerns in the Public Health Implications, Community Health Concerns Evaluation section. The following is a summary of the community health concerns:

1. One person was concerned that their private well is contaminated.

2. One person was concerned that their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

3. One person was concerned that health problems in their family were caused by exposure to pesticides and other chemicals from the Flag Sulphur Company (now Helena Chemical Company). Their family lived within 0.25 mile of this site during the 1940s and 1950s. This person reported contaminated dust from the site frequently covering their house and children of this family played in the contaminated run-off from the site. This person reported nausea, headaches, and burning sensation of the eyes and nose when the facility "cooked" or after a tank exploded. This person reported their father worked at the site in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include Grave's disease; difficulty in conceiving and spontaneous abortions; asthma; hiatal hernia; impaired circulation; and kidney problems.

4. One person was concerned that their fibromyalgia was caused by pesticide exposure. This person forwarded a copy of the laboratory analysis of their blood for chlorinated pesticides, trimellitic anhydride, isocyanate, and formaldehyde exposure. This person's family also lived within 0.25 mile of the site during the 1940s and 1950s and reported breathing contaminated dust and playing as a child in the contaminated run-off.

5. One person was concerned that their family's health problems (kidney, bladder, and lung) are related to living in this area during the 1940s and 1950s.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

In this section we review the environmental data, evaluate its adequacy, select contaminants of concern, and list the maximum concentration and frequency of detection of these contaminants. We then compare the maximum concentrations to background levels and to standard comparison values. We selected contaminants of concern based on the following factors:

1. Concentrations of contaminants on and off the site.
2. Field data quality, laboratory data quality, and sample design.
3. Community health concerns.
4. Comparison of on-site and off-site concentrations with the following health assessment comparison values:
    a. Environmental Media Evaluation Guide (EMEG): derived from ATSDR's Minimal Risk Level (MRL), the estimate of daily human exposure to a chemical likely to be without an appreciable risk of adverse effects, generally for a period of a year or longer.
    b. Reference Dose Media Evaluation Guide (RMEG): derived from EPA's Reference Dose (RfD), the estimate of daily human exposure to a chemical likely to be without an appreciable risk of adverse effects, generally for a period of a year or longer.
    c. Lifetime Health Advisory (LTHA): EPA's estimate of the concentration of a contaminant in drinking water at which non-cancerous adverse health effects would not be expected to occur over a lifetime of exposure. LTHAs provide a safety margin to protect sensitive members of the population.
    d. Maximum Contaminant Level (MCL): the contaminant concentration that EPA considers protective of public health over a 70 year lifetime at an exposure rate of 2 liters of water per day. MCLs are regulatory concentrations.
    e. Cancer Risk Evaluation Guide (CREG): calculated from EPA's cancer slope factors, the contaminant concentration estimated to result in one excess cancer in a million persons exposed over a lifetime.

Based on the above criteria, we selected the following chemicals as contaminants of concern:

Arsenic	Dieldrin
alpha-, beta-, and delta-BHC	Heptachlor
gamma-BHC	Toxaphene
DDT, DDE, and DDD	

Alpha-, beta-, and delta-BHC (benzene hexachloride) are also known as alpha-, beta-, and delta-HCH (hexachlorocyclohexane). Gamma-BHC is also known by its trade name, Lindane.

Identification of a contaminant of concern in this section does not necessarily mean that exposure will cause adverse health effects. When selected as a contaminant of concern in one medium, we also reported that contaminant in all other media. We evaluate these contaminants in subsequent sections and determine whether exposure has public health significance.

We eliminated from further consideration 57 chemicals found in the air, soil, surface water, sediments, and ground water at concentrations below standard comparison values (Table 2). Twenty-nine other chemicals, however, have no standard comparison values and the human health data are insufficient to determine their public health significance (Table 3).

Table 2. Site-Related Chemicals At Concentrations Below Standard Comparison Values

1,1-dichloroethane
1,2-dichlorobenzene
1,2-dichloroethene
1,2,4-trichlorobenzene
2,4-D
3-methyl phenol
4-methyl phenol
aldrin
atrazine
barium
benzo(a)anthracene
benzo(a)pyrene
benzo(b/k)fluoranthene
benzo(g,h,i)perylene
beryllium
bromacil
cadmium
carbon disulfide
carbophenthion
chlordane
chlorobenzilate
chromium
chrysene
copper
cyanide
di(2-ethylhexyl)phthalate
di(n-butyl)phthalate
diazinon
dibrom (Naled)
endosulfan
endosulfan sulfate
endrin
EPN
ethion
ethyl benzene
fluoranthene
fluorene
heptachlor epoxide
indeno(1,2,3-cd)pyrene
iron
lead
malathion
manganese
mercury
methyl naphthalene
methyl parathion
naphthalene
nickel
parathion
phenanthrene
phenol
pyrene
silvex (2,4,5-TP)
toluene
vanadium
xylenes
zinc

Table 3. Site-Related Chemicals With Insufficient Toxicological Data

aminobenzene sulfonamide
benzene propanoic acid
benzene sulfonamide
bis(chlorophenyl)methanone
camphor
chlordene
chloro(chloromethyl)thiobenzene
chlorobenzenethiol
di-n-octylphthalate
diazanone
diethylbenzene
diethylmethyl ethane diamine
dimethyl phenyl benzene acetamide
ethyl thiocyclohexane
ethylhexanoic acid
ethylhexanol
hexadecanoic acid
hexanoic acid
iodomethyl benzene
methyl(methylethyl)benzene
methylethyl benzene
nonachlor, cis and trans
phosdrin
terpin hydrate
tetradifon
trimethyl cyclohexane methanol
trimethyl benzene

The area within about 1.5 mile of Helena is mostly industrial/commercial/residential. Alaric to the west, Stauffer Chemical Company to the southeast, and Woodruff & Sons to the east may have contributed to the contamination near Helena. The ground water at Alaric is contaminated with trichloroethylene and tetrachloroethylene (DEP 1988). Stauffer, a proposed Superfund hazardous waste site, is an inactive facility that handled many of the same pesticides used at Helena. To find other industrial facilities that could add to the contamination near the Helena site, we searched the 1987-1990 EPA Toxic Chemical Release Inventory (TRI) data base. EPA developed TRI from the chemical release information (air, water, and soil) provided by certain industries. Thirteen facilities in the 33619 ZIP code reported releases from 1987-1990. This ZIP code covers a rectangular area about 2 miles west, north and east and 5 miles south of Helena (Figure 5, Appendix A). None of these facilities reported releases of contaminants that are of concern at Helena.

In this assessment, the contamination that exists **on** the site will be discussed first, separately from the contamination that occurs **off** the site.

A. On-Site Contamination

For the purposes of this evaluation, "on-site" will be defined as the Helena Chemical Company property boundaries (Figure 3 and 4, Appendix A). This definition includes the eight acre production facility east of 71st St. and the three acre vacant lot west of 71st St. We compiled data in this subsection from EPA and Florida DEP reports.

On-Site Air

On October 13 and 14, 1988, EPA collected six on-site air samples (Figure 6, Appendix A). EPA did not specify the sampling height. The wind was light and from the east-northeast. Two samples (HC-Air-01 and HC-Air-04) were from background locations. Since pesticides make up the bulk the chemicals used at this site, EPA only analyzed these air samples for pesticides. As shown in Table 4, EPA did not detect any pesticides in the air at this site (EPA 1990). Detection limits were not reported. They did detect one unidentified compound at trace concentrations. For this preliminary assessment, these air samples adequately characterize the ambient air quality.

Table 4. Maximum Concentrations in On-Site Air

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	NA	---	NA	---	---
alpha-, beta-, and delta-BHC	ND	0/4	ND	---	---
gamma-BHC	ND	0/4	ND	---	---
DDT, DDE, DDD	ND	0/4	ND	---	---
Dieldrin	ND	0/4	ND	---	---
Heptachlor	ND	0/4	ND	---	---
Toxaphene	ND	0/4	ND	---	---

NA-not analyzed; ND-not detected; µg/L-micrograms per liter
Source: EPA 1990

On-Site Surface Soil

Between 1988 and 1990, EPA consultants collected "surface" soil samples from this site (Figures 6 and 7, Appendix A). They did not give the precise depth of these soil samples, only describing them as "surface". We consider two samples, both designated HC-SS-01, as representative of background. EPA found elevated concentrations of arsenic, DDT, DDE, DDD, and toxaphene in the surface soil (EPA 1990, 1991a). The highest toxaphene concentrations were near the three defunct wastewater holding tanks. Table 5 lists the maximum concentrations for the selected contaminants of concern. For this preliminary assessment, these surface soil samples adequately characterize the on-site surface soil quality.

Table 5. Maximum Concentrations in On-Site Surface Soil (Depth Not Specified)

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive / Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	10.0	2/6	ND	0.4	CREG
alpha-, beta-, and delta-BHC	ND	0/24	ND	----	----
gamma-BHC	ND	0/8	ND	----	----
DDT, DDE, DDD	100	21/30	0.89	2	CREG
Dieldrin	1.8	1/14	ND	0.04	CREG
Heptachlor	ND	0/8	ND	----	----
Toxaphene	3,900	9/12	15	0.6	CREG

ND-not detected; mg/kg-milligrams per kilogram
Sources: EPA 1990, 1991a

On-Site Subsurface Soil

Between 1989 and 1990, EPA consultants collected on-site subsurface soil samples between 3 and 5 feet deep (Figure 7, Appendix A). We consider sample HC-SB-01, as representative of background. EPA found elevated concentrations of arsenic, DDT, DDE, and DDD in the subsurface soil (EPA 1991a). Table 6 lists the maximum concentrations for the selected contaminants of concern. For this preliminary assessment, these subsurface soil samples adequately characterize the on-site subsurface soil quality.

Table 6. Maximum Concentrations in On-Site Subsurface Soil (3 to 5 Feet Deep)

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive / Total # samples	Background Concentration (mg/kg)	Comparison Value (mg/kg)	Comparison Value Source
Arsenic	2.3	1/5	NA	0.4	CREG
alpha-, beta-, and delta-BHC	0.018	2/10	ND	0.4	CREG
gamma-BHC	NA	----	NA	----	----
DDT, DDE, DDD	0.33	2/15	ND	2.1	CREG
Dieldrin	0.14	2/5	ND	0.04	CREG
Heptachlor	NA	----	NA	----	----
Toxaphene	ND	0/5	ND	----	----

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram
Source: EPA 1991a

On-Site Retention Pond Water

In 1984, Florida DEP consultants collected one surface water grab sample from the on-site retention pond (Figure 8, Appendix A) (DEP 1984). Between 1988 and 1990, EPA consultants collected two more grab samples from this pond (Figures 9 and 10, Appendix A) (EPA 1990, 1991a). There are no other on-site surface water bodies for comparison. EPA found low levels of beta-BHC in one pond water sample. Table 7 lists the maximum concentration for the selected contaminants of concern.

Due to its small size, shallow depth, variable water levels, and contaminated sediments, it is unlikely this retention pond contains fish large enough for human consumption. If it did, human fish consumption is unlikely since site access is strictly limited.

Three water samples are inadequate to characterize the extent of contamination in this retention pond. Additional water samples, however, are only representative of recent site activities since the retention pond does not typically retain stormwater for very long. Also the water quality in this pond changes depending on site activities and the amount of stormwater run-off. Exposure to contaminated ground water is more likely than exposure to

the pond water. Therefore, we do not recommend additional surface water samples, but do recommend continued sampling of the surficial aquifer monitor wells.

Table 7. Maximum Concentrations in On-Site Retention Pond Water

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	NA	---	NA	----	----
alpha-, beta-, and delta-BHC	0.58	1/2	NA	0.02	CREG
gamma-BHC	NA	---	NA	----	----
DDT, DDE, DDD	ND	0/3	NA	----	----
Dieldrin	ND	0/1	NA	----	----
Heptachlor	ND	0/1	NA	----	----
Toxaphene	ND	0/1	NA	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter
Sources: DEP 1984; EPA 1990, 1991a

On-Site Sediments

In 1984, Florida DEP consultants collected one sediment grab sample from the on-site retention pond (Figure 8, Appendix A) (DEP 1984). Between 1988 and 1990, EPA consultants collected three more sediment grab samples from the on-site retention pond (Figures 9 and 10, Appendix A)(EPA 1990, 1991a). Florida DEP and EPA found elevated levels of arsenic, DDT, DDE, DDD, and toxaphene in the on-site pond sediments. Table 8 lists the maximum concentration for the selected contaminants of concern. There are no other on-site sediments for comparison.

Although the number of sediment samples from the on-site retention pond is limited, additional samples are not necessary because the likelihood of human exposure to these sediments is low.

Table 8. Maximum Concentrations in On-Site Sediments

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive / Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	16	1/2	NA	0.4	CREG
alpha-, beta-, and delta-BHC	ND	0/3	NA	----	----
gamma-BHC	ND	0/1	NA	----	----
DDT, DDE, DDD	190	5/7	NA	2	CREG
Dieldrin	ND	0/1	NA	----	----
Heptachlor	NA	---	NA	----	----
Toxaphene	260	1/1	NA	0.6	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram
Sources: DEP 1984; EPA 1990, 1991a

On-Site Surficial Aquifer Groundwater

In 1985, at the direction of Florida DEP, Helena installed five on-site surficial aquifer monitor wells. Helena measured water levels in these wells and determined that ground water flow in the surficial aquifer is to the east, southeast, and south (Figure 11, Appendix A). Florida DEP required Helena to sample and analyze these wells quarterly, but did not require pesticide analyses (DEP 1990). As part of a 1988 investigation at the adjacent Alaric Inc. facility, Florida DEP installed two additional surficial aquifer monitor wells at Helena: MW-1 and MW-2 (Figure 12, Appendix A). Florida DEP sampled these two wells and two of the original wells (HMW-1 and HMW-5) (DEP 1988). Later in 1988, EPA consultants sampled the original five monitor wells (EPA 1990). In 1989 and 1990, EPA consultants installed two temporary surficial aquifer monitor wells and sampled these two wells and the five original monitor well (EPA 1991a) (Figure 13, Appendix A).

Florida DEP and EPA found elevated concentrations of arsenic, gamma-BHC, and toxaphene in the on-site surficial aquifer. Table 9 summarizes the maximum concentration for the selected contaminants of concern. For this preliminary assessment, these samples adequately characterize the on-site surficial aquifer ground water quality. We do, however, recommend continued sampling of these surficial aquifer monitor wells and analyses for solvents, metals, and pesticides.

Table 9. Maximum Concentrations in On-Site Surficial Aquifer Ground Water (2 to 7 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	100	3/8	ND	0.02	CREG
alpha-, beta-, and delta-BHC	1.3	8/35	ND	0.02	CREG
gamma-BHC	11	1/11	ND	0.2	LTHA
DDT, DDE, DDD	0.72	1/19	ND	0.2	CREG
Dieldrin	0.78	2/11	ND	0.002	CREG
Heptachlor	0.12	1/11	ND	0.008	CREG
Toxaphene	14	1/11	ND	0.03	CREG

NA-not analyzed; ND-not detected; µg/L-micrograms per liter
Sources: DEP 1988; EPA 1990, 1991a

On-Site Floridan Aquifer Groundwater

In 1984, Florida DEP consultants sampled ground water from the Floridan aquifer via the on-site, 500 foot deep production well (Figure 8, Appendix A) (DEP 1984). As shown in Table 10, they analyzed for pesticides and found only alpha-BHC. There are no other Floridan aquifer wells on site for comparison. Neither EPA nor Helena have determined the site-specific flow direction in the Floridan aquifer.

Lack of ground water quality data for the Floridan aquifer at this site is a significant data gap. One sample analyzed for pesticides is inadequate to characterize the extent of contamination in the Floridan aquifer. At least three monitor wells should be installed in the upper Floridan aquifer, at least 50 feet hydraulically downgradient from the Helena retention pond. An upper Floridan aquifer background monitor well hydraulically upgradient from the site should also be installed. These wells should be analyzed for solvents, metals, and pesticides. These wells are necessary to determine the extent of contamination in the upper Floridan aquifer from the retention pond. These wells should be installed so they do not create a conduit for the downward movement of contaminated ground water from the surficial aquifer. Water level measurements from these wells should be used to determine the site-specific flow direction in the upper Floridan aquifer.

Table 10. Maximum Concentrations in On-Site Floridan Aquifer Ground Water (500 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	NA	---	NA	---	---
alpha-, beta-, and delta-BHC	0.15	1/1	NA	0.02	CREG
gamma-BHC	ND	0/1	NA	---	---
DDT, DDE, DDD	ND	0/1	NA	---	---
Dieldrin	ND	0/1	NA	---	---
Heptachlor	ND	0/1	NA	---	---
Toxaphene	ND	0/1	NA	---	---

NA-not analyzed; ND-not detected; µg/L-micrograms per liter
Source: DEP 1984

B. Off-Site Contamination

For the purposes of this evaluation, "off-site" will be defined as any area outside the Helena Chemical Company property boundaries (Figure 3, Appendix A). We compiled data in this subsection from EPA and Florida DEP reports and data submitted to EPA by Wheelblast, Inc.

