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EPA 541-R98-103
November 1998

EPA Superfund
Record of Decision:

Stauffer Chemical Co.
(Tarpon Springs) OU 1
Tarpon Springs, FL
7/2/1998

Record of Decision

The Decision Summary
Operable Unit 1

Stauffer Chemical Tarpon Springs Site
Tarpon Springs, Pinellas County, Florida

Prepared By:
U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

Stauffer Chemical Tarpon Springs Site
Tarpon Springs, Pinellas County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 1 at the Stauffer Chemical Tarpon Springs Site in Tarpon Springs, Pinellas County, Florida, which was chosen in accordance with the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments Reauthorization Act of 1986 (SARA), 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record file for this site.

The State of Florida, as represented by the Department of Environmental Protection (FDEP), has been the support agency during the Remedial Investigation/Feasibility Study process for the Stauffer site. In accordance with 40 CFR § 300.430, FDEP, as the support agency, has provided input during this process. Based upon comments received from FDEP, it is expected that concurrence will be forthcoming; however, a formal letter of concurrence has not yet been received.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This is the first of two operable units planned for the Site. This operable unit addresses the source of the soil and groundwater contamination by treating and containing the source material. The second operable unit will address the contaminated groundwater in the surficial aquifer. The diesel fuel product identified during the groundwater investigation will be addressed under the State of Florida's Underground Storage Tank Program.

The major components of the selected remedy include:

- Limited excavation of radiologically and chemically contaminated material/soil which exceed Residential Cleanup Standards.

- Consolidation of contaminated material/soil in the main pond area, slag area, and/or other areas on-site. Top Cover Caps which meet the Florida Administrative Code § 62-701.050 will be placed over the Consolidation Areas. The movement of contaminated soil/waste will be limited to minimize the generation of fugitive dust and to prevent the creation of additional threats to human health and the environment.

- Institutional Controls must be placed on the site. Institutional controls must include deed restrictions, land use ordinances, physical barriers, and water supply well permitting prohibitions. These restrictions will limit access to the site and prohibit the disturbance of the remedy.

- In-situ Solidification/Stabilization of pond material and contaminated soil below the water table will be required in the consolidation areas on-site. The consolidation areas will be delineated in the Remedial Design Report.

The total present worth cost for the selected remedy as presented in the Feasibility Study is $9,356,000. The construction of multiple consolidation areas may increase the present worth cost of this remedy.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, is cost effective, and it complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous source material remaining on-site above health-based levels, a review will be conducted within five years after the commencement of remedial action and every five years thereafter to ensure the remedy continues to provide adequate protection of human health and the environment.

Richard D. Green — 2 JUL 98

RICHARD D. GREEN — DATE
WASTE DIVISION
DIRECTOR

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1.0 SITE LOCATION AND DESCRIPTION

The Stauffer Chemical Tarpon Springs Superfund Site (Site) is located on Anclote Road in Tarpon Springs, Pinellas County, Florida. The location of the Site, taken from the U.S. Geological Survey (USGS) Topographic Map prepared in 1987, is presented in Figure 1-1 (not to scale). The Site is situated along the Anclote River, which flows into the Gulf of Mexico approximately two miles downstream of the Site. The town of Tarpon Springs is located approximately 2 miles southeast of the Site. The Site comprises an area of approximately 130 acres and includes the former phosphate processing area, elemental phosphorus production facilities, and office/administrative buildings. While operating, the plant utilized a system of seventeen waste ponds on-Site. Currently, these unlined ponds contain waste and no water. Land use in the surrounding area includes light industrial, commercial, and residential. Also, there are some undeveloped areas near the Site. The Site is generally flat with an average elevation of 10 ft above sea level.

The most significant surface water bodies near the Tarpon Springs Site are the Anclote River which is located along the Site's southern and western boundaries and the Gulf of Mexico which is approximately 2 miles from the Site. Pinellas County and the Site are underlain by two primary aquifers, the surficial aquifer and the Floridan aquifer. The depth to the surficial aquifer groundwater is relatively shallow. The thin nature of the surficial aquifer limits its usefulness as a drinking water supply; however, the aquifer provides water for irrigation purposes. The surficial aquifer is separated from the Floridan aquifer by a semi-confining, relatively continuous bed of clay to sandy clay. The Floridan aquifer, consisting of a thick sequence of carbonate (limestone) rocks which are hydraulically connected, provides most of the public water supply for Pinellas County. There are no active residential, or commercial wells either on-Site or between the Site and the Anclote River; therefore, there are no groundwater users on-Site or downgradient of the Site.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Stauffer Chemical Company Tarpon Springs Plant (the "Plant") produced elemental phosphorus using phosphate ore mined from deposits in Florida. The Plant was originally constructed and operated by the Victor Chemical Company, which began production in 1947. Stauffer Chemical Company obtained the Plant from Victor Chemical in 1960 and operated it until shutdown of operations in 1981. In 1983, the decision was made to decommission and dismantle the Plant permanently. Most of the Plant's former process buildings have since been dismantled. In 1987, the Stauffer Management Company (SMC) was formed as a result of a divestiture of the Stauffer Chemical Company.

In the February 1992 Federal Registry Notice, the Stauffer Chemical/Tarpon Springs Site was proposed for listing on the National Priorities List (NPL) by the United States Environmental Protection Agency (U.S. EPA). On July 28, 1992, SMC voluntarily entered into an