Off-Site Sediments

In 1988, EPA consultants collected one sediment grab sample (HC-SS-05) from the stormwater run-off path between Helena and the Tampa Bypass Canal (Figure 6, Appendix A) (EPA 1990). In 1989 and 1990, EPA consultants collected three more sediment grab samples from this stormwater run-off path and two sediment grab samples from the bypass canal near the stormwater run-off path outfall (Figure 14, Appendix A). EPA consultants also collected two background sediment samples, HC-SD-03 and HC-SD-06 (EPA 1991a). They did not collect sample HC-SD-03 far enough upstream in the bypass canal, however, to be considered representative of "background". EPA analyzed these samples for pesticides, metals, solvents, and other organic chemicals. An EPA quality control review of the analytical data indicated that some of the pesticide data are unusable.

Four samples are inadequate to determine the extent of sediment contamination in the stormwater run-off path between Helena and the Tampa Bypass Canal. The lack of adequate sediment quality data is a significant data gap. This is especially important since pesticides are of major concern at this site and some of the pesticide data for these samples are unusable. We recommend four additional sediment grab samples be collected between the retention pond and the bypass canal. These samples should be analyzed for solvents, metals, and pesticides.

Table 11. Maximum Concentrations in Off-Site Sediments

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive / Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	20	2/6	NA	0.4	CREG
alpha-, beta-, and delta-BHC	0.2	1/3	NA	0.4	CREG
gamma-BHC	ND	0/1	NA	---	----
DDT, DDE, DDD	10.6	4/17	ND	2	CREG
Dieldrin	1.7	2/3	NA	0.04	CREG
Heptachlor	ND	0/1	NA	---	----
Toxaphene	20	1/7	ND	0.6	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram
Sources: EPA 1990, 1991a

Off-Site Biota

Neither EPA nor Helena have collected or analyzed fish from the nearby Tampa Bypass Canal. If persistent and lipophilic site-related pesticides such as DDT/DDE/DDD and toxaphene were transported to the bypass canal via stormwater run-off, they could accumulate in fish eaten by sport fishermen. Since sediment sampling between the site and the bypass canal has been inadequate, we cannot estimate the probability of fish contamination. If the additional sediment samples recommended above indicate pesticide contaminated sediments have reached the bypass canal, we will recommend fish sampling and analysis.

Off-Site Surficial Aquifer Groundwater

In 1987 EPA consultants installed and sampled a temporary surficial aquifer monitor well (SC-01, depth not specified) in the northwest corner of the nearby Stauffer Chemical Company site. This well was 50 feet southeast of the Helena retention pond (Figure 15, Appendix A). EPA found low levels of alpha-BHC in this well (EPA 1988b). In 1990 Stauffer Chemical Company consultants installed a permanent surficial aquifer monitor well (MWT-1A, 4.5 to 6.5 feet deep) in the northwest corner of their property (Figure 15, Appendix A). They sampled this well twice and found elevated levels of arsenic and low levels of gamma-BHC (ERM 1991). It is important to note that Stauffer, an inactive facility recently proposed to the Superfund hazardous waste site list, handled many of the same pesticides used at Helena. EPA has not yet determined Stauffer's contribution, if any, to the ground water contamination at Helena.

In 1990 Wheelblast Inc. consultants installed and sampled five surficial aquifer ground water monitor wells (2 to 12 feet deep) on their property. Wheelblast is 50 feet south of Helena (Figure 16). In addition, they installed 18 piezometers (wells to measure water levels) and determined that ground water in the surficial aquifer flows toward the southeast from Helena. They found elevated levels of arsenic and alpha-BHC in the surficial aquifer on their property (Lynch 1991).

On November 10, 1987 Woodruff & Sons (a.k.a. Florida Mining and Materials) found low levels (20 ug/L) of total volatile organic chemicals in the ground water from a shallow well (7 feet deep) on their property east of Helena. The concentrations of benzene, chlorobenzene, ethylbenzene, toluene, xylenes, and methyl-tert-butyl ether were all below detection limits (EPC 1993). They sampled the ground water in conjunction with a buried petroleum storage tank.

In 1988 Florida DEP found trichloroethylene and tetrachloroethylene in the surficial aquifer ground water at Alaric Inc. west of Helena. This contamination does not appear to be related to the contamination at Helena.

Table 12 summarizes the maximum concentrations of the contaminants of concern in the surficial aquifer from these investigations.

Table 12. Maximum Concentrations in Off-Site Surficial Aquifer Ground Water (2 to 12 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	65	7/7	ND	0.02	CREG
alpha-, beta-, and delta-BHC	110	5/15	ND	0.02	CREG
gamma-BHC	23	2/6	ND	0.2	LTHA
DDT, DDE, DDD	ND	0/16	ND	----	----
Dieldrin	ND	0/6	ND	----	----
Heptachlor	0.85	1/7	ND	0.008	CREG
Toxaphene	ND	0/6	ND	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter
Sources: EPA 1988b; ERM 1991; Lynch 1991

Off-Site Floridan Aquifer Ground Water

In 1990 Stauffer Chemical Company consultants installed a Floridan aquifer monitor well (MWT-1B, 33 to 44 feet deep) on their property about 50 feet southeast of the Helena retention pond (Figure 15). According to their water level measurements, this well is hydraulically downgradient from Helena. They found arsenic but did not detect any pesticides associated with Helena (ERM 1991). It is important to note that Stauffer, an inactive facility recently proposed to the Superfund hazardous waste site list, handled many of the same pesticides used at Helena. EPA has not yet determined Stauffer's contribution, if any, to the ground water contamination at Helena. Table 13 lists the concentrations of the contaminants of concern in this well. One sample, however, is insufficient to determine if the arsenic and solvents originated from Helena. Further investigation is necessary to determine the direction and extent of contamination in the Floridan aquifer from Helena.

In 1988 Florida DEP found trichloroethylene and tetrachloroethylene in the Floridan aquifer ground water at Alaric Inc. west of Helena. This contamination does not appear to be related to the contamination at Helena.

As recommended in the "On-Site Floridan Aquifer Ground Water" section above, at least three monitor wells should be installed in the upper Floridan aquifer, at least 50 feet hydraulically downgradient from the Helena retention pond. A background well hydraulically upgradient from the retention pond should also be installed. These wells should be analyzed for solvents and metals, as wells as for pesticides. These wells are necessary to determine the extent of contamination in the Floridan aquifer from the retention pond. These wells should be installed so they do not create a conduit for the downward movement of contaminated ground water from the surficial aquifer. Water level measurements from these wells should be used to determine the site specific flow direction in the upper Floridan aquifer.

Table 13. Maximum Concentrations in Off-Site Floridan Aquifer Ground Water (33 to 43 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
Arsenic	210	1/1	---	0.02	CREG
alpha-, beta-, and delta-BHC	ND	0/1	---	---	---
gamma-BHC	ND	0/1	---	---	---
DDT, DDE, DDD	ND	0/1	---	---	---
Dieldrin	ND	0/1	---	---	---
Heptachlor	ND	0/1	---	---	---
Toxaphene	ND	0/1	---	---	---

ND-not detected; µg/L-micrograms per liter; Source: ERM 1991

Off-Site Private Wells

In 1989 and 1990, EPA consultants sampled four private wells within 0.25 mile of Helena (Figure 15, Appendix A). These wells are in the upper Floridan aquifer 72 to 120 feet deep. EPA found gasoline components in one well but at concentrations below levels of health concern. As shown in Table 14, they did not find any of the selected contaminants of concern (EPA 1991a).

Because of the threat of future contamination of the upper Floridan aquifer, all of the private wells within 0.25 mile hydraulically downgradient of this site should be identified and tested annually for solvents, metals, and pesticides.

Table 14. Maximum Concentrations in Off-Site Private Wells (72 to 120 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive / Total # samples	Background Concentration (µg/L)	Comparison Value (µg/L)	Comparison Value Source
Arsenic	ND	0/4	---	---	----
alpha-, beta-, and delta-BHC	ND	0/4	---	---	----
gamma-BHC	ND	0/4	---	---	----
DDT, DDE, DDD	ND	0/4	---	---	----
Dieldrin	ND	0/4	---	---	----
Heptachlor	ND	0/4	---	---	----
Toxaphene	ND	0/4	---	---	----

ND-not detected; µg/L-micrograms per liter; Source: EPA 1991a

C. Quality Assurance and Quality Control

In preparing this preliminary public health assessment, we relied on the referenced information and assumed that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn for this preliminary public health assessment are determined by the completeness and reliability of the referenced information. We assumed that estimated data (J) and presumptive data (N) were valid. This second assumption errs on the side of public health by assuming that a contaminant exists when actually it may not exist.

We requested from EPA, but did not receive, a complete data review summary package. We did, however, receive a copy of an EPA memo (EPA 1991b) explaining analytical laboratory biases of estimated chemical concentrations cited in the EPA Final Report, Expanded Site Inspection (EPA 1991a). As noted in this report, some of the pesticide soil and sediment analytical data is unusable. We did not receive quality assurance or quality control reviews of any of the other data.

D. Physical and Other Hazards

During our site visit, we did not observe any obvious physical hazards.

PATHWAYS ANALYSES

To determine whether nearby residents are exposed to contaminants migrating from the site, we evaluated the environmental and human components of exposure pathways. Exposure pathways consist of five elements: a source of contamination, transport through an environmental medium, a point of human exposure, a route of human exposure, and an exposed human population.

An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. We categorize exposure pathways that are not eliminated as either completed or potential. For completed pathways, all five elements exist and exposure to a contaminant has occurred, is occurring, or will occur. For potential pathways, at least one of the five elements is missing, but could exist. For potential pathways, exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

A. Completed Exposure Pathways

Worker Incidental Soil Ingestion Pathway

Incidental ingestion of contaminated surface soil is a completed exposure pathway (Table 15). Site workers have likely been exposed to contaminants from incidental ingestion of contaminated surface soil. Past pesticide spills are the source, surface soil the medium, on-site the point of exposure, and incidental ingestion the route of exposure. Five to ten outdoor Helena workers have likely been exposed.

Table 15. Complete Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRON-MENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Worker Soil Ingestion	Pesticide Spills	Surface Soil	On-Site	Incidental Ingestion	5 to 10 On-Site Workers	Past Present Future

Table 16. Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRON-MENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATIO N	
Child Sediment Ingestion	Pesticide Spills	Off-Site Sediments	Off-Site Stormwater Run-off Path	Incidental Ingestion	Unknown Number of Children	Past Present Future
Nearby Private Residential Wells	Pesticide Spills	Ground Water	Nearby Private Wells	Ingestion	Up to 50 Nearby Residents	Future
Fish Consumption	Past Waste Disposal	Sediment Transport	Fish in Bypass Canal	Ingestion	5-50 Fishermen Daily	Past Present Future

B. Potential Exposure Pathways

Child Incidental Sediment Ingestion Pathway

Incidental ingestion of contaminated sediments along the stormwater run-off path between the site and the Tampa Bypass Canal is a potential exposure pathway (Table 16). Children who play in the drainage way between the site and the Tampa Bypass Canal may have been exposed to site related contaminants. We classify this exposure as potential since the sediment sampling data are inadequate and we have not actually observed children playing in this area. Pesticide spills at Helena are the source and contaminated sediments transported from the site via stormwater run-off is the medium. The stormwater run-off path between the site and the Tampa Bypass Canal is the point of exposure and incidental ingestion the route of exposure. An unknown number of children may have been exposed.

Nearby Private Residential Well Pathway

Ingestion of contaminated ground water from the upper Floridan aquifer is a future potential exposure pathway (Table 16). Ground water from the Floridan aquifer is the source of drinking water for most of Hillsborough County. The surficial aquifer is not used as a source of irrigation or drinking water locally due to its limited yield. The surficial aquifer, however, is only separated from the deeper Floridan aquifer by about 15 feet of clay. The thickness of this clay and its ability to impede the movement of contaminants between these two aquifers likely varies across the site.

We classify this pathway as future potential since it may occur in the future if contaminated ground water in the surficial and Floridan aquifers reaches nearby private wells. If it does, nearby residents could be exposed to site-related contaminants. Spills at Helena are the source and ground water the transport medium. Nearby private wells are the point of exposure and ingestion the route of exposure. We estimate up to 50 nearby residents could be exposed, depending on the direction and extent of the ground water contamination.

Fish Consumption

Ingestion of pesticide-contaminated fish from the Tampa Bypass Canal is a past, current, and future potential exposure pathway (Table 16). Soil contaminated as the result of past disposal practices is the source of contamination. Stormwater run-off may have transported contaminated sediments from the site to the bypass canal. Fish in the bypass canal could accumulate DDT, DDE, DDD, toxaphene, and other persistent, lipophilic pesticides. Ingestion would be the route of exposure. We estimate that between 5 and 50 people could be exposed. We base our estimate of the exposed population on the number of people we observed fishing from the levee and bridges near Helena. We categorize this exposure pathway as potential since there are no fish analyses and the sediment analyses are inadequate to determine if contaminants from Helena have reached the Tampa Bypass Canal.

C. Eliminated Pathways

Since on-site air sampling failed to detect any pesticides, we eliminated inhalation of contaminated dust as an exposure pathway. We also eliminated surface water as an exposure pathway since there is little chance for on-site exposure to water in the retention pond and overflow is infrequent and of short duration. In addition, we eliminated ingestion of contaminated ground water from the surficial aquifer directly as an exposure pathway since the surficial aquifer is not used locally for irrigation or drinking water.

PUBLIC HEALTH IMPLICATIONS

In this section we will discuss the health effects from exposure to contaminants of concern and address specific community health concerns. For the 29 chemicals listed in Table 3, however, the animal and human health data are insufficient to allow us to determine their public health significance.

A. Toxicological Evaluation

Introduction

To evaluate possible health effects, we estimated human exposure to each of the contaminants of concern at this site. We then compared these estimates to the ATSDR Minimal Risk Levels (MRLs). An MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. ATSDR developed MRLs for contaminants commonly found at hazardous waste sites. ATSDR develops MRLs for each route of exposure, such as ingestion and inhalation, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). MRLs are contained in ATSDR toxicological profiles: chemical-specific reports containing information on health effects, environmental transport, human exposure, and regulatory status. In addition to ATSDR MRLs, we also compared our estimate of human exposure to EPA Reference Doses (RfDs) for noncancerous health effects, and EPA cancer potency factors for carcinogens.

In this section we used standard assumptions to estimate human exposure from incidental ingestion of contaminated soil and sediments, and ingestion of contaminated ground water. These standard assumptions may overestimate the actual exposure. They are unlikely to underestimate exposure and the resulting public health risk.

There are many uncertainties in estimating human exposures to chemicals in the environment. One uncertainty is the actual concentrations of chemicals that people are exposed to. In order to assess the health threat, we are forced to estimate exposures. To be protective of public health in our assessment, we use the maximum measured medium concentration (highest chemical concentration in air, soil, water, etc.) as the highest concentration people are likely

exposed to. Since we do not know the highest concentration that people may have actually been exposed to, we do not know if this over or underestimates the actual exposure.

To estimate the potential worker exposure from incidental ingestion of contaminated surface soil, we assumed: 1) adult workers outdoors at this site ingest, incidentally, an average of 100 milligrams of soil per day, 2) they weigh about 70 kilograms, 3) they have been exposed for the 25 years that Helena has owned the site, and 4) for each contaminant found in the surface soil, they ingest the maximum measured concentration.

To estimate the potential exposure to children from incidental ingestion of contaminated sediments, we assumed: 1) children play in the stormwater run-off path between Helena Chemical and the Tampa Bypass Canal an average of 1 day per week, 40 weeks per year; 2) they weigh about 15 kilograms; 3) they ingest, incidentally, an average of 30 milligrams of sediment per day (average ingestion of 200 milligrams of sediments per day times 1 day per week exposure: 200/7=30); 4) they have been exposed for 5 years; 5) for each contaminant measured in the sediments, they ingest the maximum measured concentration.

To estimate the potential exposure from ingestion of contaminated ground water, we assumed: 1) adults ingest an average of 2 liters of water per day, 2) these adults weigh about 70 kilograms, 3) in the future, these adults may be exposed for 5 years, and 4) for each contaminant measured in the ground water, they will ingest the maximum measured concentration. We selected a 5 year exposure period based on the average time between household moves in the U.S. and our estimate of the average time between private well testing in a mixed residential/commercial/industrial area.

Arsenic

Outside Helena workers may be exposed to arsenic via incidental ingestion of contaminated surface soil. Children who play in the stormwater run-off path between the site and the Tampa Bypass Canal may also be exposed via incidental ingestion of contaminated sediments. Depending on the direction and rate of flow in the Floridan aquifer, it is possible that nearby residents could be exposed in the future to arsenic via ingestion of contaminated ground water.

Although there is no ATSDR Minimal Risk Level (MRL) for arsenic, the dose we estimated from incidental ingestion of the surface soil by Helena workers is less than the EPA chronic oral Reference Dose (RfD) (ATSDR 1989b, 1991b). Therefore, we do not expect any noncancerous adverse health effects from this exposure. Although arsenic is a known human carcinogen, the surface soil concentrations at Helena are so low that there is no apparent increased risk of cancer from incidental ingestion. Likewise, the estimated daily dose of arsenic for children playing in the off-site sediments is unlikely to cause cancer or other adverse health effects.

Ingestion of arsenic at the maximum concentration found in the Floridan aquifer at this site is unlikely to cause noncancerous adverse health effects. People who used water with similar arsenic concentrations in their houses for 10 years did not suffer any gastrointestinal, circulatory, dermal, or nervous system effects (Harrington et al. 1978; Southwick et al. 1981). Ingestion of arsenic for 12 years at double the highest concentration found at this site, however, has resulted in decreased circulation in the hands and feet, a condition known as Raynaud's disease (Zaldivar 1974). If left untreated, this condition can progress to necrosis (cell death) and gangrene of the hands and feet, a condition known as Blackfoot disease (Tseng 1977, 1989). Also, continuous ingestion of arsenic contaminated water at double the highest concentration found at this site has caused gastrointestinal irritation and increased pigmentation of the skin in some populations (Cebrian et al. 1983; Tseng et al. 1968).