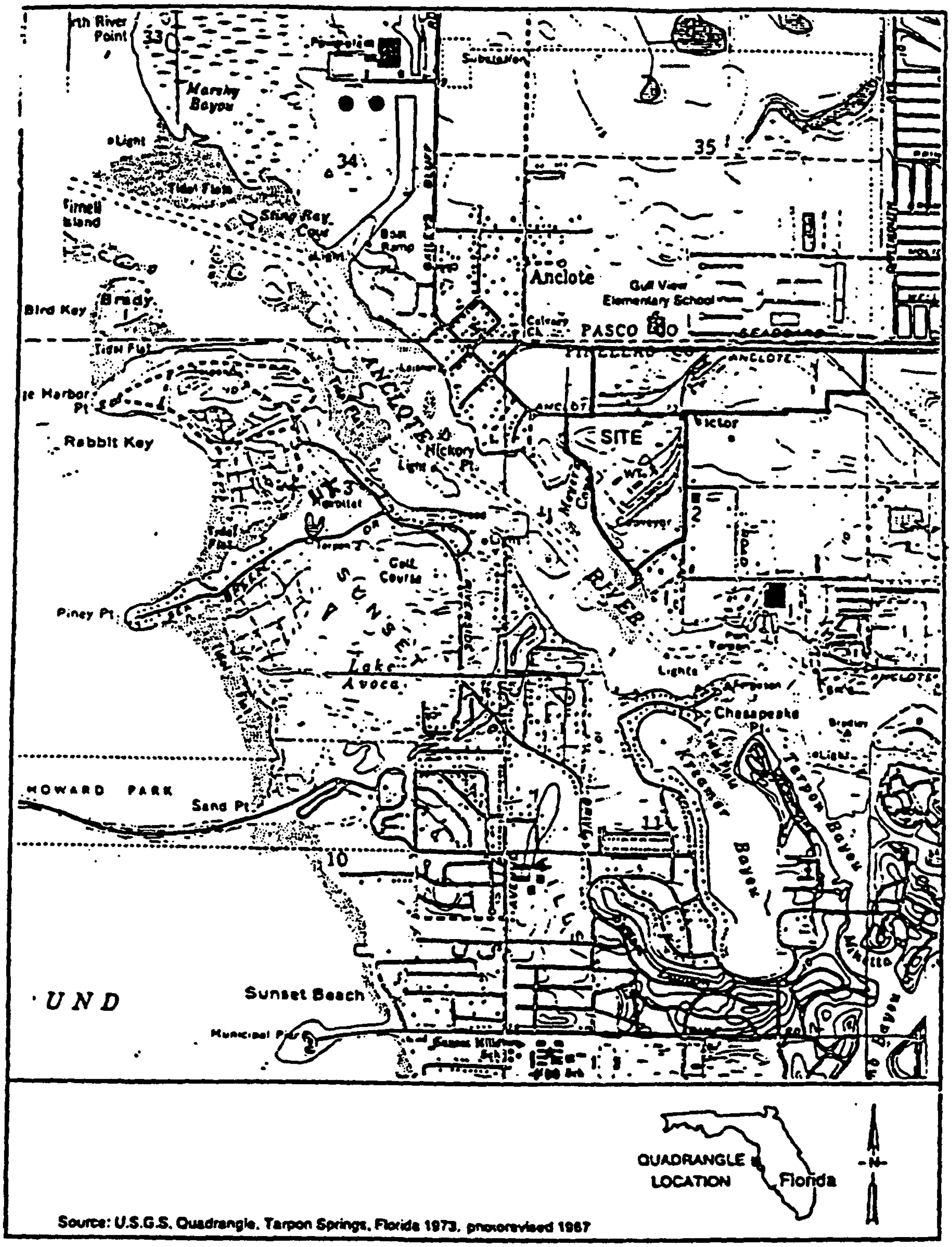

FIGURE 1-1 GEOGRAPHIC LOCATION MAP, SMC TARPON SPRINGS, FLORIDA

Figure 1-1

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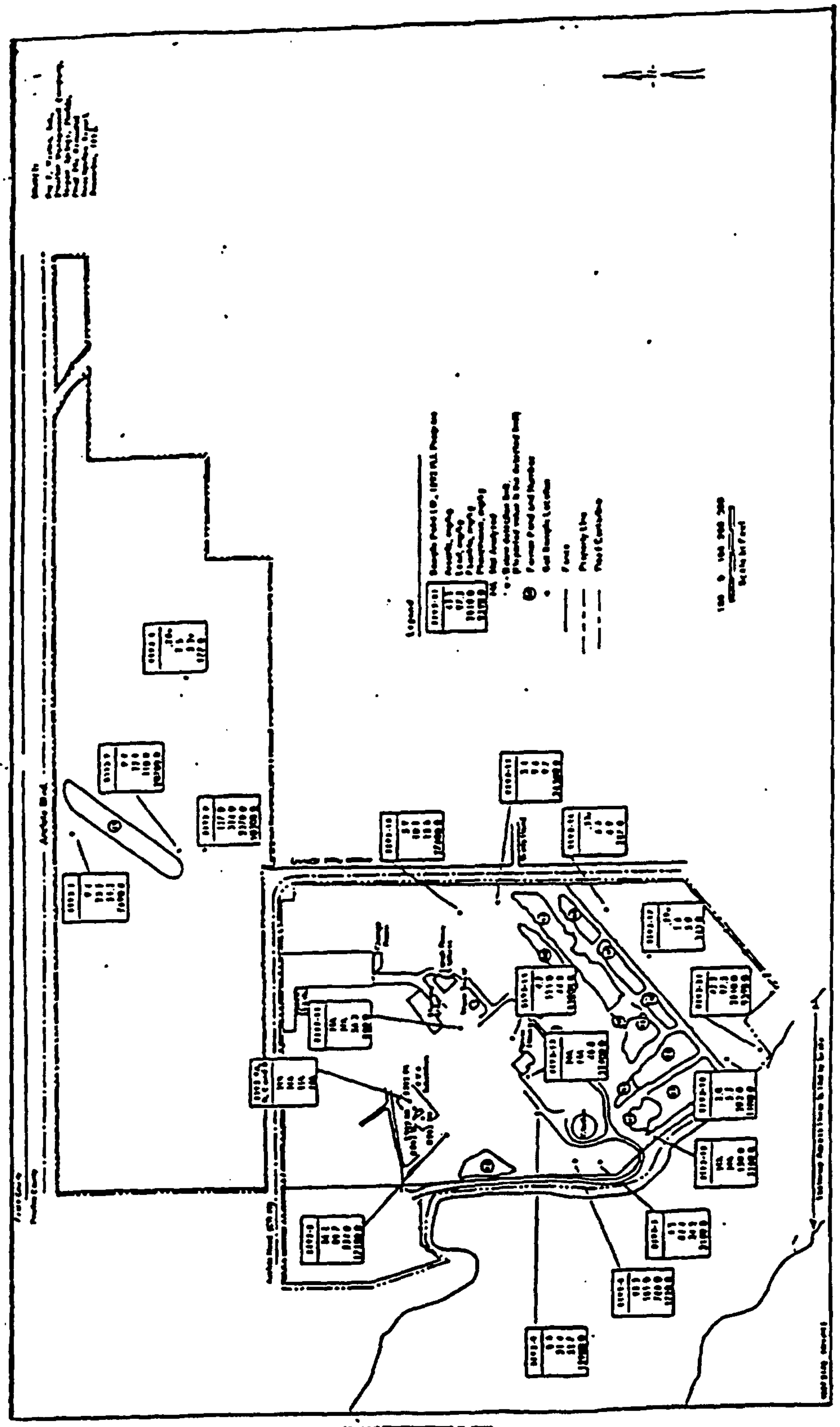

Figure 2-1
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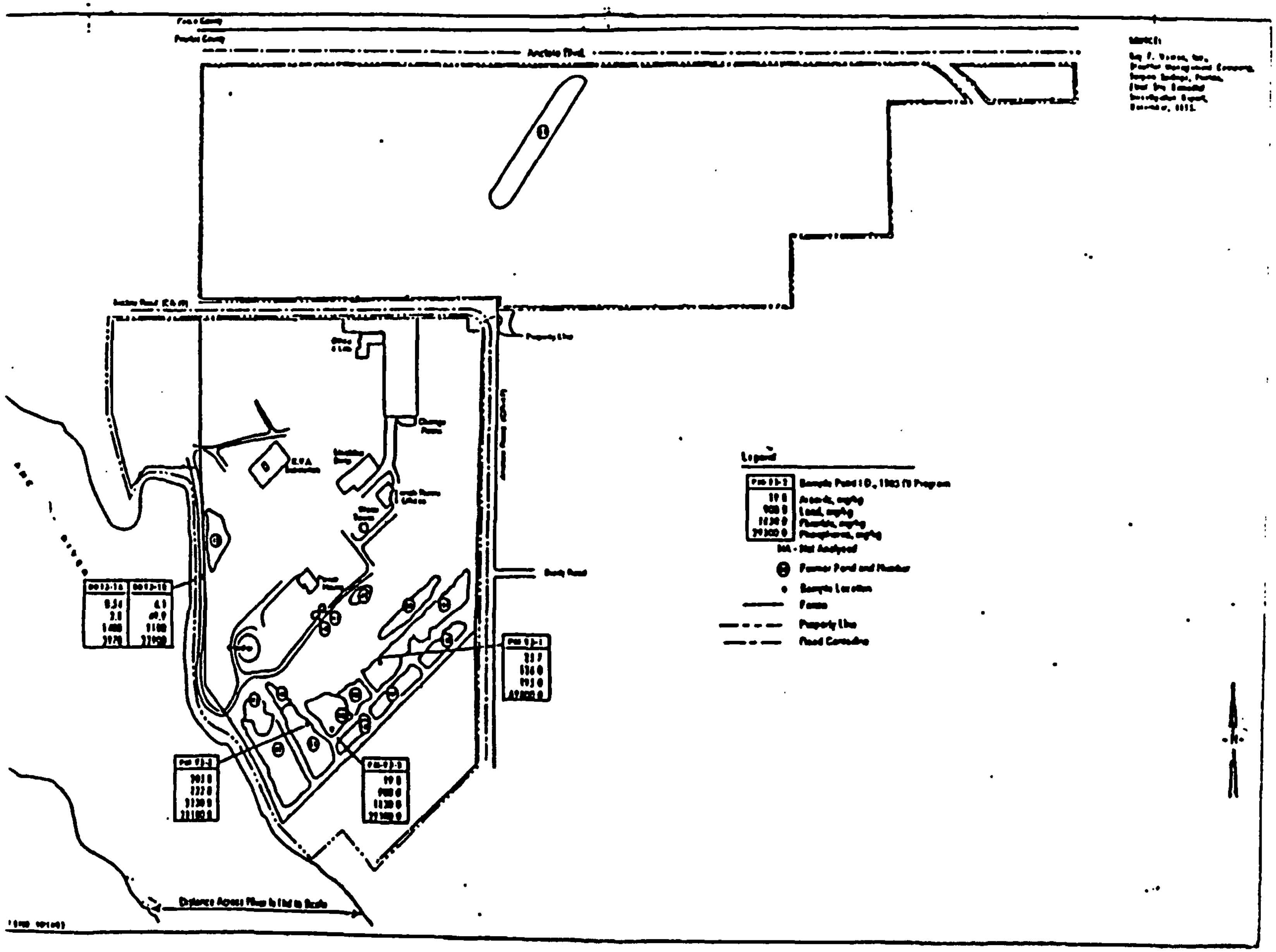


Figure 2-2

Administrative Order on Consent (Consent Order) with U.S. EPA Region 4 (EPA), which requires the performance of a Remedial Investigation and Feasibility Study (RI/FS). The RI and FS final reports were completed and approved in March of 1996.

Several field investigations by various consultants were conducted at the Site. These investigations began with sampling of on-Site groundwater wells in 1974. Beginning in 1987, additional, multi-media investigations were conducted by various parties. To the extent possible, the studies were utilized in the Remedial Investigation

In addition to the RI field activities, a Contamination Assessment (CA) investigation was conducted at the Site in 1993. The CA was performed for the Florida Department of Environmental Protection (FDEP) in response to reported soil and groundwater contamination in the vicinity of two former above ground fuel oil storage tanks removed in August 1992. The cleanup of these areas in a coordinated approach with this operable unit will proceed under the State of Florida's Underground Storage Tanks Program.