EPA has classified arsenic as a known human carcinogen. Long-term ingestion of Floridan aquifer ground water at the maximum arsenic concentration detected could result in a low to moderate increased risk of skin cancer. Large-scale epidemiological studies in Taiwan have shown that long-term (14 to 60 years) ingestion of arsenic at the maximum concentration found in the Floridan aquifer at this site increases the rate of skin cancer (Tseng 1977; Tseng et al. 1968; Zaldivar 1974; Zaldivar et al. 1981). This type of skin cancer usually develops from warts or corns. Although this type of skin cancer can be removed surgically, if left untreated, it can develop into painful lesions that may be fatal (Shannon and Strayer 1989).

alpha-, beta-, and delta-BHC

EPA did not detect alpha-, beta-, and delta-BHC in the surface soil at Helena. Ingestion of alpha-BHC at the concentration detected in the on-site Floridan production well is too low to cause any noncancerous adverse health effects. Although EPA found delta-BHC in one sediment sample from the stormwater run-off path between Helena and the Tampa Bypass Canal, the estimated dose for children via incidental ingestion was less than the draft ATSDR intermediate MRL (ATSDR 1989a, 1992a). We do not expect any noncancerous adverse health effects in children from incidental ingestion of sediment with this concentration of delta-BHC. Sampling of the off-site sediment, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the extent of off-site sediment contamination.

People who fish in the bypass canal near Helena may have also been exposed to alpha-, beta-, and delta-BHC in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain alpha-, beta-, or delta-BHC or the risk from eating these fish.

Although there is no evidence of alpha-, beta-, or delta-BHC causing cancer in humans, EPA has classified them as possible human carcinogens based on limited animal testing. The sediment and ground water concentrations are so low, however, that there is no apparent increased risk of cancer from these exposures.

Gamma-BHC

EPA did not detect gamma-BHC (Lindane) in the surface soil or off-site sediments at Helena. Sampling of off-site sediments, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the extent of off-site sediment contamination. Although EPA found gamma-BHC in the on-site surficial aquifer ground water, they did not detect it in the Floridan aquifer ground water.

People who fish in the bypass canal near Helena may have also been exposed to gamma-BHC in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain gamma-BHC or the risk from eating these fish.

DDT, DDE, and DDD

Florida DEP or EPA did not detect DDT, DDE, or DDD in the Floridan aquifer. Outdoor Helena workers may be exposed to DDT via incidental ingestion of contaminated surface soil. The estimated dose from incidental soil ingestion is less than both the acute and intermediate ATSDR Minimal Risk Levels (ATSDR 1989c, 1992b). Therefore, we do not expect any noncancerous health effects from these exposures.

Children who play in the stormwater run-off path between the site and the Tampa Bypass Canal may also be exposed to DDT, DDE, and DDD via incidental ingestion of contaminated sediments. Sampling of off-site sediments, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the extent of off-site sediment contamination. People who fish in the bypass canal near Helena may have also been exposed to DDT, DDE, and DDD in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain DDT, DDE, and DDD or the risk from eating these fish.

Although there is no evidence of DDT, DDE, or DDD causing cancer in humans, EPA has classified them as probable human carcinogens based on sufficient animal testing. The soil and sediment concentrations are so low, however, that there is no apparent increased risk of cancer from these exposures.

Dieldrin

Florida DEP or EPA did not detect dieldrin in the Floridan aquifer ground water. Outdoor Helena workers may be exposed to dieldrin via incidental ingestion of contaminated surface soil. The estimated dose from incidental soil ingestion, however, is less than the chronic ATSDR Minimal Risk Levels (ATSDR 1991a). Therefore, we do not expect any noncancerous health effects from these exposures.

Children who play in the stormwater run-off path between the site and the Tampa Bypass Canal may also be exposed via incidental ingestion of contaminated sediments. Sampling of

off-site sediments, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the extent of off-site sediment contamination. People who fish in the bypass canal near Helena may have also been exposed to dieldrin in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain dieldrin or the risk from eating these fish.

Although there is no evidence of dieldrin causing cancer in humans, EPA has classified them as probable human carcinogens based on sufficient animal evidence. The soil and sediment concentrations are so low, however, that there is no apparent increased risk of cancer from these exposures.

Heptachlor

EPA did not detect heptachlor in the surface soil or off-site sediments at Helena. Sampling of off-site sediments, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the extent of off-site sediment contamination. Although EPA found heptachlor in the surficial aquifer they did not detect it in the Floridan aquifer. People who fish in the bypass canal near Helena may have also been exposed to heptachlor in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain heptachlor or the risk from eating these fish.

Toxaphene

Outside workers at Helena may be exposed to toxaphene via incidental ingestion of contaminated surface soil. The estimated dose for on-site workers from incidental ingestion of contaminated soil equals the ATSDR acute Minimal Risk Level (MRL) and exceeds the intermediate MRL (ATSDR 1990). ATSDR has not designated a chronic MRL. Health effects from acute exposure (1-14 days) are unlikely, however, since the dose estimated for workers at this site is 1,000 times less than the smallest dose that caused health effects (decrease biliary excretion) in rats (Mehendale 1978). Since there are no health effects data for humans exposed to toxaphene at concentrations similar to Helena, we are uncertain of the human health effects from intermediate exposure (15-364 days) and chronic exposure (> 365 days). At toxaphene exposures 10 times higher than estimated for Helena workers, rats (exposed for 45 days) showed inferior swimming ability (Olson et al. 1980). At toxaphene exposures 100 times higher than estimated for Helena workers, dogs (exposed for two years) did not suffer any blood, circulatory system, liver, or kidney damage (Industrial Biotest 1965).

Although EPA detected toxaphene in the surficial aquifer, they did not detect it in the Floridan aquifer. Children who play in the stormwater run-off path between the site and the Tampa Bypass Canal may also be exposed via incidental ingestion of contaminated sediments. Based on the available data, the estimated dose from the incidental ingestion of off-site sediment by children is less than both the acute and intermediate ATSDR Minimal Risk Levels (ATSDR 1990). Sampling of off-site sediments, however, has been inadequate to determine the extent of contamination. Additional sampling is necessary to determine the

extent of off-site sediment contamination. People who fish in the bypass canal near Helena may have also been exposed to toxaphene in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain toxaphene or the risk from eating these fish.

Although there is no evidence of toxaphene causing cancer in humans, EPA has classified it as a probable human carcinogen based on sufficient animal evidence. Based on extrapolation from these animal tests, long term (25 years) incidental ingestion of toxaphene in the soil at Helena would result in a low to moderate increased risk of cancer for Helena workers.

B. Health Outcome Data Evaluation

We did not evaluate community health outcome data for two reasons. First, Helena workers are the only population currently at risk from exposure to site-related contaminants of concern. Investigation of industrial worker health is the responsibility of the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH). We will recommend OSHA or NIOSH consider medical evaluation and/or medical monitoring of Helena workers. Second, the available environmental data indicate that nearby residents are not currently exposed to concentrations of site-related contaminants likely to cause adverse health effects. Although former residents may have been exposed to higher concentrations of chemicals, this area was sparsely populated in the 1940s and 1950s. It is unlikely a search of state-wide health outcome data would detect an effect in such a small group. Therefore, there is little justification or community demand for an evaluation of health outcome data at this time. If future environmental investigations find other contaminants we will evaluate the appropriate health outcome data.

C. Community Health Concerns Evaluation

We address community health concerns as follows:

1. One person was concerned that their private well is contaminated.

Although it is unlikely that contaminants from Helena have contaminated this person's well, we referred them to the Hillsborough County Public Health Unit for testing.

2. One person was concerned that their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

Since this person's well was between 0.5 and 0.75 mile hydraulically upgradient from Helena, it is unlikely that contaminants from Helena contaminated their well.

3. One person was concerned that health problems in their family were caused by exposure to pesticides and other chemicals from the Flag Sulphur Company (now Helena Chemical Company). Their family lived within 0.25 mile of this site during the 1940s and 1950s. This person reported contaminated dust from the site frequently covering their house and children of this family played in the contaminated run-off from the site. This person reported nausea, headaches, and burning sensation of the eyes and nose when the facility "cooked" or after a tank exploded. This person reported their father worked at the site in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include Grave's disease; difficulty in conceiving and spontaneous abortions; asthma; hiatal hernia; impaired circulation; and kidney problems.

It is likely that people living near this site in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. The causes of periarteritis nodosa and Graves' disease are unknown. Although the literature suggests an association between infertility and exposure to high levels of arsenic, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link the reported infertility with exposure to arsenic. It is possible that the reported asthma attacks, nausea, headaches, and a burning sensation of the eyes and nose could have all been caused or made worse by chemicals used at this site. But again, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link these health effects to chemicals from Flag Sulphur or Helena. The following is a more detailed discussion of all of these health effects and possible causes.

Nausea, headaches, and burning sensation of the eyes and nose can be caused by any number of chemicals including, but not limited to, chemicals used at Flag Sulphur or Helena. Although emissions from Flag Sulphur are a possible source, without air sampling data from the 1940s and 1950s, we cannot definitely link these health effects to chemicals from this site.

The cause of periarteritis nodosa, also known as polyarteritis nodosa (PAN) or Kussmaul's disease, is not known. Since its cause is not known, we do not know what, if any, association there is with exposure to the chemicals used at this site. Although some of the pesticides found at Helena can cause nervous system effects such as headaches, dizziness, muscle twitching, tremors, convulsions, and seizures, their association with polyarteritis nodosa (PAN), if any, is unknown. PAN is characterized by inflammation and necrosis (deterioration) of small and medium sized arteries. PAN is an uncommon, but not a rare disease. It is twice as common in males as females. The mean age at onset is 45 years. PAN is characterized by various symptoms depending on which organ the artery damage is most severe. Nonspecific signs and symptoms are the hallmark of classic PAN. Fever, weight loss, and malaise are present in over one-half of cases. Patients usually have vague

symptoms such as weakness, malaise, headache, stiff and painful joints (arthritis), and muscle pain. The kidneys are often affected resulting in high blood pressure (hypertension) and kidney failure. The gastrointestinal tract may also be affected resulting in abdominal pain, nausea, vomiting, and bleeding. The nervous system, skin, and heart may also be affected. If left untreated PAN usually results in death from kidney failure, bowel perforations, or heart failure (Wilson et al 1991).

The cause of Graves' disease is unknown. Since the cause of Graves' disease is not known, we do not known what, if any, association there is with exposure to the chemicals used at this site. Results from studies with rats and dogs given the site-related pesticide toxaphene in their food suggests that prolonged exposure may induce thyroid injury (Chu et al. 1986; 1988; NCI 1977). We do not know, however, if exposure to toxaphene or other site-related chemicals is associated with Graves' disease in humans. Graves' disease is characterized by an overactive and chronically enlarged (hyperplastic) thyroid gland. This condition is also known as a diffuse toxic goiter. An overactive thyroid (hyperthyroidism) releases too much of the thyroid hormone, thyroxine, in to the blood stream. This in turn causes excessive nervousness, excitability, tremors, and inability to sleep; excessive sweating and heat intolerance; increased heart rate and blood pressure; and frequent bowel movements and weight loss. Graves' disease is sometimes accompanied by bulging of the eyes (exophthalmos). In view of the varied manifestations of Graves' disease and their differing courses, it is possible that no single factor is responsible for the entire syndrome. Graves' disease is a relatively common disorder that occurs at any age but is especially common in the third and fourth decade. It is more frequent in women than men. Genetic factors play an important role; there is a distinct familial predisposition to Graves' disease (Wilson et al 1991).

Although there is evidence that one contaminant found at Helena, arsenic, can interfere with normal pregnancy, there is no environmental data from the 1940s or 1950s on which to a estimate exposure. Without this information, we cannot link arsenic exposures in the 1940s and 1950s to infertility in the 1970s and 1980s. Concentrations of arsenic at Helena now are not likely to interfere with a normal pregnancy. Difficulty in conceiving or infertility is defined as the failure to become pregnant after 1 year of unprotected intercourse. Infertility affects 10 to 15% of all couples. Male infertility is responsible for 40% of infertile couples. In women, tubal disease and endometriosis is responsible for 50% of the cases of female infertility, failure to ovulate for 30% of the cases, and a cervical factor for 10%. No cause is known for 10% of the infertile women (Wilson et al 1991). There are several human epidemiological studies that have reported an association between exposure to inorganic arsenic and increased risk of adverse reproductive effects (birth defects, low birth weight, and spontaneous abortion), both by inhalation (Nordstrom et al. 1978a, 1978b, 1979a, 1979b) and by ingestion (Aschengrau et al. 1989; Zierler et al. 1988). However, in all of these studies the populations were exposed to a number of other chemical and risk factors which may have contributed to the observed effects, and

these studies provide only suggestive evidence that arsenic was the cause. Studies with mice, rats, and hamsters also suggest that arsenic is toxic to the developing fetus, but only at levels that are also toxic to the pregnant female (ATSDR 1991b).

It is possible that inhalation of sulphur compounds from Helena in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with reported cases of asthma. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al 1991).

There is no known association of hiatal hernias with chemical exposure. A hiatal hernia is a protrusion of part of the stomach through the opening where the esophagus passes through the diaphragm. It is usually caused by a weakening of the attachment between the esophagus and the diaphragm. The incidence of hiatal hernias increase with age to about 60% of the population by age 60 years. Hiatal hernias by themselves usually do not cause any clinical symptoms (Wilson et al 1991).

The report of impaired circulation and kidney problems is not specific enough to assess. We were unsuccessful in obtaining more details about this complaint.

4. One person was concerned that their fibromyalgia was caused by pesticide exposure. This person forwarded a copy of the laboratory analysis of their blood for chlorinated pesticides, trimellitic anhydride, isocyanate, and formaldehyde exposure. This person's family also lived within 0.25 mile of the site during the 1940s and 1950s and reported breathing contaminated dust and playing as a child in the contaminated run-off.

It is likely that people living near this site in the 1940s and 1950s were exposure to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between fibromyalgia and site-related chemicals. Since the cause of fibromyalgia is not known, we do not know what, if any, association there is with exposure to the chemicals used at Flag Sulphur or Helena.

An analysis of this person's blood found the pesticide DDE at a concentration of 13.7 nanograms per milliliter (ng/ml). This value is 3 times the laboratory reported average. Since the biological half-lives for elimination of the DDT family members are: DDE>DDT>DDD; the low ratio of DDT and DDD to DDE in this person's blood indicates a past, as opposed to a recent, exposure. Unfortunately, there is not enough information to quantitatively correlate blood levels of DDT, DDD, or DDE with levels in the environment or with toxic effects (ATSDR 1989c).

An analysis of this person's blood also found the pesticide beta-BHC at a concentration of 0.6 nanograms per milliliter (ng/ml) or parts per billion (ppb). Blood levels of beta-BHC have been found to reflect both the intensity and duration of exposure. Studies of pesticide production workers found that blood levels increase at a uniform rate for every year of exposure (Baumann et al. 1980). Other studies have found elevated blood levels of beta-BHC 10 to 15 years after the last exposure (Morgan 1978). Although it is apparent that this person has been exposed to beta-BHC, it is difficult to estimate their exposure based on pesticide production workers with blood concentrations 30 to 600 times higher. Nigam et al. (1986) and Kashyap (1986) documented complaints of paraesthesia of the face and extremities, headache, giddiness, malaise, vomiting, tremors, apprehension, confusion, loss of sleep, impaired memory, and loss of libido in pesticide production workers with concentrations of 0.07 to 0.72 parts per million (ppm) of beta-BHC in their blood. These blood levels, however, are about 100 to 1000 times higher than the levels in this person's blood (0.0006 ppm). We do not know if the levels of beta-BHC in this person's blood could cause any or all of these same health effects.

The pesticides heptachlor epoxide, oxychlordane, and trans-nonachlor were also found in this person's blood at levels above the laboratory reported average. Detection of oxychlordane and trans-nonachlor indicates they have been exposed to chlordane. They may have also been exposed to heptachlor since heptachlor epoxide is a breakdown product of both chlordane and heptachlor. Unfortunately, there is no information to quantitatively correlate the blood levels of these pesticides with levels in the environment or with toxic effects (ATSDR 1991c).

The reported antibody assay of this person's blood was inconclusive for exposure to trimellitic anhydride and isocyanate, but positive for exposure to formaldehyde. We do not believe that exposure to trimellitic anhydride, isocyanate, or formaldehyde, however, is related to Helena.

The cause of fibromyalgia is not known. Fibromyalgia, also known as fibrositis, is a common disorder characterized by musculoskeletal pain, stiffness, and easy fatigue. It affects mostly women between the ages of 25 and 45 years. Symptoms include generalized muscle pain and weakness, and generalized aching and stiffness of the trunk, hip and shoulders. Patients complain of waking up frequently at night, having trouble falling back to sleep, waking up tired, and feeling exhausted. Symptoms are

made worse by stress or anxiety, cold, damp weather, and overexertion. Disorders commonly associated with fibromyalgia include irritable bowel syndrome, irritable bladder, headaches, and difficult or painful menstruation. Fibromyalgia is characterized by tender sites on the back and along the spine which are extremely more painful to the touch than adjacent areas (Wilson et al 1991).