Black & Veatch Waste Science and Technology Corporation (BVWST), under contract with EPA), prepared the Final Baseline Risk Assessment (dated May 18, 1994) for the Site. EPA issued Addendum I (dated June 10, 1994) to revise the Final Baseline Risk Assessment acknowledging the conservative nature of the assumption that all Phosphorus present was considered to be the most toxic Phosphorus (Elemental Phosphorus). In response to this addendum , additional samples were collected and analyzed by Roy F. Weston Incorporated, the SMC's consultant in September of 1996. The purpose of this sampling event was to confirm presence or absence of Elemental Phosphorus in Site media. EPA was present to oversee this sampling event. Based on the results of the Phosphorus Sampling Program conducted by WESTON, EPA issued Addendum II - Elemental Phosphorus and Diesel (February 2, 1996). Also, EPA presented Addendum IIA - Elemental Phosphorus in Surface Water and Sediment on February 22, 1995. Based on the confirmed absence or presence of Elemental Phosphorus in discrete samples collect in each Site media, the risk assessment was revised to re-evaluated risk levels in Site media. As a result of this additional work, the Final Revised Baseline Risk Assessment was issued by EPA on July 21, 1995.

The Feasibility Study (FS) was prepared by WESTON in accordance with the Consent Order. EPA reviewed and approved this FS. As part of the FS, an assessment of the environmental impact created by the Site was performed through a comparison of the concentration of contaminants at the Site with federal and state Applicable or Relevant and Appropriate Requirements (ARARs) and Site-specific criteria developed in the Baseline Risk Assessment.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

All basic requirements for public participation under CERCLA Sections 113(k)(2)(B)(I-V) and 117 were met in the remedy selection process. The first fact sheet on the Site was distributed in February 1993. Since that time, a community relations plan was developed and implemented at the Site. An information repository was established in March 1993, at the Craig Park Branch of the Pinellas County Public Library, Spring Street, Tarpon Springs, Florida. The Remedial Investigation (December 1993), the Revised Final Baseline Risk Assessment (July 1995), Feasibility Study (January 1996) and the Proposed Plan (March 1996) were released to the public and continue to be available for public review. These documents have been incorporated in the Administrative Record for the Site. A copy of the Administrative Record, upon which the remedy is based, is available to the public at the information repository. In addition, the Administrative Record and the Site files are available for review at the EPA Region 4 offices in Atlanta, Georgia. Notices of the availability of these documents were published in the Tampa Tribune and the St. Petersburg Times on May 26, 27, and 29 of 1996.

On May 29, 1996, EPA presented its preferred remedy for the Stauffer Chemical Tarpon Springs Superfund Site during a public meeting at the Gulfside Elementary School, Holiday, Florida. At this meeting, representatives of EPA answered questions about the sampling at the Site and the remedial alternatives under consideration.

A 90-day public comment period was held from May 29, 1996, through August 29, 1996. At the request of the public, this comment period was extended for an additional 30 days. The public comment period concluded on September 30, 1996. EPA's response to comments which were received during the comment period are contained in Appendix A of the Record of Decision.

4.0 SCOPE AND ROLE OF ACTION

The ROD selects the remedy for the first of two operable units. This ROD addresses the cleanup of heavy metals and radiation in soil and waste at the Site. Contaminants pose a risk to human health and to environmental receptors. The purpose of this proposed action is to prevent current or future exposure to contamination and to control the source of contamination. Groundwater will be addressed in a subsequent operable unit.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Physiography and Topography

The terrain at and surrounding the Site is generally flat with an average elevation of 10 feet above sea level. There is a slight slope to the south toward the Anclote River. The Site is sparsely wooded in the north and northeastern areas, but is clear of vegetation throughout the main Plant area. The Site is located in the Gulf Coastal Lowlands physiographic region within the Gulf and

Atlantic Coastal Plain physiographic province. The Gulf Coastal Lowlands generally contain numerous wetlands which are interspersed with pine-palmetto flatwoods.

5.2 Geology

The Site is located in the Gulf Coastal Lowlands Physiographic Province. The Gulf Coastal Lowlands are characterized by three sedimentary sequences: (1) unconsolidated fine sand with interbeds of clay and marl; (2) fossilferous limestone and dolomite; and (3) gypsiferous limestone and dolomite. The primary sedimentary units underlying Pinellas County comprise a thick, continuous sequence of shallow-water platform carbonate rocks ranging in thickness from 10,000 to 12,000 feet.

The carbonate rocks underlying Pinellas County form a peninsula which separates Tampa Bay from the Gulf of Mexico. These rocks lie on the southwest flank of the Peninsula Arch. The Peninsular Arch is the dominant subsurface structure in southwest Florida whose axis trends in a northwest direction. In northern Pinellas County, these highly fractured units demonstrate a preferred fracture orientation of N 54° W to N 35° W.

Two distinct stratigraphic units exposed in Pinellas County: A thin veneer of fine sand with clay, marl, and phosphorite interbeds (surficial sand) and a thicker, highly variable calcareous sand to sandy clay with black phosphate nodules and chert (Hawthorn Formation). The Pleistocene surficial sand is located throughout the county except for in the south-central region. These deposits range in thickness from 5 to 50 feet and rest unconformably upon the underlying Tampa formation. The late Miocene Hawthorn formation is exposed in the south-central region and attains thicknesses of approximately 50 to 90 feet.

A thick sequence of carbonate strata unconformably underlies the surficial sediment. These strata are listed in descending order from youngest to oldest: the early Miocene Tampa formation - a poorly to semi-cemented, sandy limestone which thickens from 100 feet in the north to 250 feet in the south, the Suwanee formation; a white, fossiliferous, sandy limestone attains a maximum thickness of approximately 180 feet, and a series of Eocene limestones and dolomites which may achieve thicknesses of 3,000 feet including the Ocala formation - a fossiliferous, chalky limestone unit exhibiting some dolomitization; Avon Park formation - a limestone and dolomite unit containing intergranular evaporates; and the Lake City and Oldsmar formations - a chalky limestone with intergranular gypsum and anhydrite deposits.

5.3 Hydrogeology

Pinellas County is underlain by two primary aquifers, the surficial aquifer, and the Floridan aquifer. The surficial aquifer is a thin veneer of predominantly fine sand whose pore waters are influenced by atmospheric pressures. The water table rises and falls within the surficial aquifer in response to infiltration via precipitation, tidal changes, and variations in atmospheric pressures.

In eastern Pinellas, the depth to groundwater is relatively shallow and the saturated thicknesses range from 5 to 35 feet while averaging 15 feet. The thin nature of the surficial aquifer limits its usefulness as a drinking water supply; however, the aquifer adequately provides water for irrigation purposes. Hydrogeologists have measured mean horizontal conductivity (Kh), vertical conductivity (Kv), and storativity (S) values of 23 ft/day, 9 ft/day, and 0.3, respectively, for the surficial aquifer.

Underlying the surficial aquifer is a semi-confining, relatively continuous bed of clay to sandy clay. The clay unit behaves as a semi-confining unit separating the surficial aquifer from the Floridan Aquifer. Laboratory measurements indicate the vertical hydraulic conductivity of the clay ranges from 2.9×10^{-4} to 5.6×10^{-3} ft/day (1.0×10^{-7} to 2×10^{-6} cm/sec) with an average of 2.3×10^{-3} ft/day (8.1×10^{-7} cm/sec). In south-central Pinellas, the calcareous sand and sandy clay of the Hawthorn formation overlie the Floridan aquifer creating semi-confined to confined aquifer conditions.

The Floridan aquifer consists of a thick sequence of carbonate rocks which are hydraulically connected. The aquifer system is heterogeneous and groundwater flow is principally through a series of interconnected fractures and solution channels. A considerable amount of water is stored, and to a lesser degree transmitted, through the pore matrix of limestone units. Groundwater flow in the upper Floridan aquifer typically occurs under leaky-confined to confined conditions. In Pinellas County, the Floridan aquifer system encompasses the limestone units of the Tampa, Suwannee, Ocala, and Avon Park formations.

Locally, the top of the aquifer system is defined as the first competent sequence of limestone containing small percentages of clay, marl, and sand. This lithologic distinction coincides with the highly porous Tampa limestone. Conversely, the base of the aquifer is generally considered to occur at the first limestone or dolomite unit containing thin, continuous beds of gypsum. Locally, the base of the aquifer occurs at the formational contact separating the Avon Park and Lake City limestones.

Groundwater flow through the Floridan aquifer is by the way of a series of permeable units which typically do not coincide with formational boundaries. These permeable units consist of interconnected fractures and solution channels which are partly separated by dense carbonate beds containing clay seams of lower permeability. These less permeable units behave as semiconfining beds. Hydrogeologists have subdivided the Floridan aquifer into four hydrostratigraphic units separated by three semiconfining units. The shallowest of these hydrostratigraphic units are located approximately 10 to 140 feet below MSL (Tampa limestone) and approximately 250 to 330 feet below MSL (Suwannee limestone). Most production wells providing public water supply for Pinellas County are open exclusively to the upper hydrostratigraphic units. Aquifer tests performed on this unit yielded an average hydraulic conductivity value of 145 ft/day (5.1×10^{-2} cm/sec) and a storativity value of 7.7×10^{-4}. The deeper hydrostratigraphic units are predominantly saline within the study area and, thus, not considered important water sources.

The average annual water budget for Pinellas County consists of 53 inches of precipitation of which 39 inches (74%) is attributed to Evapotranspiration, 6 inches (11%) is attributed to surface water runoff, 6 inches as (11%) is attributed to groundwater recharge and 2 inches (4%) is attributed to leakage to the Floridan Aquifer. Predicted groundwater recharge rates in Pinellas County vary from 6 to 11 in/yr.

5.4 Surface Water and Drainage

Florida has created several water management districts. The individual districts have the regulatory responsibility for the management, retrieval and storage of any surface water and groundwater within the established boundaries. Pinellas County is located within the Southwestern Florida Water Management District (SWFWMD).

The most significant surface water features near the Tarpon Springs Site are the Anclote River, a recreational, Fish and Wildlife Class III-marine surface water body, located on the southern Site boundary and the Gulf of Mexico, located approximately two miles west of the Site. Class III-marine surface waters are defined as suitable for fishing and swimming. The Anclote River extends from south-central Pasco County, south into Pinellas County and then westward to the Gulf of Mexico. The Pinellas County Aquatic Preserve is approximately one mile downstream of the Site along this river. Upstream from the Site are the Port of Tarpon sewage treatment Plant, and the City of Tarpon Springs. Tidal movement can reverse river flow. The primary uses of this river include recreation and maintenance and propagation of wildlife. Stormwater runoff from the Site drains directly into the Anclote River.

5.5 Soil

According to the soil survey of Pinellas County, Florida (USDA-SCS, 1972), the primary soil underlying the Tarpon Springs area are of the Ashtabula St. Lucie Association. The deep sandy soil are relatively flat-lying and classified as extremely well drained. There are lesser percentages of Astar association consisting of poorly drained sandy soil overlain by organic-rich material, and the Ashtabbula-Adamsville Association, consisting of gently sloping, deep sandy soil. The study area is underlain predominately by Made Land soil (Ma) which consist of mixed sand, clay, hard rock, shells and shell fragments. The thickness of the Made Land soil typically ranges from 2 to 8 feet below ground surface. Adjacent to the Made Land Series to the north and east of the Site lie the Ashtabula (AfB) soil consisting of excessively drained, fine sands. Ashtabula soil (AfB) series predominantly underlies the Made Land soil throughout the Site.

5.6 Summary of Site Contaminants

5.6.1 Substances Detected in Soil

Soil samples were collected at many different times during the Site investigation process. Initially, soil samples were collected by NUS (a company under contract with EPA to conduct the Site Inspection) for purposes of ranking the Site and placing it on the National Priorities List.. For the Expanded Site Investigation Report in 1989, four surface soil samples and twenty-two subsurface soil samples were collected and analyzed. Concurrent with sampling conducted by EPA, SMC utilized the services of Roy F. Weston to sample surface soil. Also in 1990, Weston collected 47 discrete samples of the surface soil and 47 samples of the subsurface soil. In addition to Weston's discrete soil samples, eight composite surface soil samples were collected in the northeast part of the Site. In 1990 Weston also collected an additional 35 subsurface samples. All of this information was compiled into the Past Work Document which has become Volume II of the Final Remedial Investigation Report. Pond material was analyzed to determine the maximum degree of contamination. Seventeen samples were collected by Weston in the pond areas on-Site.

The purpose of the Final Remedial Investigation Report (RI) was to confirm the past work and to further define the extent of contamination at the Site. As part of the RI, twenty-one surface and seven subsurface soil samples were collected to confirm the past work performed on-Site. The analytical results were consistent with the results from earlier sampling work.

Subsurface Soil

All subsurface soil samples (collected in 1993) were analyzed for Target Analyte List (TAL) metals, cyanide, fluoride, and total phosphorus. In addition to these parameters, two samples were analyzed for Target Compound List (TCL) volatiles, semi-volatiles, pesticides, and PCBs. Radiological parameters were also tested.

Few TCL contaminants were detected in the subsurface soil sample locations. The only two TCL volatiles detected were acetone and methylene chloride. The only TCL semi-volatile was di-n-butyl phthalate. No TCL pesticides or PCBs were detected.

Arsenic, lead, fluoride, and total phosphorus were detected in the subsurface soil.

The radiological parameters of Gross Alpha, Gross Beta, Radium-226, Radon-222, and Polonium-210 were all detected in on-Site subsurface soil.

For more detailed information concerning the subsurface soil results please refer to the Final Remedial Investigation.

Surface Soil

As part of the RI, twenty-two discrete samples were collected in the main production area, northeast property, and southern property areas. In 1993, three discrete samples were collected at the Gulfside Elementary School located directly across the street from the Site on Anclote Boulevard. Ten additional surface soil samples were collected at the elementary school in February 1996. See Table 5-1 for further detail.

All samples on the elementary school property were detected at normal levels.

Surface soil samples were tested for one or more of the following: TAL metals, Cyanide, Fluoride, Total Phosphorus, Elemental Phosphorus, TCL volatiles, semivolatiles, pesticides, Gross Alpha Radiation, Gross Beta Radiation, and Gross Gamma Radiation. Specifically for the radiological parameters, an isotopic analysis was performed which confirmed that the radiological contamination is detected in the form of Radium 226.

Soil within the Site is contaminated with radionuclides primarily found in the uranium decay chain, specifically Radium 226. As noted earlier, radioactive waste material, suspected to have originated from the Phosphate ore (radium) processing Plant, were disposed on-Site. The radioactive decay of Radium 226 in soil causes elevated concentrations of radon gas and radon decay products.

In broad terms, the results of the assessment for surface soil were as follows:

- The main contaminants of concern for soil were radiological constituents, mostly located in the former slag processing area, railroads, road, and parking lots. In addition, some chemical contaminants including arsenic, antimony, beryllium, cadmium, chromium, thallium, PAHs, and fluoride, were identified. For a complete list of Potential Contaminants of Concern refer to Table 6-1.

- The pond material were not evaluated from a risk standpoint in the Final Baseline Risk Assessment (BVWST, 1994). The risk assessment assumed that this material would be treated or remediated. Radiological levels detected in the ponds exceeded residential and commercial use standards. Refer to Table 6-1 Potential Contaminants of Concern for a complete list of contaminants.

Contaminant detection tables for all media are presented as Table 5-1, 5-2, 5-3, and 5-4. These tables present the sampling results from the Remedial Investigation for the media of soil and pond material.

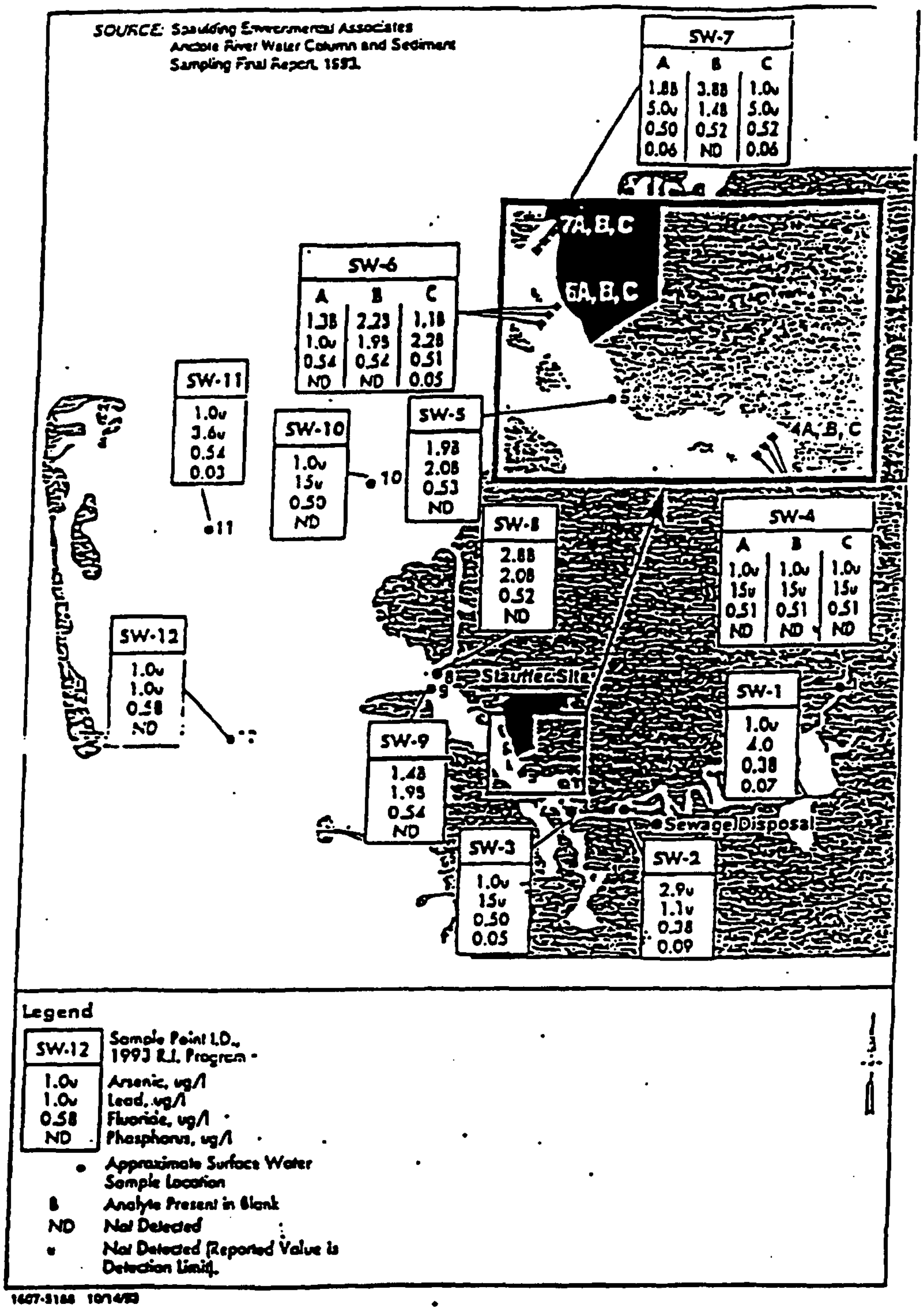
5.6.2 Substances Detected in Surface Water and Sediment