5. One person was concerned that their family's health problems (lung, kidney, and bladder) are related to living in this area during the 1940s and 1950s.

It is likely that people living in this area in the 1940s and 1950s were exposure to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. It is possible that inhalation of sulphur compounds from Flag Sulfur Company in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with the reported lung problems. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al 1991).

Without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link kidney or bladder problems to chemicals from the Flag Sulfur Company.

CONCLUSIONS

Based on the lack of adequate sampling data for all of the contaminated media, we classify this site as an indeterminate public health hazard.

1. There are no hazardous waste warning signs around this site. Although this site is fenced, Florida law (Statutes 403.704 and 403.7255) requires warning signs at all Superfund hazardous waste sites. Specific details of this requirement are contained in Florida DEP Rule 17-736.

2. Incidental ingestion of toxaphene contaminated surface soil by five to ten outdoor Helena workers is a completed exposure pathway likely to result in a low to moderate increased risk of cancer.

3. Incidental ingestion of contaminated sediments along the stormwater run-off path between the site and the Tampa Bypass Canal is a potential exposure pathway. Children who play in this stormwater run-off path may have been exposed to site related contaminants. Four samples are inadequate to determine the extent of sediment contamination in this stormwater run-off path, especially since some of the pesticide data for these samples are unusable. The lack of adequate off-site sediment quality data is a significant data gap.

4. Ingestion of pesticide-contaminated fish from the Tampa Bypass Canal is a potential exposure pathway. We categorize this exposure pathway as potential since there are no fish sampling data and the sediment sampling data are inadequate to determine if contaminated sediments from Helena have reached the Tampa Bypass Canal.

5. Quarterly monitoring of the on-site surficial aquifer has been inadequate due to the lack of pesticide analyses.

6. The existing data are inadequate to determine ground water flow direction in the upper Floridan aquifer below this site.

7. One sample analyzed for pesticides is inadequate to characterize the extent of contamination in the Floridan aquifer under this site. The lack of adequate ground water quality data for the Floridan aquifer at this site is a significant data gap. Additional Floridan aquifer monitor wells are necessary to determine the extent of contamination under this site.

8. Ingestion of contaminated ground water from the upper Floridan aquifer near this site is a future potential exposure pathway. Ground water from the Floridan aquifer is the source of drinking water for most of Hillsborough County. The surficial aquifer is not used as a source of irrigation or drinking water locally due to its limited yield. Ground water in the upper Floridan aquifer, 50 feet from the Helena retention pond, is

contaminated with arsenic. Long-term ingestion of arsenic at the maximum concentration detected would cause a low to moderate increased risk of skin cancer. At least four houses within 0.25 mile of this site use ground water from the upper Floridan aquifer for drinking. Although these wells have been tested and found to be free of contamination, they may become contaminated in the future. A more accurate survey of private wells in this area is needed.

9. Twenty-nine chemicals found in various media at this site lack enough toxicological data to determine their public health significance.

RECOMMENDATIONS

Cease/Reduce Exposure Recommendations

1. Post hazardous waste warning signs around this site as required by Florida Statutes 403.704 and 403.7255 and Florida DEP Rule 17-736. To warn the public of the existence of hazardous waste at this site, Helena should post hazardous waste warning signs that comply with the requirements of Florida DEP Rule 17-736.

2. Reduce worker exposure to toxaphene contaminated soil. Helena should reduce worker exposure to toxaphene contaminated soil. The Occupational Safety and Health Administration or the National Institute for Occupational Safety and Health should consider medical evaluation and/or monitoring of Helena workers.

Site Characterization Recommendations

3. Collect four additional sediment grab samples from the stormwater run-off path between the site and the Tampa Bypass Canal and analyze for solvents, metals, and pesticides.

4. If additional sediment samples from the stormwater run-off path between the site and the Tampa Bypass Canal indicate that pesticide contamination has reached the canal, Helena should collect and analyze 5-10 fish samples from the canal. Helena should collect these fish samples between the spillway downstream of the site (S-160), and the spillway upstream of the site (S-162). These fish should be of the kind and size that people catch and eat. They should analyze these fish samples for pesticides.

5. Require Helena to analyze ground water samples from the existing surficial aquifer monitor wells quarterly for pesticides. Florida DEP should add pesticides to the list of contaminants they require Helena to analyze for quarterly in samples from the existing surficial aquifer monitor wells.

6. Determine the site specific direction of ground water flow in the upper Floridan aquifer below this site.

7. Install at least three monitor wells in the upper Floridan aquifer, at least 50 feet hydraulically downgradient from the Helena retention pond. Also install an upper Floridan aquifer background monitor well hydraulically upgradient from the site. Analyze these wells for solvents and metals, as wells as for pesticides. Install these wells so they do not create a conduit for the downward movement of contaminated ground water from the surficial aquifer.

8. Identify and sample annually all of the private wells within 0.25 mile hydraulically downgradient of Helena. Analyze for solvents, metals, and pesticides.

Health Activities Recommendation Panel (HARP) Recommendations

The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended, requires ATSDR to perform public actions needed at hazardous waste sites. To determine if public health actions are needed, ATSDR's Health Activities Recommendation Panel (HARP) has evaluated the data and information developed in this preliminary public health assessment.

Since the available information indicates that adverse health effects are likely for on-site workers, HARP determined that the appropriate occupational health agency should consider worker education and medical evaluation/monitoring. HARP also determined that the ATSDR Division of Toxicology should consider substance-specific research for those site contaminants in completed exposure pathways that lack sufficient toxicological data.

If information becomes available indicating exposure at levels of concern, ATSDR will evaluate that information to determine what actions, if any, are necessary.

PUBLIC HEALTH ACTIONS

This section describes what ATSDR and/or Florida HRS will do at Helena after the completion of this preliminary public health assessment report. The purpose of a Public Health Action Plan is to ensure that any existing health hazards are reduced and any future health hazards are prevented. ATSDR and/or Florida HRS will do the following:

1. ATSDR and/or Florida HRS will recommend that the Occupational Safety and Health Administration or the National Institute for Occupational Safety and Health consider a medical evaluation and/or monitoring of Helena workers.

2. ATSDR, Division of Toxicology, will provide appropriate toxicological information for chemicals listed in Table 3 which are found in completed pathways.

3. ATSDR and/or Florida HRS will reevaluate this preliminary public health assessment when new environmental, toxicological, or health outcome data are available.

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CERTIFICATION

This Helena Chemical Company preliminary public health assessment was prepared by the Florida Department of Health and Rehabilitative Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the preliminary public health assessment was begun.

Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this preliminary public health assessment, and concurs with its findings.

Director, DHAC, ATSDR

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APPENDIX A: FIGURES

Figure 1. Map of Florida

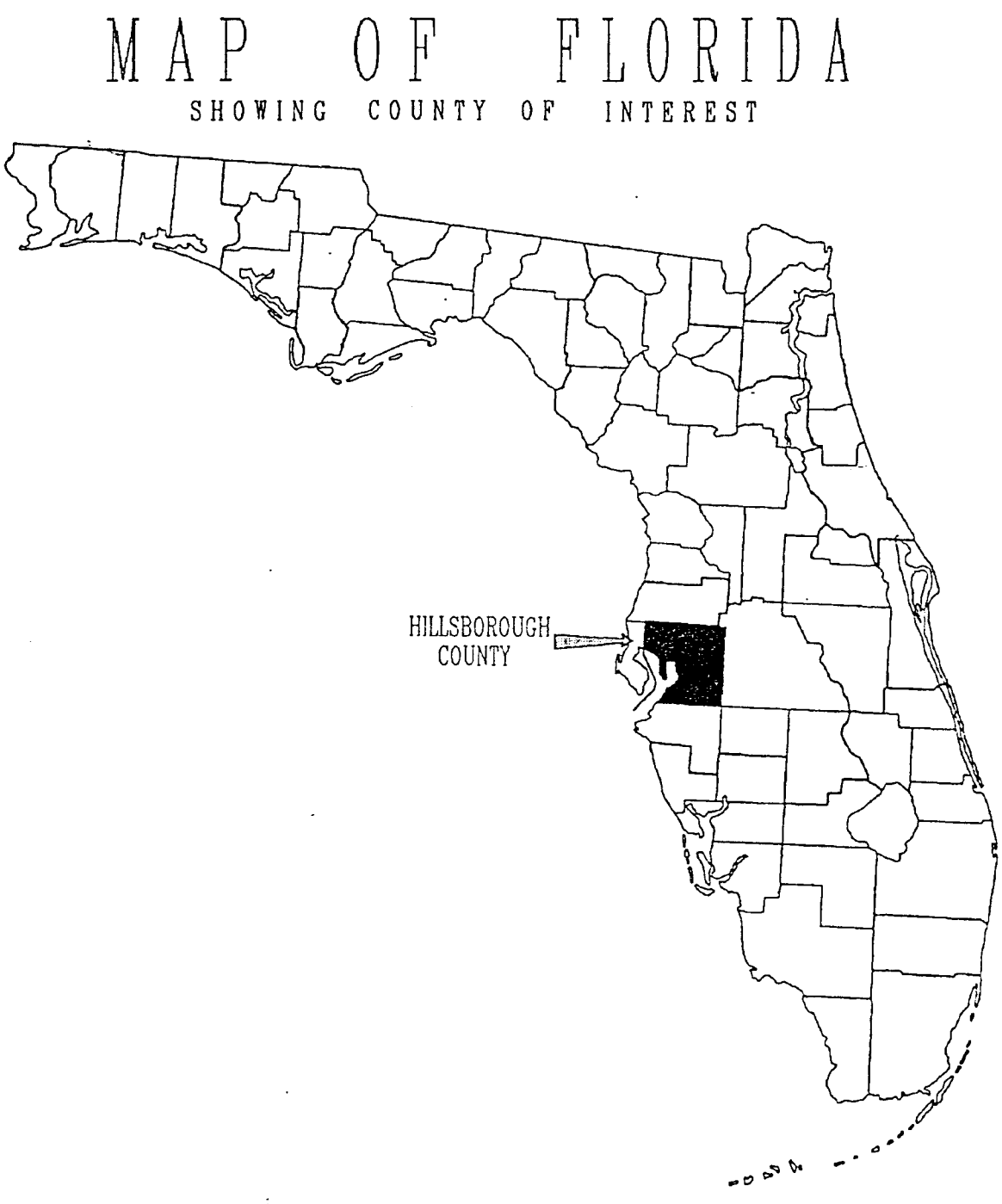
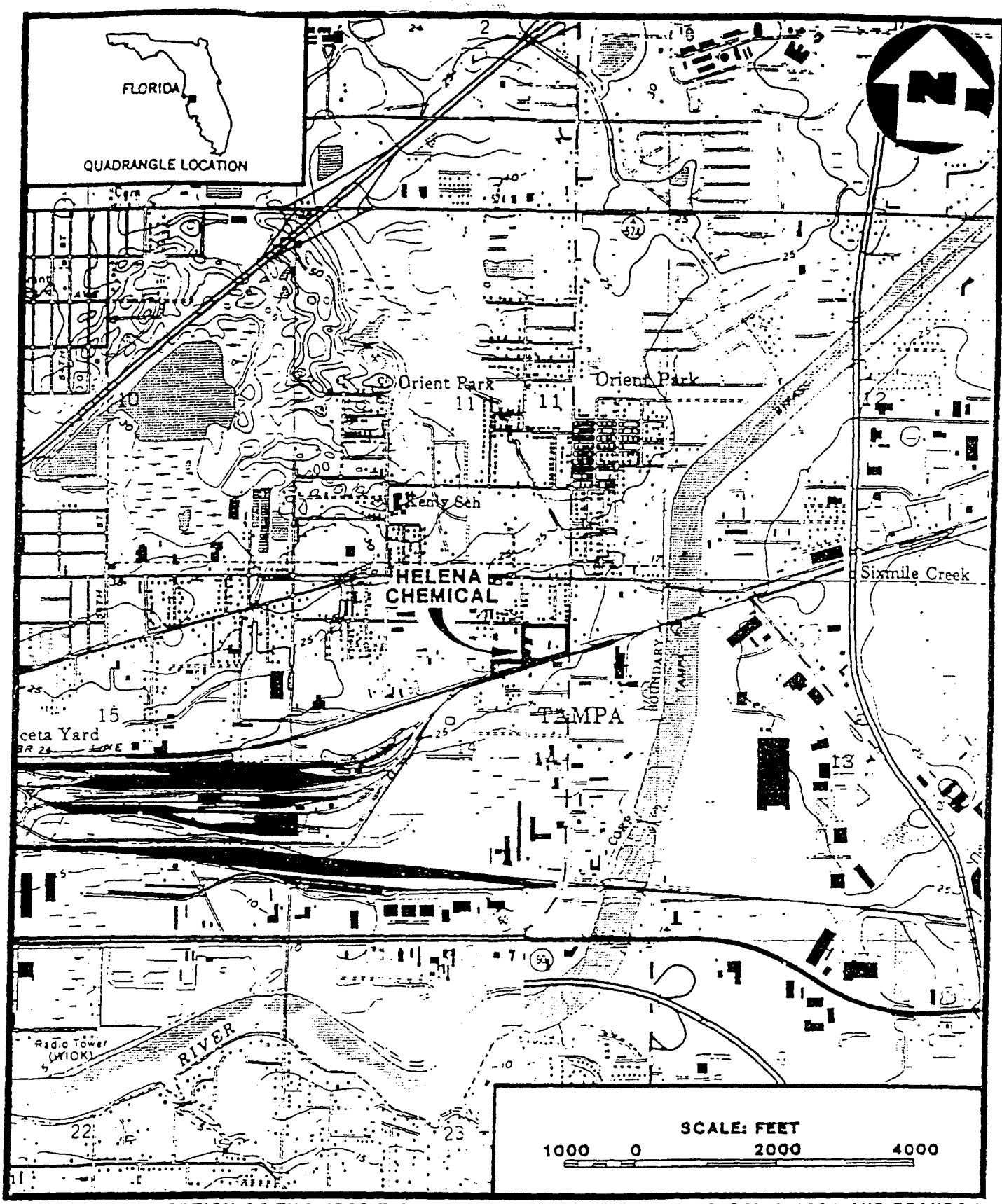


Figure 2. Area Map

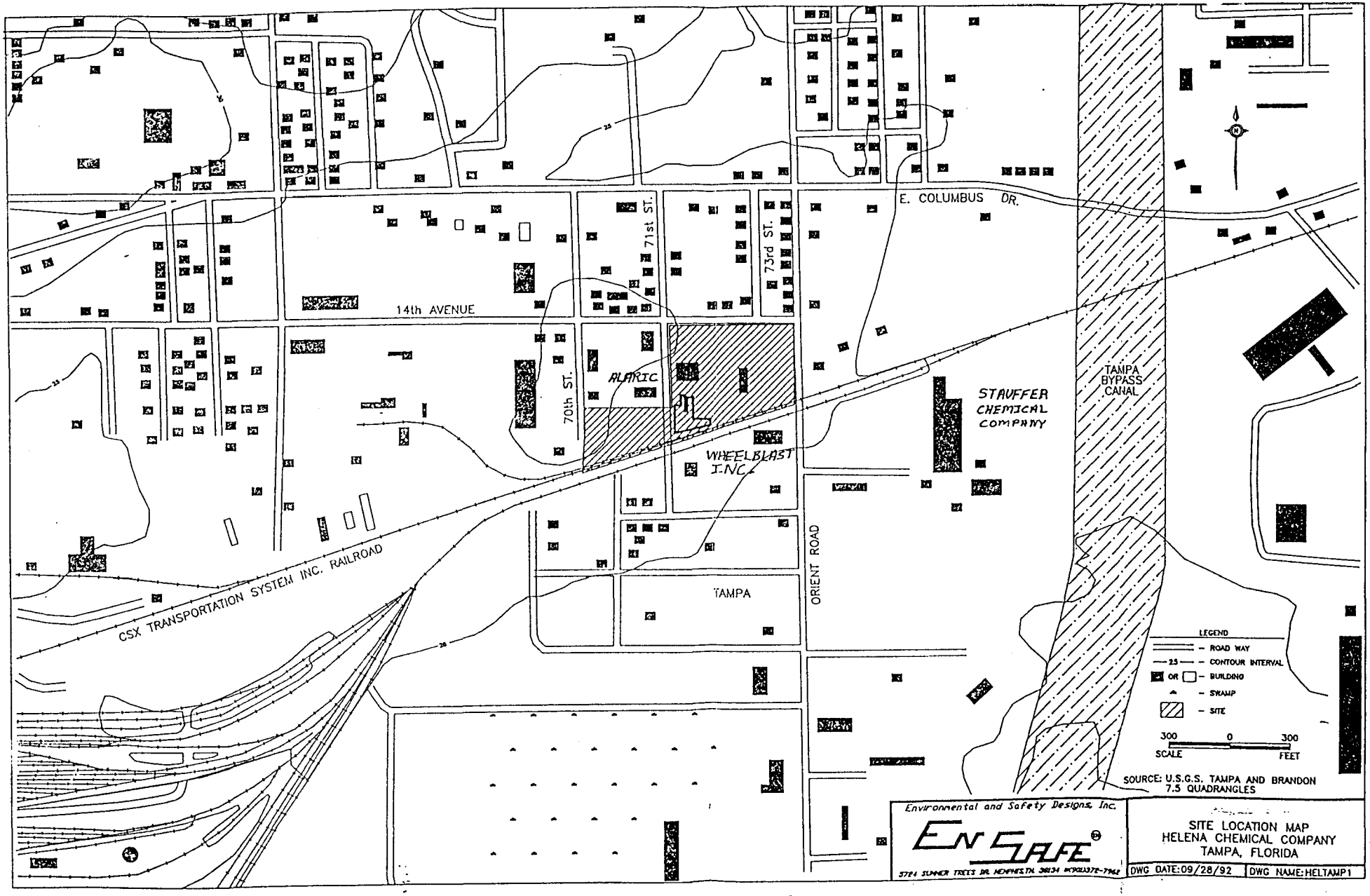


BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE TAMPA, FLORIDA 1981 AND BRANDON, FLORIDA 1987.

SITE LOCATION MAP
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

Fig 3. Site Location Map



A-3

Figure 4. Site Vicinity Map

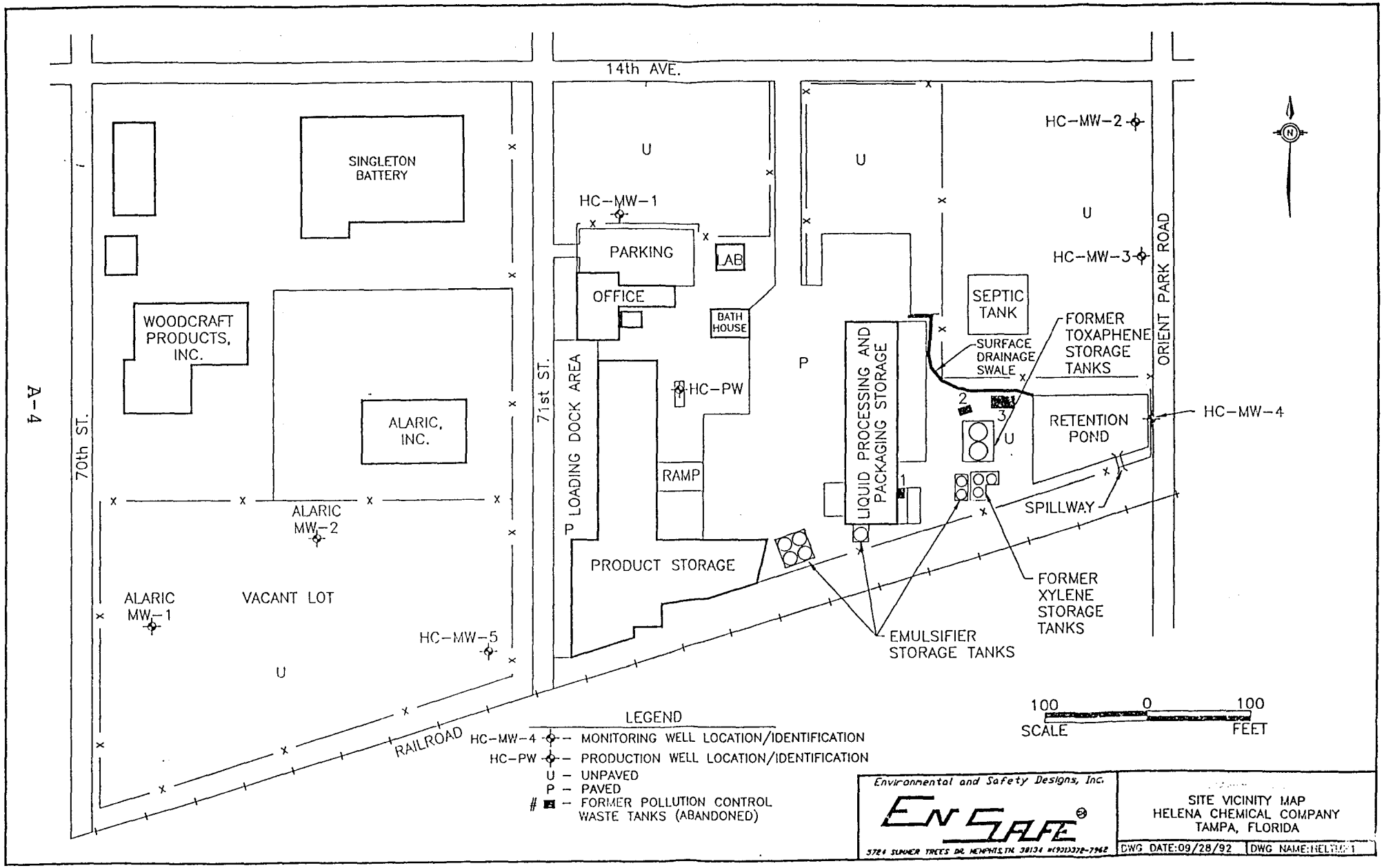
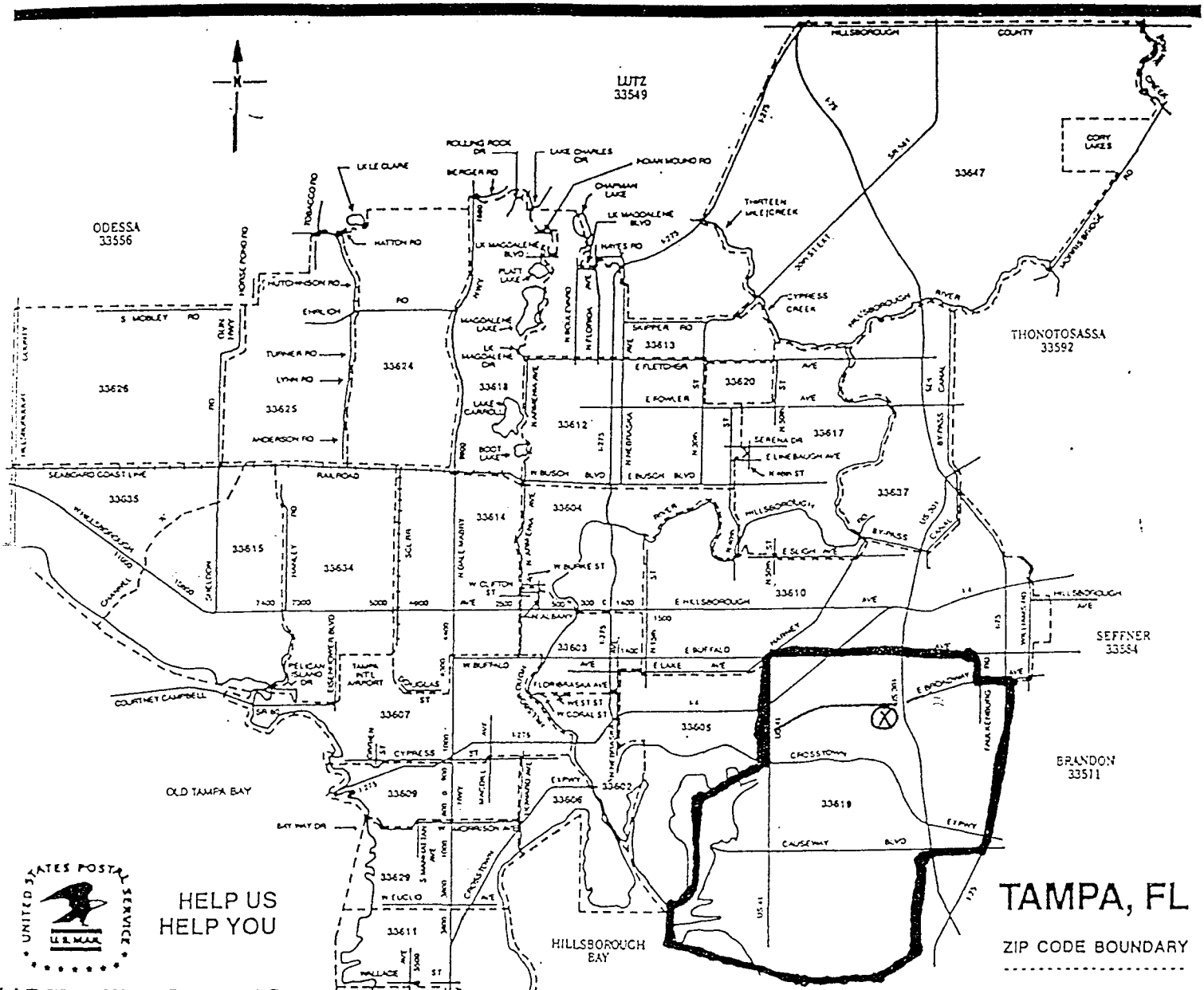


Figure 5. ZIP Code Map

Your Pager™

ZIP CODE MAP



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TAMPA POST OFFICE BOXES

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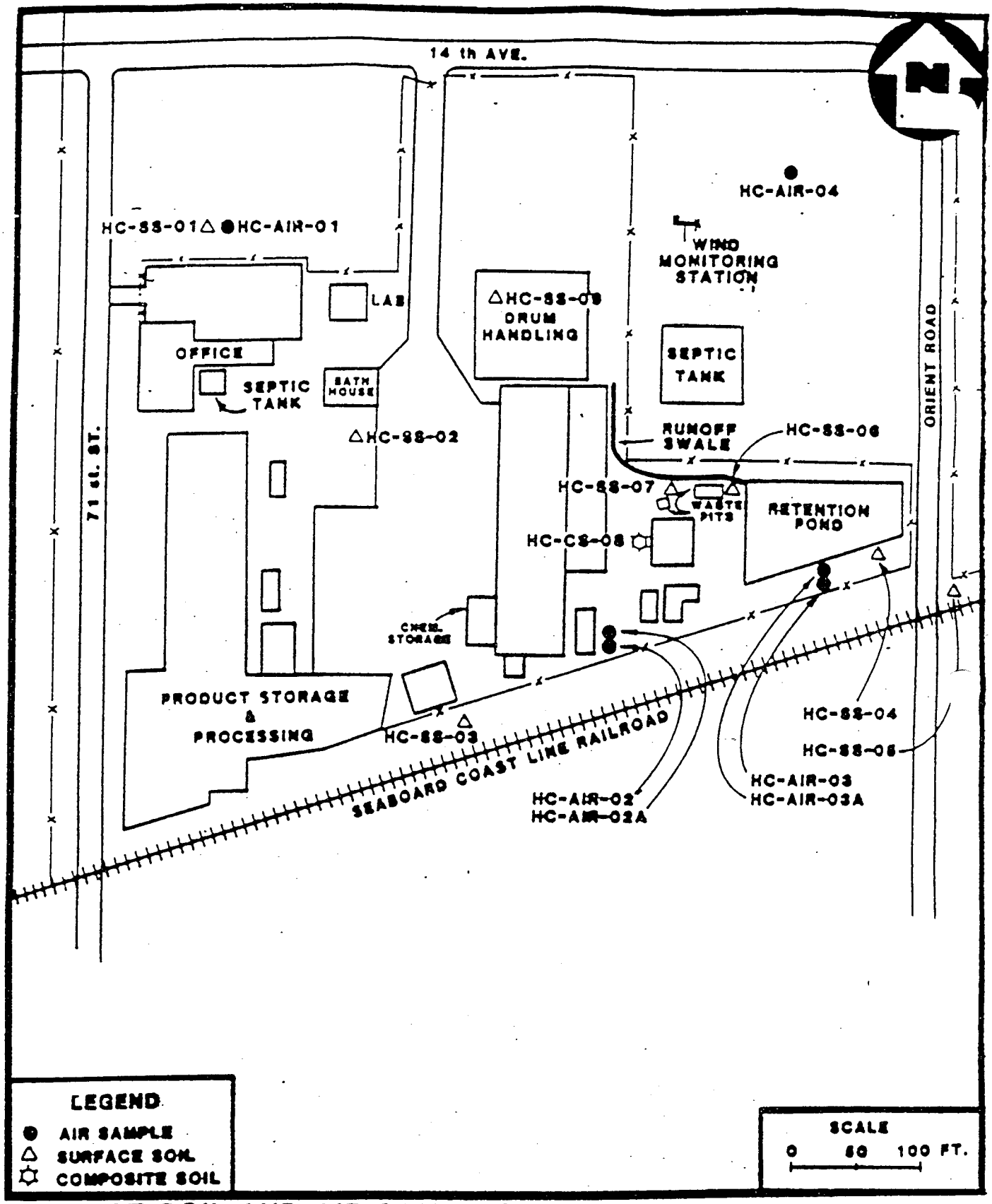
1-3999	Downtown	33601	151000-153198	Hilldale	33684
72001-72416	Downtown	33602	16001-16999	Temple Terrace	33687
172001-173736	Commerce	33672	290001-291589	Temple Terrace	33687
4001-4998	West Tampa	33677	17001-17994	Forest Hills	33682
5001-5998	Ybor City	33675	82001-82998	Forest Hills	33682
75001-76919	Ybor City	33675	280001-280598	Forest Hills	33682
6001-6844	MacDill AFB Branch	33608	19001-19538	Port Tampa City	33685
7000-7944	Seminole Heights	33673	20001-22997	Main Office	33622
8001-9800	Sulphur Springs	33674	23001-24994	Main Office	33623
10001-10944	Peninsula	33679	25001-25982	Main Office	33622
18001-18998	Peninsula	33679	26001-27996	Main Office	33623
320001-320956	Peninsula	33679	30000-30999	Main Office	33630
11001-11994	Produce	33680	31000-31999	Main Office	33631
310001-310999	Produce	33680	260061-263724	Town N Country	33685
13001-13999	Interbay	33681	270001-273675	Carrollwood	33688
130001-130540	Interbay	33681	340001-340617	Northdale Contract	33694
14151-14508	Palma Ceia Contract	33690	350001-350474	East Fletcher Contract	33695
79001-79300	Broadway Contract	33619	360001-360448	Seminole Heights	33673
15001-15999	Hilldale	33684	370001-370181	Bearss Plaza Contract	33697

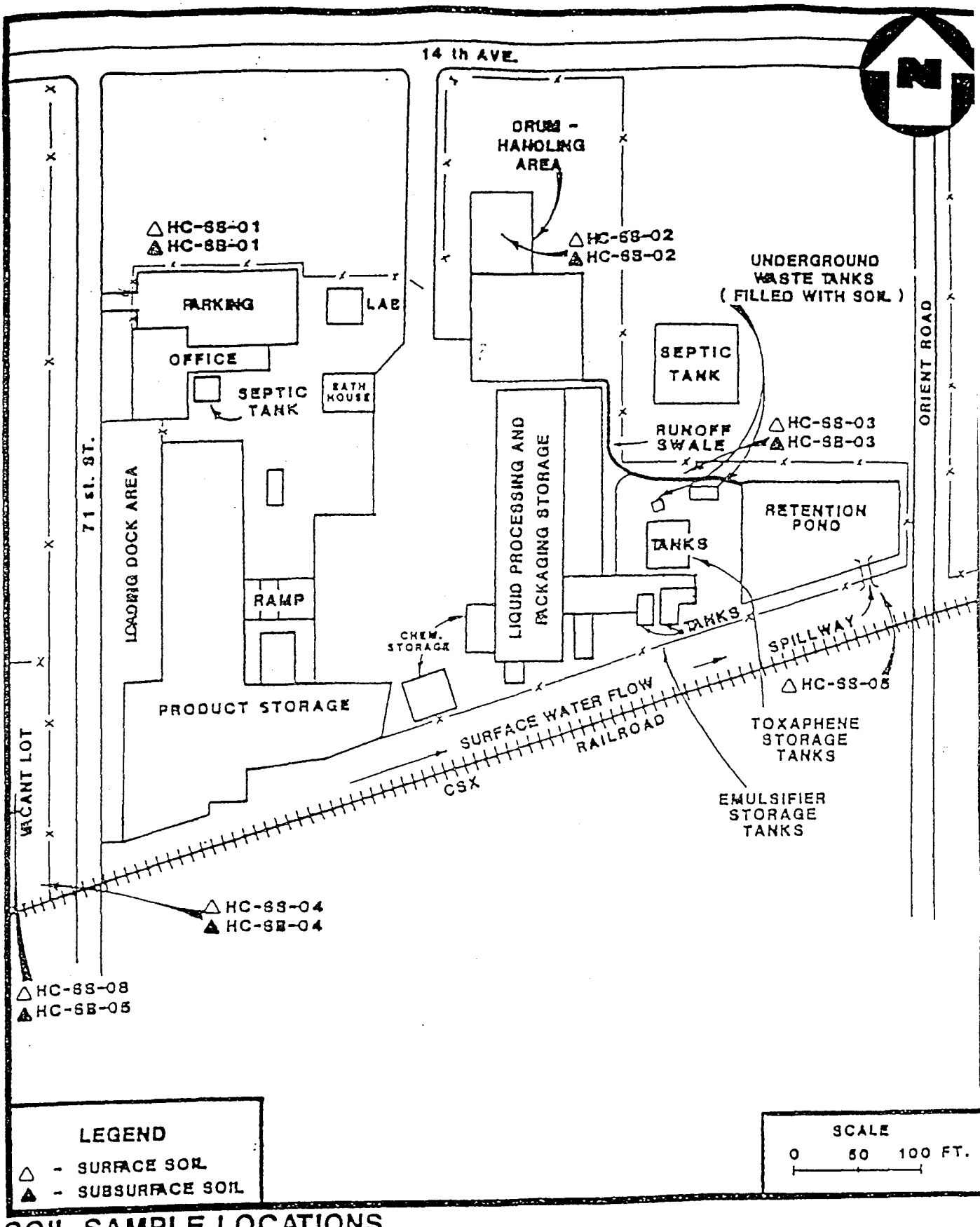
Figure 6. Surface Soil and Air Sample Locations