Surface water and sediment samples were collected from the Anclote River directly adjacent to the Site (located directly south and south-west of the Site property boundary). Surface water and sediment samples were collected in a two phase sampling event. The first phase focused on the comprehensive sampling of the Anclote River's surface water and sediment. The sample locations were selected to include areas upstream, areas downstream, and areas adjacent to the Site. The second phase of sample collection included a focused investigation of the sediment in the Myers Cove area adjacent to the Site. During the RI, a total of 15 surface water and 27 sediment samples were collected. Refer to Table 5-1, 5-2, and 5-3.

The results of the RI sampling documented that Site-related contamination was not detected in surface water above background (normal) levels. Only mercury and cadmium were detected (once each) above the National Oceanic and Atmospheric Administration (NOAA) Effect Range-Low (ER-L) guideline values, at sediment locations in Meyers Cove. Both contaminants did not exceed the NOAA Effects Range-Medium (ER-M) guideline values. For further detail, refer to the Final Remedial Investigation Report (WESTON 1993).

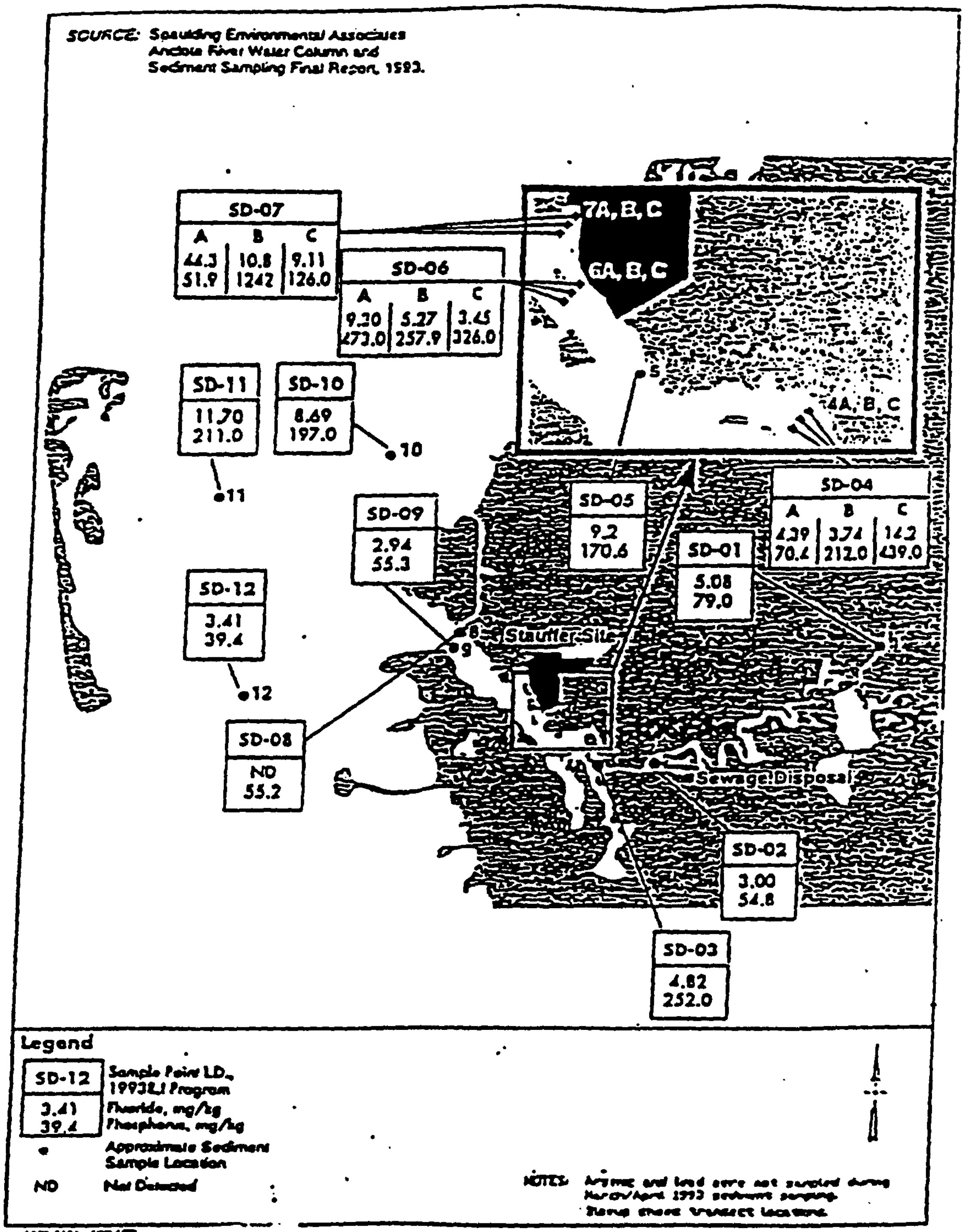
5.6.3 Air Monitoring

Air monitoring results obtained during the RI field work indicated that airborne volatile organics compounds were not problematic at the Site unless construction activities are in progress. Prior to excavation, drilling, and sampling activities, on-Site workers tested the air quality with either a flame ionizination detector (FID) and/or an organic vapor analyzer (OVA). Instrument readings were taken continuously at each drilling location for monitor wells. In addition VOCs were not detected during air monitoring conducted to support the health and safety plan. Elemental Phosphorus is the only contaminant of concern that may present a problem since it may ignite spontaneously when exposed to the atmosphere. Supported by historical information and the results of the RI field work, EPA has drawn the conclusion that airborne contaminant transport is not a significant migration pathway at the Site. The exceptions to this statement would exist when the pond and other contaminated areas are excavated or disturbed. This scenario may cause the Elemental Phosphorus to be exposed to the atmosphere. During the Removal Action construction activities on-Site, asbestos was detected at levels below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit. Even though the asbestos levels are below the Permissible Exposure Limits, EPA will add asbestos to the list of Contaminants of Concern. This decision is based on input and concerns expressed by the community. Additional samples will be collected and analyzed for asbestos as part of the Remedial Design.