SURFACE SOIL AND AIR SAMPLES
HELENA CHEMICAL COMPANY
TAMPA, FLORIDA

NUS CORPORATION

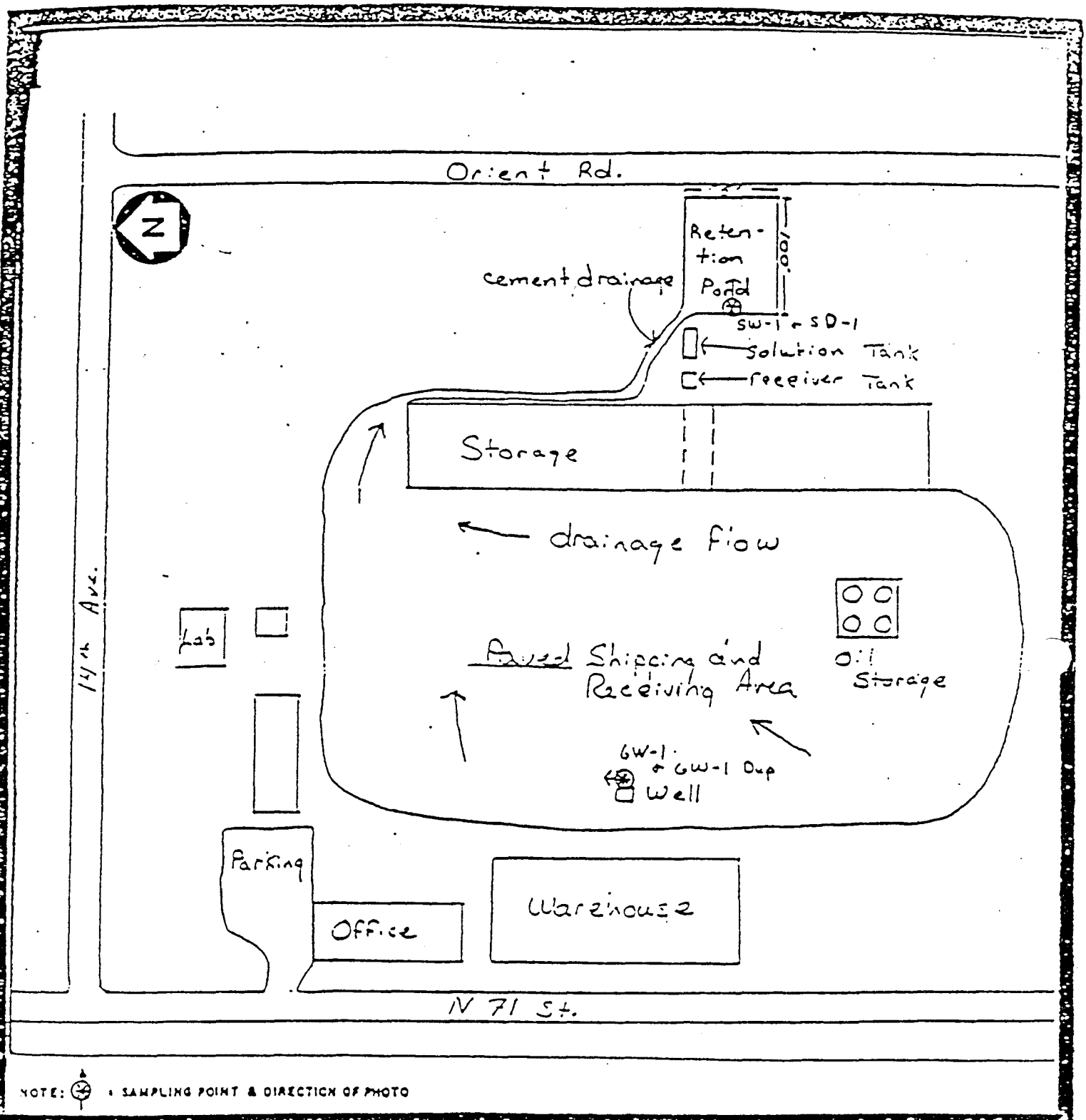
Figure 7. Soil Sample Locations



SOIL SAMPLE LOCATIONS
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

Figure 8. Sample Locations



KEY - SAMPLE TYPE

GW GROUNDWATER
SW SURFACE WATER
SL SOIL
SD SEDIMENT
LW LIQUID WASTE

SKETCH OF AREA INVESTIGATED

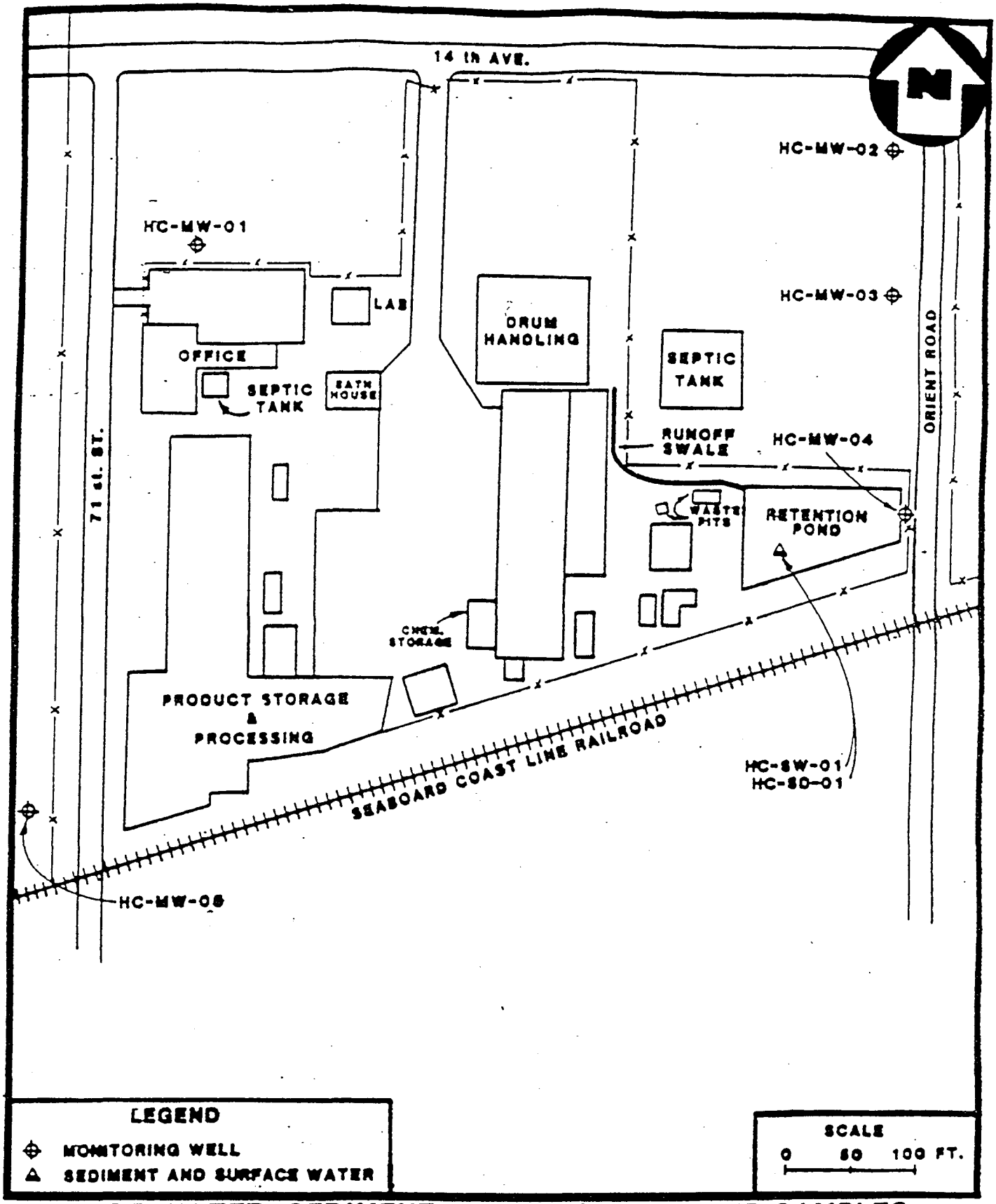
SITE: HELENA CHEMICAL

DATE SAMPLED: 8/14/94

APPROX. AREA OF SITE: 8 ACRES

E.C. JORDAN CO.

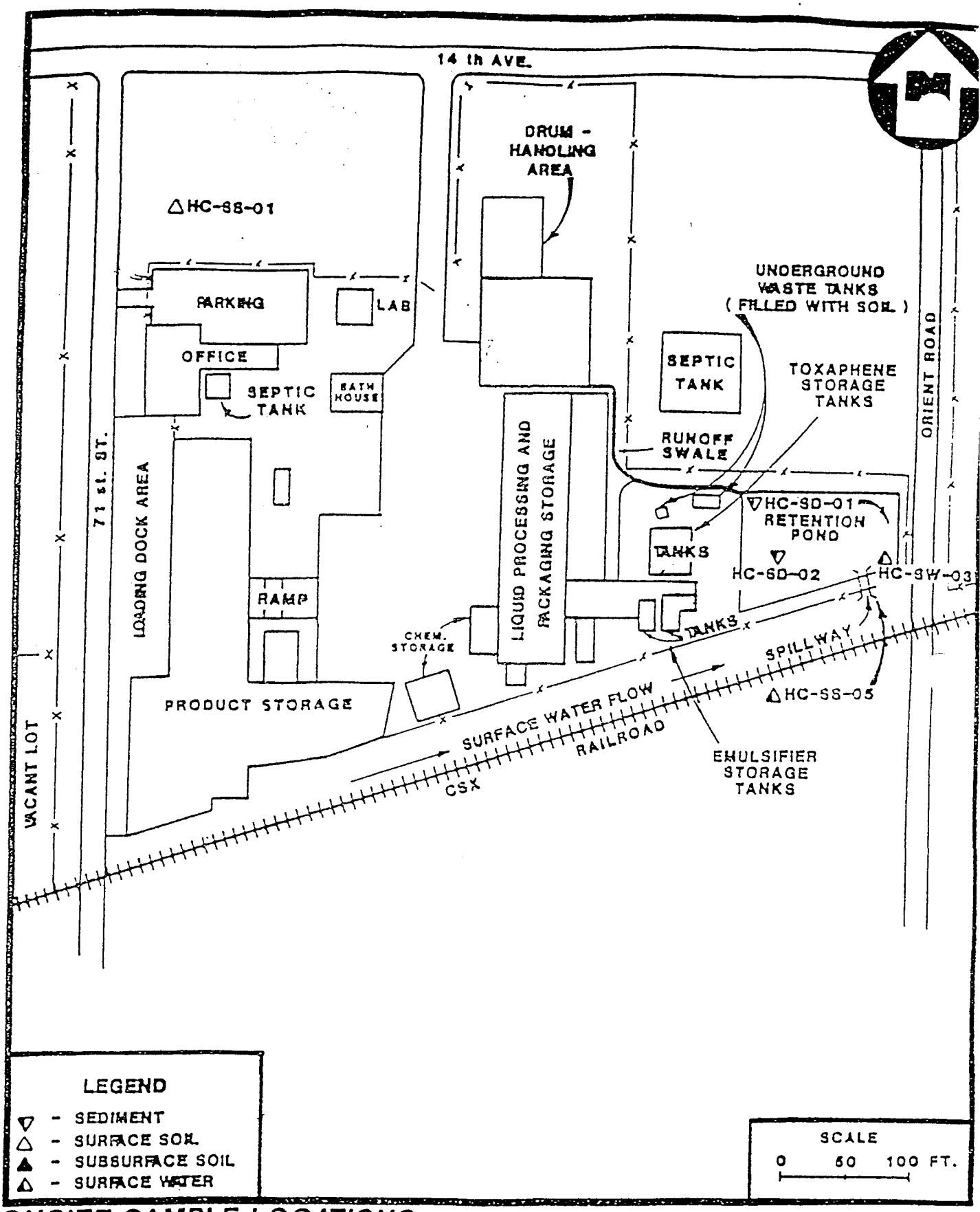
Figure 9. Surface Water, Sediment, and Ground Water Sample Locations