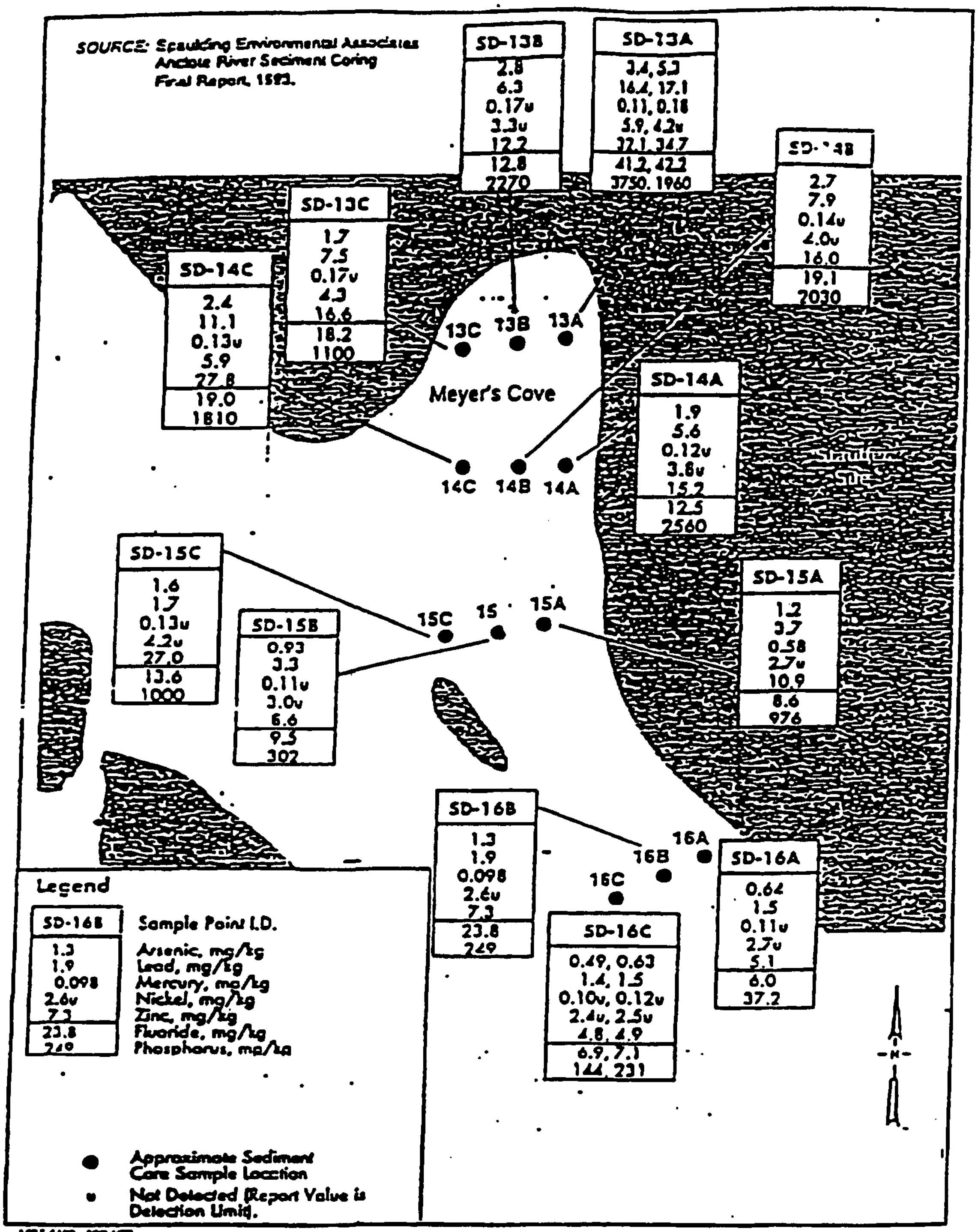
MARCH/APRIL 1993 SURFACE WATER ANALYTICAL RESULTS OF SELECTED PARAMETERS

Figure 5-1



MARCH/APRIL 1993 SEDIMENT ANALYTICAL RESULTS OF SELECTED PARAMETERS

Figure 5-2



JULY 1993 SEDIMENT CORE ANALYTICAL
RESULTS OF SELECTED PARAMETERS

Figure 5-3

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TABLE 5-1
SURFACE SOIL SAMPLES

CHEMICAL	FREQUENCY OF DETECTS	RANGE OF DETECTS µG/KG	MEAN DETECTED CONCENTRATION µG/KG	MEAN BACKGROUND CONCENTRATION µG/KG	REGION III RESIDENTIAL SOIL** µG/KG
ORGANICS					
2-CHLOROPHENOL	1 / 9	50	50	ND	39,000
2-METHYLNAPHTHALENE	2 / 9	45 - 60	53	ND	
2,4-DINITROTOLUENE	1 / 9	780	780	ND	940
2,4,6-TRICHLOROPHENOL	1 / 9	990	990	ND	58,000
4-METHYLPHENOL	1 / 9	1300	1,300	ND	39,000
ACENAPHTHENE	1 / 9	220	220	ND	470,000
ACENAPHTHYLENE	2 / 9	110 - 770	440	ND	
ACETONE	3 / 8	23 - 1,800	620	ND	780,000
ALPHA-CHLORDANE	1 / 12	1.5	2	ND	490
BENZO[A]ANTHRACENE***	5 / 9	63 - 1,600	552	ND	
BENZO[A]PYRENE***	5 / 9	77 - 2,000	643	ND	88
BENZO[B]FLUORANTHENE***	6 / 9	68 - 4,300	1,203	ND	
BENZO[G,H,I]PERYLENE	6 / 9	45 - 1,600	389	ND	
BENZO[K]FLUORANTHENE***	5 / 9	42 - 1,100	360	ND	
CARBAZOLE	2 / 9	84 - 200	142	ND	32,000
CHRYSENE***	6 / 9	53 - 2,100	596	ND	
DI-N-BUTYL PHTHALATE	9 / 9	78 - 1,300	281	ND	780,000
DIBENZOFURAN	1 / 9	38	38	ND	
DIBENZ[A,H]ANTHRACENE***	2 / 9	100 - 340	220	ND	
FLUORANTHENE	6 / 9	64 - 1,600	458	ND	310,000
FLUORENE	2 / 9	75 - 450	263	ND	310,000
INDENO[1,2,3-CD]PYRENE***	5 / 9	88 - 1,600	470	ND	
ISOPHORONE	1 / 9	540	540	ND	670,000
METHYLENE CHLORIDE	4 / 8	7 - 25	15	ND	85,000
NAPTHALENE	1 / 9	48 - 48	48	ND	310,000
PENTACHLOROPHENOL	1 / 9	2,000	2,000	ND	5,300
PHENANTHRENE	5 / 9	40 - 340	167	ND	
PHENOL	1 / 9	840	840	ND	4,700,000
P,P-DDE	1 / 12	9	9	ND	1,900
P,P-DDT	1 / 12	4.4	4	ND	1,900
PYRENE	7 / 9	61 - 1,900	647	ND	230,000

*This table summarizes the chemicals that were detected in at least one sample in this medium. This initial list of chemicals is further evaluated by comparing to appropriate screening values, such as mean background concentrations, in order to select the list of chemicals of potential concern that will be evaluated in the BRA. In accordance with EPA Region IV guidance, the non-detects were not incorporated into the average concentrations. However, non-detects are included in the calculation of 95 percent Upper Confidence Limits.

** Region III values were obtained from the Risk Based Concentration Table, Fourth Quater, 1993 (October 15, 1993). For noncarcinogens, the target HQ was adjusted from 1.0 to 0.1 in accordance with EPA Region IV guidance.

*** The TEF approach will be used to evaluate risk from carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene. Since the maximum concentration of benzo(a)pyrene exceeds its Region III screening value, all detected carcinogenic PAHs will be retained as COPCs in surface soil.

Sample SS93-2 was used as the background sample.

TABLE S-1
SURFACE SOIL SAMPLES

CHEMICAL	FREQUENCY OF DETECTS	RANGE OF DETECTS µG/KG	MEAN DETECTED CONCENTRATION µG/KG	MEAN BACKGROUND CONCENTRATION µG/KG	REGION III RESIDENTIAL SOIL** µG/KG
INORGANICS					
ALUMINUM	18 / 21	287,000 - 6,810,000	2,765,050	631	23,000,000
ANTIMONY	9 / 21	4,900 - 32,300	14,689	ND	3,100
ARSENIC	13 / 21	410 - 127,000	26,885	ND	360
BARIUM	11 / 15	2,000 - 80,900	29,206	3.2	550,000
BERYLLIUM	13 / 21	160 - 1,600	672	ND	150
CADMIUM	11 / 21	590 - 57,400	14,346	ND	3,900
CALCIUM	18 / 21	36,000 - 377,000,000	109,968,167	2240	
CHROMIUM	17 / 21	1,100 - 163,000	43,700	1.3	39,000
COBALT	10 / 21	1,100 - 33,300	7,360	ND	
COPPER	14 / 21	1,800 - 65,500	20,386	0.92	290,000
FLUORIDE	19 / 21	2,400 - 2,810,000	401,774	ND	470,000
IRON	18 / 21	231,000 - 44,800,000	9,097,167	455	
LEAD	17 / 21	1,600 - 324,000	58,691	7.5	
MAGNESIUM	17 / 21	39,000 - 3,910,000	1,226,994	70.6	
MANGANESE	18 / 21	590 - 292,000	88,099	20.6	39,000
MERCURY	2 / 21	230 - 420	325	ND	2,300
NICKEL	17 / 21	1,900 - 115,000	24,759	4	160,000
POTASSIUM	13 / 21	161,000 - 1,680,000	708,846	ND	
SELENIUM	12 / 21	240 - 32,500	7,828	0.32	39,000
SILVER	4 / 21	1,200 - 9,700	4,225	ND	39,000
SODIUM	17 / 21	8,400 - 13,500,000	2,869,006	35.2	
THALLIUM	8 / 21	370 - 13,400	4,130	ND	
ZINC	18 / 21	770 - 519,000	120,941	3.8	2,300,000

*This table summarizes the chemicals that were detected in at least one sample in this medium. This initial list of chemicals is further evaluated by comparing to appropriate screening values, such as mean background concentrations, in order to select the list of chemicals of potential concern that will be evaluated in the BRA. In accordance with EPA Region IV guidance, the non-detects were not incorporated into the average concentrations. However, non-detects are included in the calculation of 95 percent Upper Confidence Limits.