SURFACE WATER, SEDIMENT, AND GROUNDWATER SAMPLES
HELENA CHEMICAL COMPANY
TAMPA, FLORIDA

NUS CORPORATION

Figure 10. On-Site Surface Water Pathway Sample Locations



ONSITE SAMPLE LOCATIONS
SURFACE WATER PATHWAY
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

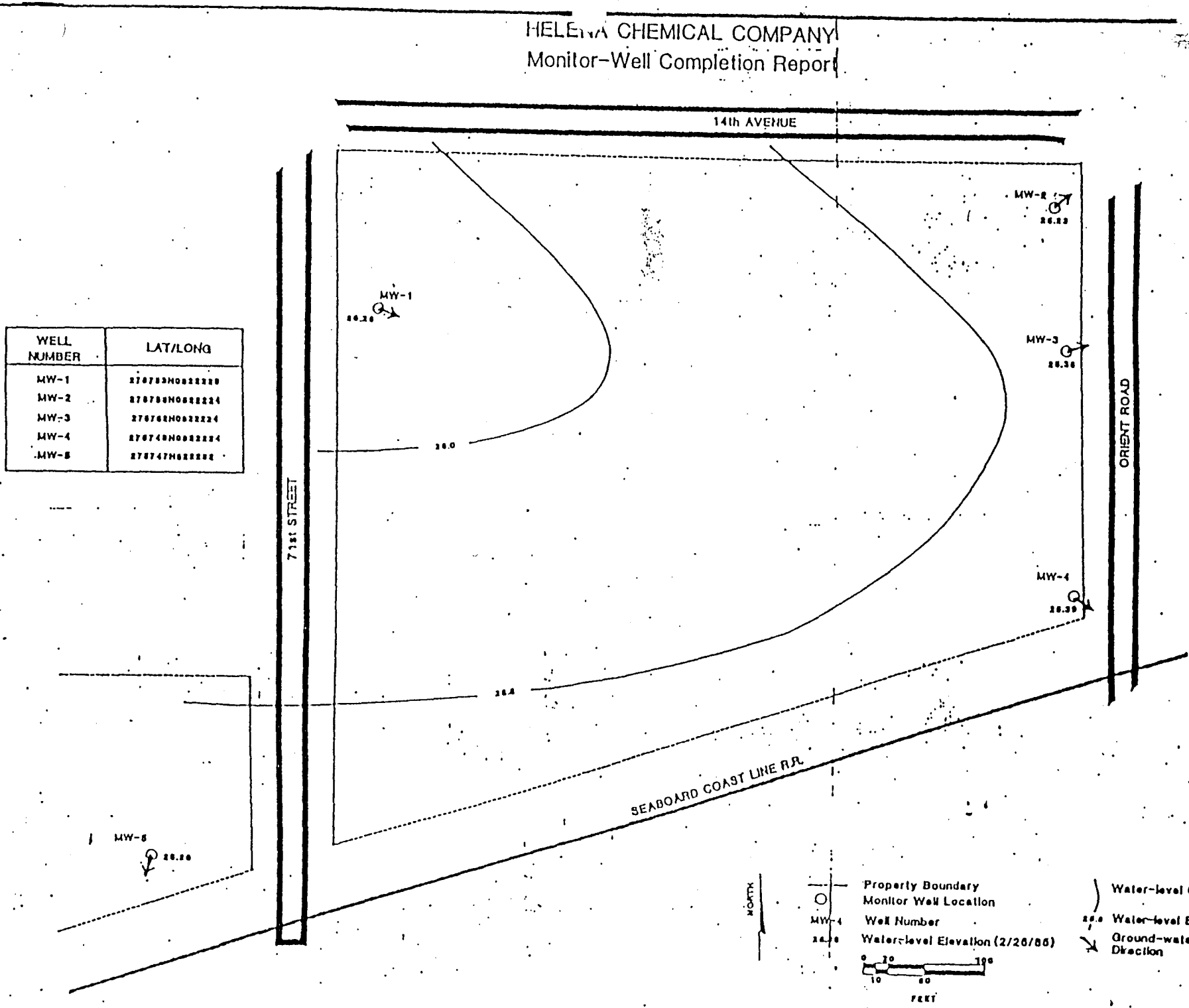


Figure 11. On-site Monitor Well Locations

Figure 12. Alaric Inc. Monitor Well Locations

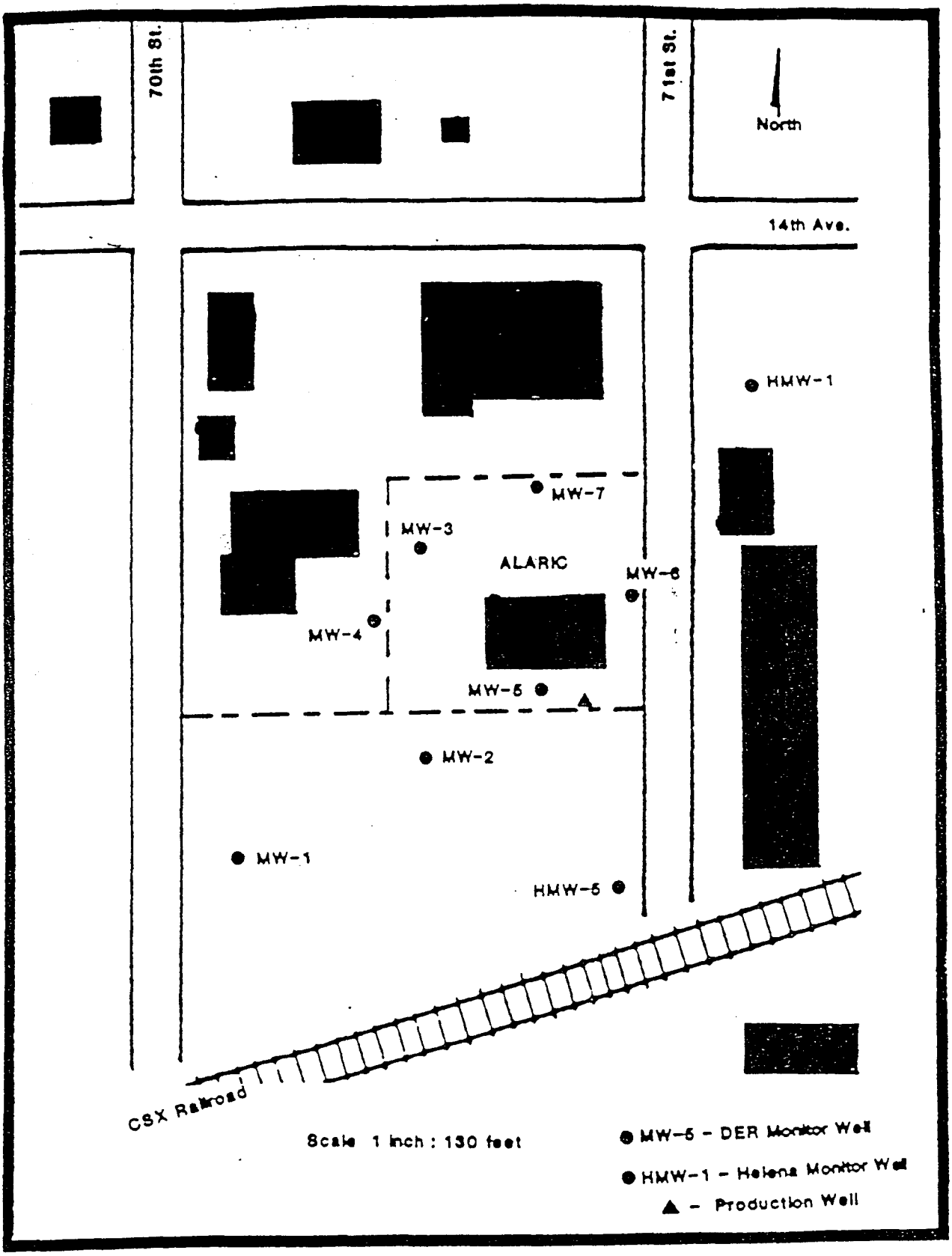
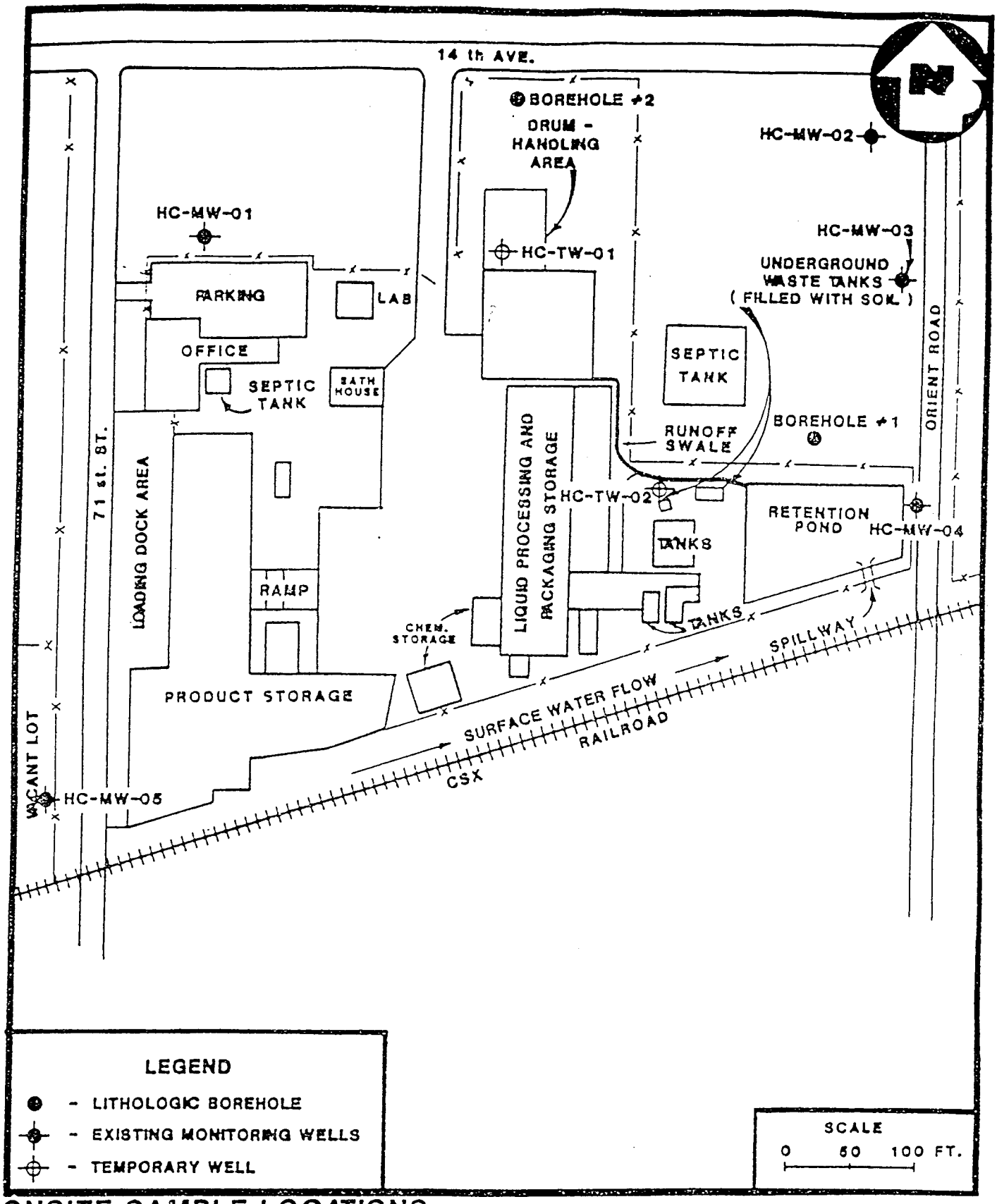


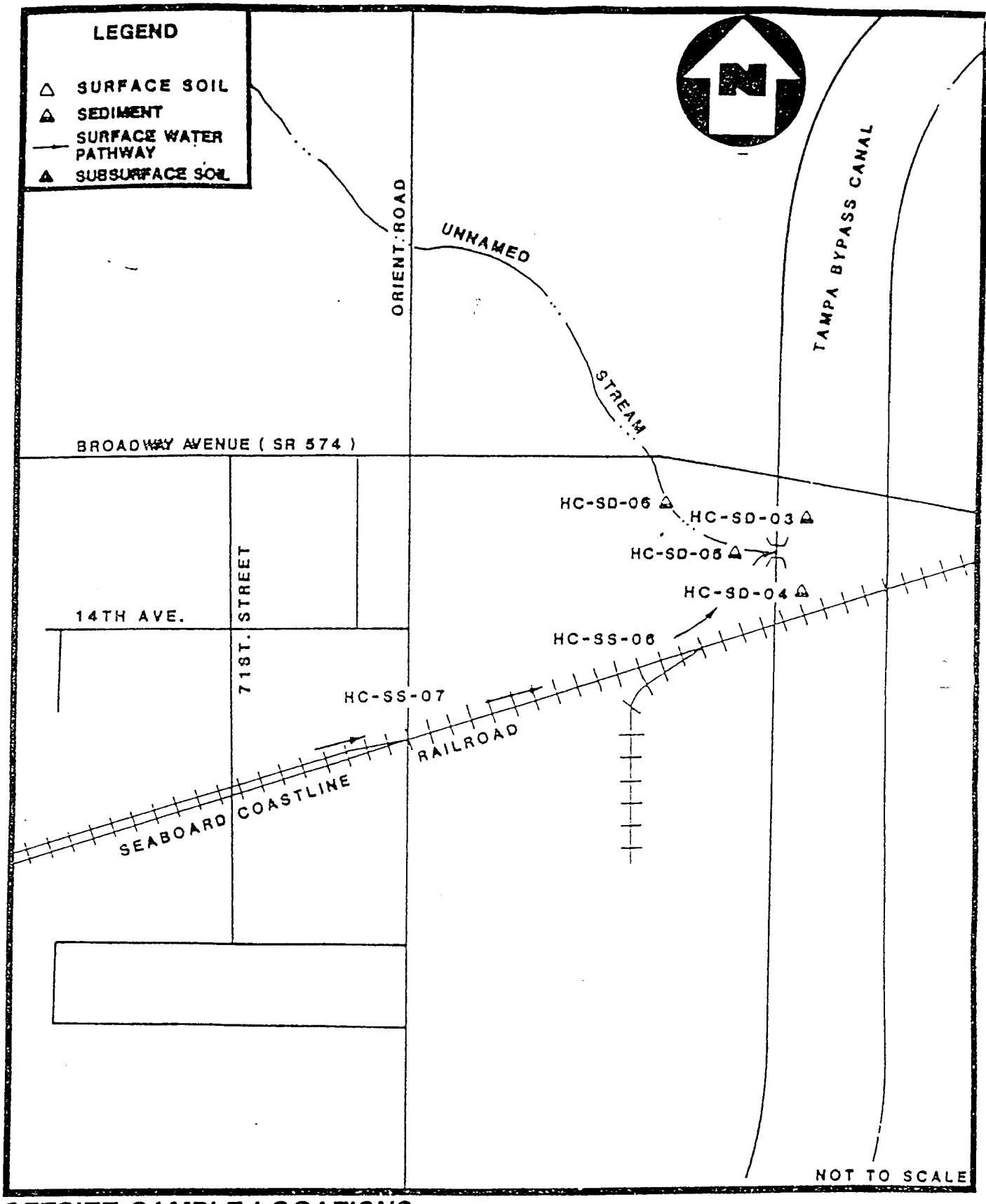
Figure 13. On-Site Ground Water Pathway Sample Locations



ONSITE SAMPLE LOCATIONS
GROUNDWATER PATHWAY
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

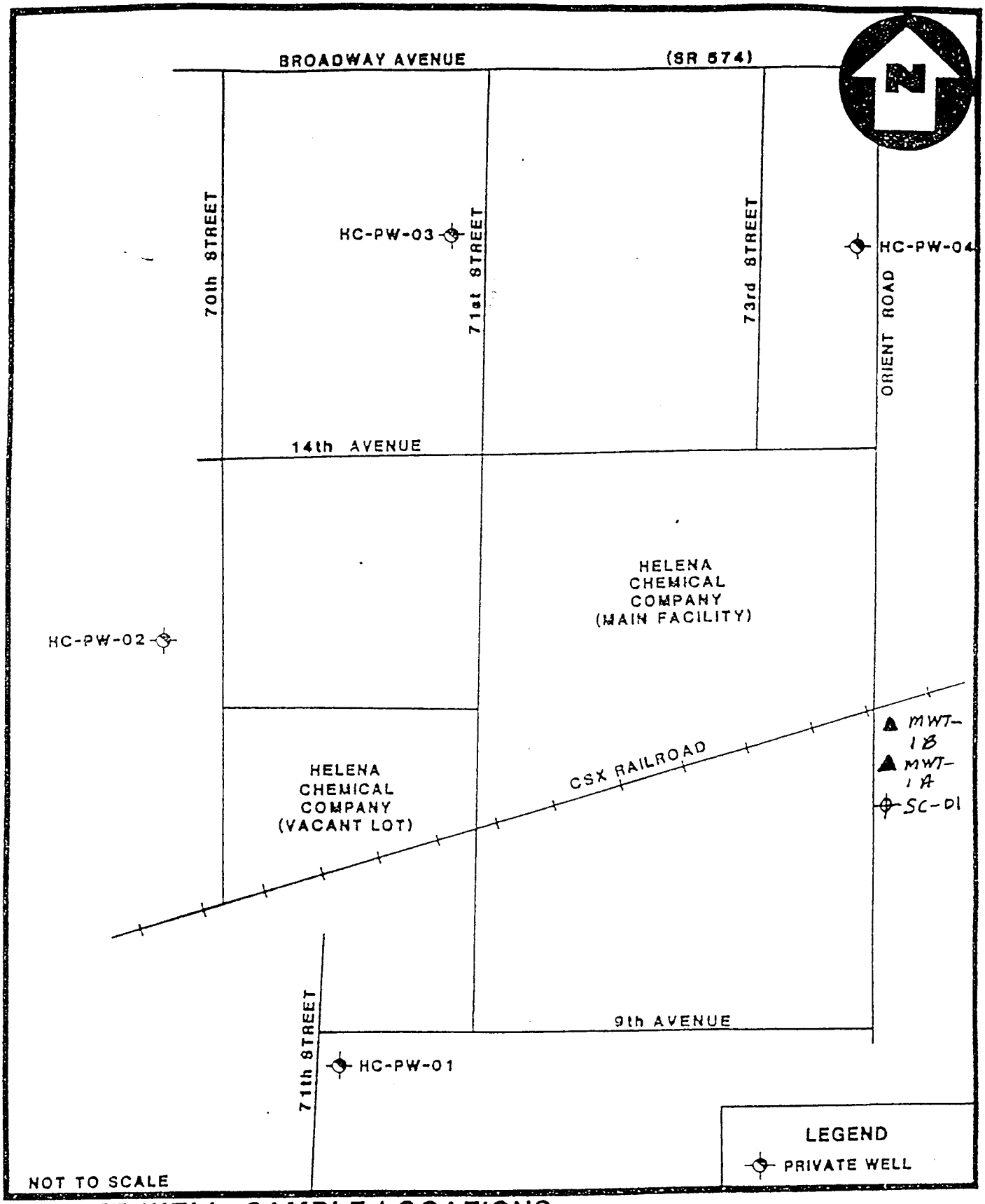
Figure 14. Off-Site Surface Water Pathway Sample Locations



OFFSITE SAMPLE LOCATIONS
SURFACE WATER PATHWAY
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

Figure 15. Private Well Locations



PRIVATE WELL SAMPLE LOCATIONS
HELENA CHEMICAL COMPANY
TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NUS CORPORATION

APPENDIX B: PUBLIC COMMENT AND RESPONSE

Summary of Public Comment on the Draft Preliminary Public Health Assessment and Florida HRS Response

On May 19, 1993 EPA held a public meeting to discuss plans for a remedial investigation/feasibility study at Helena. EPA mailed notices of this meeting to about 200 nearby residents as well as the appropriate governmental agencies. About 10 former residents, a state senator, and a reporter for the Tampa Tribune attended. At this meeting we passed out copies of our draft preliminary public health assessment. We also passed out a fact sheet that summarized the findings of our assessment, announced its availability at the local health department, and solicited public comment through July 16, 1993. Stories regarding our draft assessment appeared in the Tampa Tribune on May 21 and June 9, 1993. During the public comment period we received six sets of comments. Until then we had been unable to identify any community health concerns. We incorporated these community health concerns in the Community Health Concerns section of this report. Following is a summary of the public comment and our response:

Comment #1

One person was concerned that their private well is contaminated.

Response: Although it is unlikely that contaminants from Helena have contaminated this person's well, we referred them to the Hillsborough County Public Health Unit for testing.

Comment #2

One person was concerned that their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

Response: Since this person's well was between 0.5 and 0.75 mile hydraulically upgradient from Helena, it is unlikely that contaminants from Helena contaminated their well.

Comment #3

One person was concerned that health problems in their family were caused by exposure to pesticides and other chemicals from the Flag Sulphur Company. Their family lived within 0.25 mile of this site during the 1940s and 1950s. This person reported contaminated dust from the site frequently covering their house and children of this family played in the contaminated run-off from the site. This person reported nausea, headaches, and burning sensation of the eyes and nose when this facility "cooked" or after a tank exploded. This person reported their father worked at the site in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include Grave's disease, difficulty in conceiving, spontaneous abortions, asthma, hiatal hernia, impaired circulation, and kidney problems.

Response:

It is likely that people living in this area in the 1940s and 1950s were exposure to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. The causes of periarteritis nodosa and Graves' disease are unknown. Although the literature suggests an association between infertility and exposure to high levels of arsenic, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link infertility with exposure to arsenic. It is possible that asthma attacks, nausea, headaches, and a burning sensation of the eyes and nose could have all been caused or made worse by chemicals used at the Flag Sulphur Company. But again, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link these health effects to chemicals from Flag Sulphur Company. The following is a more detailed discussion of all of these health effects and possible causes.

Nausea, headaches, and burning sensation of the eyes and nose can be caused by any number of chemicals including, but not limited to, chemicals used at the Flag Sulphur Company and Helena. Although emissions from are a possible source, without air sampling data from the 1940s and 1950s, we cannot definitely link these health effects to chemicals from Flag Sulfur Company or Helena.