** Region III values were obtained from the Risk Based Concentration Table, Fourth Quater, 1993 (October 15, 1993). For noncarcinogens, the target HQ was adjusted from 1.0 to 0.1 in accordance with EPA Region IV guidance.

*** The TEF approach will be used to evaluate risk from carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene. Since the maximum concentration of benzo(a)pyrene exceeds its Region III screening value, all detected carcinogenic PAHs will be retained as COPCs in surface soil.

Sample SS93-2 was used as the background sample.

59 0024

TABLE 5-2
SEDIMENT SAMPLES

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTS µG/KG	MEAN DETECTED CONCENTRATION µG/KG	MEAN BACKGROUND CONCENTRATION µG/KG	REGION III RESIDENTIAL SOIL** µG/KG
INORGANICS					
ALUMINUM	12 / 27	358,000 - 4,280,000	1,954,750	ND	23,000,000
ARSENIC	12 / 27	490 - 3,400	1,763	ND	360
BARIUM	12 / 27	960 - 6,500	3,330	ND	550,000
BERYLLIUM	3 / 27	260 - 290	277	ND	150
CADMIUM	2 / 27	950 - 1,400	1,175	ND	3,900
CALCIUM	12 / 27	1,650,000 - 29,000,000	11,295,833	ND	
CHROMIUM	12 / 27	1,700 - 15,400	7,325	ND	39,000
COPPER	12 / 27	3,200 - 20,900	9,025	ND	290,000
FLUORIDE	26 / 27	3,100 - 44,300	12,872	5	470,000
IRON	12 / 27	370,000 - 4,340,000	2,105,667	ND	
LEAD	12 / 27	1,400 - 16,400	6,025	ND	
MAGNESIUM	12 / 27	357,000 - 2,310,000	1,280,167	ND	
MANGANESE	12 / 27	1,400 - 19,400	8,150	ND	39,000
MERCURY	3 / 27	98 - 580	286	ND	2,300
NICKEL	1 / 27	5,900 - 5,900	5,900	ND	160,000
PHOSPHORUS	27 / 27	37,200 - 2,560,000	639,993	117	
POTASSIUM	11 / 27	204,000 - 828,000	493,364	ND	
SELENIUM	2 / 27	260 - 420	340	ND	39,000
SODIUM	12 / 27	1,740,000 - 9,780,000	5,300,000	ND	
ZINC	12 / 27	4,800 - 32,100	15,300	ND	2,300,000
ORGANICS					
ACETONE	1 / 2	15	15	ND	780,000
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 2	260	260	44	46,000
METHYLENE CHLORIDE	1 / 2	4	4	2	85,000
PENTACHLOROPHENOL	1 / 2	100	100	ND	5,300
PHENOL	2 / 2	66 - 68	67	ND	4,700,000
PYRENE	1 / 2	68,000	68,000	ND	230,000
TOLUENE	2 / 2	51 - 62	57	32	1,600,000

*This table summarizes the chemicals that were detected in at least one sample in this medium. This initial list of chemicals is further evaluated by comparing to appropriate screening values, such as mean background concentrations, in order to select the list of chemicals of potential concern that will be evaluated in the BRA. In accordance with EPA Region IV guidance, the non-detects were not incorporated into the average concentrations. However, non-detects are included in the calculation of 95 percent Upper Confidence Limits.

** Region III values were obtained from the Risk Based Concentration Table, Fourth Quarter, 1993 (October 15, 1993).
For noncarcinogens, the target HQ was adjusted from 1.0 to 0.1 in accordance with EPA Region IV guidance.

Samples SD-1, SD-2, and SD-3 were used as background samples.

59 0026

TABLE 5-3
SURFACE WATER SAMPLES

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTS µG/L	MEAN DETECTED CONCENTRATION µG/L	MEAN BACKGROUND CONCENTRATION µG/L	AWQC ** (Consumption of Organisms) µG/L
INORGANIC					
ALUMINUM	15 / 15	23 - 89	53	98	
ARSENIC	8 / 15	1 - 6	2	2	0.14
BARIUM	15 / 15	6 - 11	8	8	
CALCIUM	15 / 15	206,000 - 318,000	235,933	124,800	
COPPER	13 / 15	3 - 15	9	13	
FLUORIDE	15 / 15	0.49 - 1	0.52	0.42	
IRON	15 / 15	17 - 135	63	168	
LEAD	6 / 15	1 - 3	2	3	
MAGNESIUM	15 / 15	722,000 - 1,390,000	924,600	330,667	
MERCURY	11 / 15	0.13 - 1	0.29	0.27	0.15
PHOSPHORUS	4 / 15	0.05 - 0.06	0.06	0.09	
POTASSIUM	15 / 15	311,000 - 588,000	379,533	152,067	
SELENIUM	1 / 15	7	7	23	
SODIUM	15 / 15	6,380,000 - 10,900,000	8,001,333	4,260,000	
THALLIUM	1 / 15	17	17	19	6
ORGANIC					
ACETONE	1 / 2	24	24	15	
TOLUENE	1 / 2	9	9	48	200,000

*This table summarizes the chemicals that were detected in at least one sample in this medium. This initial list of chemicals is further evaluated by comparing to appropriate screening values, such as mean background concentrations, in order to select the list of chemicals of potential concern that will be evaluated in the BRA. In accordance with EPA Region IV guidance, the non-detects were not incorporated into the average concentrations. However, non-detects are included in the calculation of 95 percent Upper Confidence Limits.

** These values were obtained from the National Ambient Water Quality Criteria (updated December, 1992). The values listed represent human health, consumption of organisms parameters.

Samples SW-1, SW-2, and SW-3 were used as background samples.

TABLE 5 4
POND MATERIAL SAMPLES

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTS µG/KG	MEAN DETECTED CONCENTRATION µG/KG	REGION III RESIDENTIAL SOIL** µG/KG
INORGANICS				
ALUMINUM	3 / 3	4,510,000 - 6,060,000	5,130,000	23,000,000
ANTIMONY	3 / 3	27,900 - 52,000	43,467	3,100
ARSENIC	3 / 3	19,800 - 205,000	83,500	360
BARIUM	3 / 3	46,100 - 114,000	74,133	550,000
BERYLLIUM	3 / 3	710 - 2,000	1,237	150
CADMIUM	3 / 3	15,300 - 36,300	28,800	3,900
CALCIUM	3 / 3	167,000,000 - 370,000,000	274,666,667	
CHROMIUM	3 / 3	30,000 - 226,000	104,800	39,000
COBALT	3 / 3	1,300 - 4,200	2,833	
COPPER	3 / 3	9,900 - 1,040,000	376,867	290,000
FLUORIDE	3 / 3	195,000 - 2,230,000	1,418,333	470,000
IRON	3 / 3	4,290,000 - 9,760,000	7,116,667	
AD	3 / 3	126,000 - 900,000	386,000	
.GNESIUM	3 / 3	1,030,000 - 5,030,000	2,650,000	
MANGANESE	3 / 3	58,400 - 115,000	80,400	39,000
MERCURY	3 / 3	150 - 2,200	887	2,300
NICKEL	3 / 3	9,300 - 26,900	17,000	160,000
ELEMENTAL PHOSPHORUS	3 / 3	28,100,000 - 69,800,000	42,400,000	
POTASSIUM	3 / 3	933,000 - 4,820,000	2,354,333	
SELENIUM	3 / 3	6,600 - 35,100	23,433	39,000
SILVER	2 / 3	4,500 - 19,300	11,900	39,000
SODIUM	3 / 3	2,170,000 - 14,100,000	6,463,333	
THALLIUM	3 / 3	6,900 - 36,200	23,933	
ZINC	3 / 3	297,000 - 758,000	541,333	2,300,000

TABLE 5 4
POND MATERIAL SAMPLES

CHEMICAL ORGANICS	FREQUENCY	RANGE	MEAN DETECTED	REGION III
ACETONE	1 / 3	310	310	780,000
BENZO(A)ANTHRACENE***	1 / 3	2,800	2,800	88
BENZO(B)FLUORANTHENE***	2 / 3	160 - 5,200	2,680	88
BENZO(G,H,I)PERYLENE	2 / 3	93 - 1,500	797	
BENZO(K)FLUORANTHENE***	2 / 3	52 - 1,100	576	88
BIS(2-EHTYLHEXYL)PHTHALATE	1 / 3	2,200	2,200	46,000
CHRYSENE***	2 / 3	61 - 4,800	2,431	88
DI-N-BUTYL PHTHALATE	3 / 3	110 - 670	300	780,000
FLUORANTHENE	1 / 3	3,900	3,900	310,000
INDENO(1,2,3-CD)PYRENE***	2 / 3	120 - 1,800	960	88
METHYLENE CHLORIDE	2 / 3	5 - 27	16	85,000
PHENANTHRENE	1 / 3	2,000	2,000	
PYRENE	1 / 3	3,300	3,300	230,000

*This table summarizes the chemicals that were detected in at least one sample in this medium. This initial list of chemicals is further evaluated by comparing to appropriate screening values, such as mean background concentrations, in order to select the list of chemicals of potential concern that will be evaluated in the BRA. In accordance with EPA Region IV guidance, the non-detects were not incorporated into the average concentrations. However, non-detects are included in the calculation of 95 percent Upper Confidence Limits.