The cause of periarteritis nodosa, also known as polyarteritis nodosa (PAN) or Kussmaul's disease, is not known. Since its cause is not known, we do not know what, if any, association there is with exposure to the chemicals used at this site. Although some of the pesticides found at Flag Sulfur Company or Helena can cause nervous system effects such as headaches, dizziness, muscle twitching, tremors, convulsions, and seizures, their association with polyarteritis nodosa (PAN), if any, is unknown. PAN is characterized by inflammation and necrosis (deterioration) of small and medium sized arteries. PAN is an uncommon, but not a rare disease. It is twice as common in males as females. The mean age at onset is 45 years. PAN is characterized by various symptoms depending on which organ the artery damage is most severe. Nonspecific signs and symptoms are the hallmark of classic PAN. Fever, weight loss, and malaise are present in over one-half of cases. Patients usually have vague symptoms such as weakness, malaise, headache, stiff and painful joints (arthritis), and muscle pain. The kidneys are often affected resulting in high blood pressure (hypertension) and kidney failure. The gastrointestinal tract may also be affected resulting in abdominal pain, nausea, vomiting, and bleeding. The nervous system, skin, and heart may also be affected. If left untreated PAN usually results in death from kidney failure, bowel perforations, or heart failure (Wilson et al 1991).

The cause of Graves' disease is unknown. Since the cause of Graves' disease is not known, we do not known what, if any, association there is with exposure to the chemicals used at this site. Results from studies with rats and dogs given the site-related pesticide toxaphene in their food suggests that prolonged exposure may induce thyroid injury (Chu et al. 1986; 1988; NCI 1977). We do not know, however, if exposure to toxaphene or other site-related

chemicals is associated with Graves' disease in humans. Graves' disease is characterized by an overactive and chronically enlarged (hyperplastic) thyroid gland. This condition is also known as a diffuse toxic goiter. An overactive thyroid (hyperthyroidism) releases too much of the thyroid hormone, thyroxine, in to the blood stream. This in turn causes excessive nervousness, excitability, tremors, and inability to sleep; excessive sweating and heat intolerance; increased heart rate and blood pressure; and frequent bowel movements and weight loss. Graves' disease is sometimes accompanied by bulging of the eyes (exophthalmos). In view of the varied manifestations of Graves' disease and their differing courses, it is possible that no single factor is responsible for the entire syndrome. Graves' disease is a relatively common disorder that occurs at any age but is especially common in the third and fourth decade. It is more frequent in women than men. Genetic factors play an important role; there is a distinct familial predisposition to Graves' disease (Wilson et al 1991).

Although there is evidence that one contaminant found at Helena, arsenic, can interfere with normal pregnancy, there is no environmental data from the 1940s or 1950s on which to a estimate exposure. Without this information, we cannot link arsenic exposures in the 1940s and 1950s to infertility in the 1970s and 1980s. Concentrations of arsenic at Helena now are not likely to interfere with a normal pregnancy. Difficulty in conceiving or infertility is defined as the failure to become pregnant after 1 year of unprotected intercourse. Infertility affects 10 to 15% of all couples. Male infertility is responsible for 40% of infertile couples. In women, tubal disease and endometriosis is responsible for 50% of the cases of female infertility, failure to ovulate for 30% of the cases, and a cervical factor for 10%. No cause is known for 10% of the infertile women (Wilson et al 1991). There are several human epidemiological studies that have reported an association between exposure to inorganic arsenic and increased risk of adverse reproductive effects (birth defects, low birth weight, and spontaneous abortion), both by inhalation (Nordstrom et al. 1978a, 1978b, 1979a, 1979b) and by ingestion (Aschengrau et al. 1989; Zierler et al. 1988). However, in all of these studies the populations were exposed to a number of other chemical and risk factors which may have contributed to the observed effects, and these studies provide only suggestive evidence that arsenic was the cause. Studies with mice, rats, and hamsters also suggest that arsenic is toxic to the developing fetus, but only at levels that are also toxic to the pregnant female (ATSDR 1991b).

It is possible that inhalation of sulphur compounds from Flag Sulfur company in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with reported cases of asthma. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of

sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al 1991).

There is no known association of hiatal hernias with chemical exposure. A hiatal hernia is a protrusion of part of the stomach through the opening where the esophagus passes through the diaphragm. It is usually caused by a weakening of the attachment between the esophagus and the diaphragm. The incidence of hiatal hernias increase with age to about 60% of the population by age 60 years. Hiatal hernias by themselves usually do not cause any clinical symptoms (Wilson et al 1991).

The report of impaired circulation and kidney problems is not specific enough to assess. We were unsuccessful in obtaining more details about this complaint.

Comment #4

One person was concerned that their fibromyalgia was caused by pesticide exposure. This person forwarded a copy of the laboratory analysis of their blood for chlorinated pesticides, trimellitic anhydride, isocyanate, and formaldehyde exposure. This person's family also lived within 0.25 mile of the site during the 1940s and 1950s reported breathing contaminated dust and playing as a child in the contaminated run-off.

Response:

It is likely that people living near the Flag Sulfur Company in the 1940s and 1950s were exposure to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between fibromyalgia and site-related chemicals. Since the cause of fibromyalgia is not known, we do not know what, if any, association there is with exposure to the chemicals used at the Flag Sulfur Company.

An analysis of this person's blood found the pesticide DDE at a concentration of 13.7 nanograms per milliliter (ng/ml). This value is 3 times the laboratory reported average. Since the biological half-lives for elimination of the DDT family members are: DDE>DDT>DDD; the low ratio of DDT and DDD to DDE in this person's blood indicates a past, as opposed to a recent, exposure. Unfortunately, there is not enough information to quantitatively correlate blood levels of DDT, DDD, or DDE with levels in the environment or with toxic effects (ATSDR 1989c).

An analysis of this person's blood also found the pesticide beta-BHC at a concentration of 0.6 nanograms per milliliter (ng/ml) or parts per billion (ppb). Blood levels of beta-BHC have been found to reflect both the intensity and duration of exposure. Studies of pesticide production workers found that blood levels increase at a uniform rate for every year of exposure (Baumann et al. 1980). Other studies have found elevated blood levels of beta-BHC 10 to 15 years after the last exposure (Morgan 1978). Although it is apparent that this person

has been exposed to beta-BHC, it is difficult to estimate their exposure compared to pesticide production workers with blood concentrations 30 to 600 times higher. Nigam et al. (1986) and Kashyap (1986) documented complaints of paraesthesia of the face and extremities, headache, giddiness, malaise, vomiting, tremors, apprehension, confusion, loss of sleep, impaired memory, and loss of libido in pesticide production workers with concentrations of 0.07 to 0.72 parts per million (ppm) of beta-BHC in their blood. These blood levels, however, are about 100 to 1000 times higher than the levels in this person's blood (0.0006 ppm). We do not know if the levels of beta-BHC in this person's blood could cause any or all of these same health effects.

The pesticides heptachlor epoxide, oxychlordane, and trans-nonachlor were also found in this person's blood at levels above the laboratory reported average. Detection of oxychlordane and trans-nonachlor indicates they have been exposed to chlordane. They may have also been exposed to heptachlor since heptachlor epoxide is a breakdown product of both chlordane and heptachlor. Unfortunately, there is no information to quantitatively correlate the blood levels of these pesticides with levels in the environment or with toxic effects (ATSDR 1991c).

The reported antibody assay of this person's blood was inconclusive for exposure to trimellitic anhydride and isocyanate, but positive for exposure to formaldehyde. We do not believe that exposure to trimellitic anhydride, isocyanate, or formaldehyde, however, is related to the Flag Sulfur Company or Helena.

The cause of fibromyalgia is not known. Fibromyalgia, as known as fibrositis, is a common disorder characterized by musculoskeletal pain, stiffness, and easy fatigue. It affects mostly women between the ages of 25 and 45 years. Symptoms include generalized muscle pain and weakness, and generalized aching and stiffness of the trunk, hip and shoulders. Patients complain of waking up frequently at night, having trouble falling back to sleep, waking up tired, and feeling exhausted. Symptoms are made worse by stress or anxiety, cold, damp weather, and overexertion. Disorders commonly associated with fibromyalgia include irritable bowel syndrome, irritable bladder, headaches, and difficult or painful menstruation. Fibromyalgia is characterized by tender sites on the back and along the spine which are extremely more painful to the touch than adjacent areas (Wilson et al 1991).

Comment #5

One person was concerned that their family's health problems (lung, kidney, and bladder) are related to exposure to chemicals while living in this area during the 1940s and 1950s.

Response:

It is likely that people living in this area in the 1940s and 1950s were exposure to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. It is possible that inhalation of sulphur compounds from Flag Sulfur Company in the 1940s and

1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with the reported lung problems. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al 1991).

Without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot definitely link kidney or bladder problems to chemicals from the Flag Sulfur Company.

Comment #6

One person submitted the following technical comments:

a. Helena never manufactured or synthesized pesticides at its Tampa facility.

b. The data quality review for this preliminary public health assessment appears to be cursory at best.

c. Stauffer Chemical, Alaric, and Wheelblast should be added to the list of other industrial facilities that could contribute to the contamination near Helena.

d. It is unclear why the total number of compounds analyzed for in a particular media varied widely.

e. Commercial/industrial soil exposure assumptions would be more appropriate than residential assumptions.

f. The comparison values used in Table 6 are for surface soils and are inappropriate for subsurface soils.

g. Mention of the possibility of the on-site retention pond sustaining aquatic life is inappropriate.

h. Analysis of additional sediment samples from the retention pond would be of limited use in assessing the public health threat of this site. The total number of samples indicated in Table 8 exceeds the number collected according to the test for

DDT and daughter products.

i. The comparison values listed in Table 8 are inappropriate for the on-site sediments.

j. The comparison values listed in Table 11 are inappropriate for the off-site sediments. Introduction of the Tampa Bypass Canal as a potential contaminant receptor is premature. Currently, the data is insufficient to link Helena with the bypass canal sediment contamination.

k. The preliminary public health assessment report should mention all possible sources of ground water contamination in this area.

l. A phased approach to private well sampling is more appropriate than sampling all private wells within 0.25 miles since the solubility of site related contaminants varies.

m. It is unclear why EPA was unable to supply a data validation report for their sampling efforts.

n. It is premature to consider contaminated Tampa Bypass Canal sediment and fish as exposure pathways.

o. The adult soil ingestion rate used in the preliminary public health assessment--100 mg/day--is twice that used by EPA. Also the uncertainty in using the maximum media concentration should be emphasized.

p. The comparison values used in Tables 5 through 14 are misleading and should be revised.

Response:

a. The term "manufactured" is used consistently in the reports by both EPA and consultants for Helena to describe activities at this site prior to 1981. On page 3 of the Final Report, Expanded Site Inspection Helena Chemical Company (EPA 1991a), EPA states: "Helena purchased the facility from Flag Sulfur in 1967 and converted it to the manufacture (emphasis added) of agricultural chemicals, which continued until 1981." EPA cites Form 8700-1, Notification of Hazardous Waste Site, filed June 1, 1981 by Bobby Pace, Technical Services Manager as the basis of this statement.

Section 2.1.3 (page 2-4) of the October 30, 1992 draft Remedial Investigation/Feasibility Study Work Plan prepared by EnSafe for Helena states: "HCC purchased the facility from Flag Sulfur Company owned by Duval Corp. in 1967 and continued the manufacture (emphasis added) of agricultural chemicals until 1981, when manufacturing (emphasis added) operations were shifted to HCC's Georgia facility."

b. As stated in the Quality Assurance and Quality Control section (page 20) of the draft, "...we relied on the referenced information and assumed that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn for this preliminary public health assessment are determined by the completeness and reliability of the referenced information." To be protective of public health we assume all contaminants detected are valid unless the data indicate otherwise.

c. We agree that Stauffer Chemical and Alaric should be added to the list of other industrial facilities that could contribute to the contamination near Helena.

d. In our data tables, the total samples analyzed for individual compounds vary within particular media because these tables are a compilation of data from more than one study. Each study collected different numbers of samples and analyzed for different compounds. The result is a variation in the number of samples analyzed for each compound within each media.

e. The comparison values in Table 5 are based on an adult soil ingestion rate of 100 mg/day. Unless we have site-specific information, we use this default value for adult soil ingestion for both residential as well as commercial/industrial settings. We use these comparison values as a screening tool to narrow the list of all contaminants detected at a site, down to a manageable number of contaminants of concern. Exceeding a comparison value does not imply that a health effect is likely, only the contaminant should be considered further. In the Public Health Implications section we then assess the actual public health significance of each of the selected contaminants of concern.

f. We agree that potential for exposure to undisturbed subsurface soil is much lower than for surface soil. In the absence of a comparison values for subsurface soil however, we default to the comparison value for surface soil. Again, the comparison values are for screening purposes only and are not used as predictors of health effects. None of the contaminants of concern were selected based on their concentrations in the subsurface soil. In the Pathways Analyses and Public Health Implications sections, we do not consider incidental ingestion of subsurface soil a human exposure pathway.

g. The 1992 ATSDR Public Health Assessment Guidance Manual requires us to consider and discuss all possible human exposure pathways. We considered the possibility that the on-site retention pond could support fish large enough for human consumption. As we discussed, we dismissed this possibility due to the pond's small size, shallow depth, variable water levels, contaminated sediments, and restricted access.

h. We have reconsidered our assessment of the adequacy of four sediment samples from the on-site retention pond. There were problems with the analysis of some of the samples, but they do indicate metal and pesticide contamination. Although additional sediment samples may be important from a remediation standpoint, they are not as important from a public health standpoint since these sediments are not a current exposure pathway. More important from a public health standpoint are additional samples along the stormwater run-off path between Helena and the Tampa Bypass Canal. Exposure may be occurring along this path or they may act as a source of contamination for the fish in the Tampa Bypass Canal. Therefore, were have deleted our recommendation for additional sampling and analysis of the on-site retention pond sediments.

In Table 8, we considered the analysis for each member of the DDT family (DDT, DDE, and DDD) as a separate sample. Therefore, there were 12 samples possible since each of four sediment samples could have been analyzed for three different DDT family members. Due to problems with the analyses, result were only reported for 7 out of 12 possible samples.

i. We agree that potential for exposure to sediments in the on-site retention pond is low. In the absence of a comparison values for sediments however, we default to the comparison value for surface soil. Again, the comparison values are for screening purposes only and are not used as predictors of health effects. None of the contaminants of concern were selected based on their concentrations in the on-site retention pond sediments. In the Pathways Analyses and Public Health Implications sections, we do not consider incidental ingestion of sediments form the on-site retention pond a human exposure pathway.

j. We agree that the stormwater run-off path between Helena and the Tampa Bypass Canal does not regularly hold water. Although fish ingestion along this path is unlikely, incidental soil ingestion is a possible human exposure pathway. Therefore it is appropriate to compare the observed sediment concentrations with surface soil comparison values. Again however, the comparison values are for screening purposes only and are not used as predictors of health effects.

We agree that the data collected to date is insufficient to establish a link between Helena and the sediment contamination in the Tampa Bypass Canal. The likelihood of uptake of the persistent and lipophilic site-related pesticides such as DDT/DDE/DDD and toxaphene by fish in this canal and their ingestion by people who fish there recreationally, is the compelling reason however, to determine the extent of off-site sediment contamination from Helena. We repeat our recommendation that Helena collect at least four additional sediment grab samples from the stormwater run-off path between the site and the Tampa Bypass Canal and analyze for solvent, metals, and pesticides.

k. We agree that all potential ground water pollution sources in the area should be mentioned. We will modify our report to include other potential ground water pollution sources in this area.

l. Although a phased approach to ground water sampling is certainly appropriate, sampling all of the private wells within 0.25 mile (<1500 feet) hydraulically downgradient of the site (90 degree arc) in such a sparsely populated area is not unreasonable. This is also not unreasonable considering the long time contaminants have had to move with the ground water and the potentially rapid flow in the karst geology of this area. On March 22, 1993 the Hillsborough County Public Health Unit sampled and analyzed three private wells (depth not specified) within 0.25 mile of Helena but did not find any site-related contaminants

m. Apparently, the EPA memo (EPA 1991b) explaining analytical laboratory biases of estimated chemical concentrations cited in the EPA Final Report, Expanded Site Inspection (EPA 1991a) was the only formal data review performed.

n. The fish consumption pathway is a "potential" pathway based on the possible movement of contaminated sediments into the Tampa Bypass Canal and their uptake by fish. The existing data are inadequate to assess the extent of the off-site sediment contamination. If analyses of additional sediment samples from the stormwater run-off path between Helena and the canal show that contaminated sediments have not reached the canal, then this pathway can be eliminated.

o. Florida HRS and ATSDR are not bound by EPA soil ingestion assumptions. In the absence of site specific values, we believe an adult incidental soil ingestion rate of 100 milligrams per day is reasonable.

We will modify our report to point out the uncertainties in the use of the maximum measured concentration in exposure assessments. Any attempt to characterize an entire population (such as all of the possible soil samples on a site) based on sampling a subset of the total population is inherently uncertain. Due to limitations of sampling, it is possible that the actual concentration people are exposed to may actually be greater than the maximum measured concentration. Faced with this uncertainty and to be protective of public health in our assessment, we use the maximum measured concentration as the highest concentration people are likely exposed to.

p. As discussed above, comparison values in Tables 5 through 14 are for screening purposes only and are not used as predictors of health effects. We agree, however, that these values may be misleading to the uninformed reader. In the Public Health Implications section, we estimate doses of each contaminant of concern from the maximum measured concentration, for identified pathways, using standard exposure assumptions. We then use these dose estimates to identify possible health effects.