** Region III values were obtained from the Risk Based Concentration Table, Fourth Quarter 1993 (October 15, 1993). For noncarcinogens, the target HQ was adjusted from 1.0 to 0.1 in accordance with EPA Region IV guidance.

*** The TEF approach will be used to evaluate risk from carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene. The Region III screening value for benzo(a)pyrene is 88 ug/kg. All detected carcinogenic PAHs will be retained as COPCs in the pond material.

6.0 SUMMARY OF SITE RISKS

CERCLA directs EPA to conduct a baseline risk assessment to determine whether a Superfund Site poses a current or potential threat to human health and the environment in the absence of any remedial action. The baseline risk assessment provides the basis for determining whether or not remedial action is necessary. This risk assessment also provides the justification for performing the remedial action. Based upon this analysis, it was determined that the Site does pose a current or potential risk.

Site risks are summarized in the Revised Final Baseline Risk Assessment - Part A and B (BVWST-July 21, 1995), which was submitted as part of the Remedial Investigation, consist of three major sections: Risk Assessment - Chemical, Risk Assessment - Radiological, and the Baseline Ecological Risk Assessment. Chemical risks and radiological risks are discussed separately due to the complex nature of contamination at this Site. Following the discussion of each risk category, the risks posed by the aggregate categories will be summarized.

The major risks currently associated with the Site are inhalation, ingestion, and dermal contact with contaminated soil and slag. Actual or threatened releases of hazardous substances from the Site, if not addressed may present an imminent and substantial endangerment to human health, welfare, or the environment.

6.1 Risk Assessment Overview - Chemical

The chemical health threat at the Site is from heavy metal contamination. The major chemicals of concern are arsenic which is a known carcinogen and elemental phosphorus which is reactive when exposed to the air. See Table 6-1 for the list of Contaminants of Concern for the Stauffer Chemical/Tarpon Springs Site. Based on additional sampling results, and comments on the proposed plan asbestos and arsenic have been added to the list.

EPA Region 4 does not consider direct exposure to subsurface soil to be a standard scenario that should be evaluated in the baseline risk assessment for protection of human health and the environment. Therefore, chemicals of potential concern were not selected for subsurface soil; however, this medium will be evaluated for the protection of groundwater.

Table 6-1 Summary of Potential Contaminants of Concern

CHEMICAL	SOIL	SURFACE WATER	SEDIMENT	POND MATERIAL
Aluminum				
Antimony	X			X
Arsenic	X	X	X	X
Barium		X		
Beryllium	X		X	X
Cadmium	X			X
Chromium	X			X
Cobalt	X			X
Copper				X
Fluoride	X			X
Lead	X		X	X
Manganese	X			X
Mercury	X	X		X
Nickel				
Elemental Phosphorus	X			X
Selenium				
Thallium	X			X
Zinc				
2-Methylnaphthalene	X			
Acenaphthylene	X			
Acetone		X		
Benzo(a)anthracene	X			X
Benzo(a)pyrene	X			
Benzo(b)fluoranthene	X			X
Benzo(g,h,i)perylene	X			X
Benzo(k)fluoranthene	X			X
Chrysene	X			X
Dibenzofuran	X			
Dibenz(a,h)anthracene	X			
Indeno(1,2,3-cd)pyrene	X			X
Phenanthrene	X			X

6.2 Human Health Risk

6.2.1 Chemical

The Baseline Risk Assessment characterized potential current and future risks to human health and the environment from exposure to chemicals found on-Site.

The conceptual Site model for the Stauffer Chemical Site incorporates information on the potential chemical sources, affected media, release mechanisms, routes of migration, and known or potential human receptors. The purpose of the conceptual Site model is to provide a framework with which to identify potential exposure pathways occurring at the Site. Information presented in the RI, local land and water uses, and potential receptors was used to identify potential exposure pathways at the Site.

An exposure pathway consists of four elements: 1) a source and mechanism of chemical release; 2) a retention or transport medium (or media in cases involving media transfer of chemicals); 3) a point of potential human contact with the contaminated medium; and 4) an exposure route (i.e., ingestion) at the contact point. When all of these elements are present, the pathway is considered complete. The assessment of pathways by which human receptors may be exposed to contaminants includes an examination of existing migration pathways (i.e., soil and air) and exposure routes (i.e., inhalation ingestion, and dermal absorption), as well as those that may be reasonably expected in the future.

After the sources of contaminants are identified, the next step in the development of the conceptual model is to determine mechanisms of release to environmental media. The primary release mechanisms are infiltration, runoff, and tidal action from the disposal ponds, and spills leaching from the former Plant operating equipment. The secondary source of chemicals is surface and subsurface soil. Secondary release mechanisms include infiltration and surface runoff.

Contaminated groundwater and surface soil are believed to be the major sources of potential exposure for human receptors, followed by surface water, sediment, and air. The following paragraphs describe the pathways by which human receptors can be exposed to contaminated media.

Surface soil samples were collected from the main production, northeast property, and southeast property areas of the Site. A current or future maintenance worker may be exposed to contaminants in surface soil. Another potential future use may involve developing the Site for residential use. Therefore, a future resident will be evaluated for exposure to on-Site surface soil. For more detail please refer to the Final Revised Baseline Risk Assessment.

Surface water and sediment samples were collected at several locations along the Anclote River. A current or future resident may occasionally be exposed to surface water and sediment. Nearby residents or future on-Site residents may be exposed to chemicals in surface water and sediment via two exposure routes - fishing and/or swimming (or wading) in the Anclote River.

6.2.2 Radiological Overview and Assumptions

Since phosphate ore contains naturally occurring radioactive material (NORM), the slag material has appreciable amounts of measurable radioactivity which has been technically enhanced. The phosphate ore production activity apparently concentrated the radiation in the slag and disposed of the slag in the processing area of the Site. The Baseline Risk Assessment identified the major potential risks associated with the NORM components of the slag material.

The identification of potential pathways for radiological risk analysis is similar to that used for chemical risk analysis. However, several major differences do exist and need to be considered. First, radionuclide intake through the skin is a minimal pathway and need not be analyzed (i.e., dermal contact will not be a considered pathway). Second, the presence of Ra-226 in the soil at the Site indicates that Rn-222 emanation will occur and provide a potential pathway. Third, the NORM radioactivity in the soil from the processing produces an ambient radiation field that exceeds background levels.

The following assumptions were made to assess the major pathways of exposure.

1. Consistent with the risk analysis performed for the chemical hazards on the Tarpon Springs Site, the potential receptors are designated as listed below:

    a. On-Site Worker (current and future)
    b. Off-Site Adult Resident (current)
    c. Off-Site Child Resident (current)
    d. On-Site Adult Resident (future)
    e. On-Site Child Resident (future)

2. Some monitoring results identify the presence of the nuclides K-40 and Cs-137 in relatively small concentrations. These nuclides were not considered as part of this analysis. Cs-137 is a fission product that is found worldwide in environmental samples. Processing at the Tarpon Springs Site should not have enhanced the concentration of this isotope to significant levels greater than those found elsewhere in Florida. K-40 is a naturally occurring radioisotope that is part of elemental potassium. Its presence in concentrations above normal (background) are of negligible radiological concern because the amount of potassium in the human body at any given time is under control (i.e., the body regulates how much K-40 is present in tissues at any time).

3. To the extent possible, parameters were used to be consistent with the chemical risk analysis. This includes water consumption rate, exposure fractions, exposure durations, and soil/sediment ingestion rates. Alternate parameters from recognized standards were used in specific pathways as needed and are described in the discussion of each model.

4. Because the radiological data from the various sources are in relative agreement with each other (i.e., the mean and average do not vary by orders of magnitude), the maximum reported concentration for an environmental sample will be utilized in all calculations. This approach provides a bounding value for the risk associated with the pathways.

5. Consistent with the discussion presented for the chemical risk analysis, fugitive dust is not considered to be a pathway for exposure.

6. Consistent with the discussion presented for the chemical risk analysis (B&V 1994), off-Site drinking water is solely from the local city water supply. Therefore, no current ingestion of groundwater is assumed to take place. However, an analysis is performed for future on-Site residents who may use wells on the Tarpon Springs Site for drinking water purposes.

7. Consistent with the discussion presented for chemical risk analysis, current off-Site child residents are assumed not to be exposed to sediment.

8. No isotopic data were present for surface water; therefore, scenarios using surface water were not analyzed.

9. For purposes of analysis of soil data, the activity of Ac-227 is assumed to be equal to that of Th-227, since these would most likely be in secular equilibrium. Similarly, the activity of Pb-210 is assumed to be equal to that of Ra-226, and the activity of Th-228 is assumed to be equal to that of Pb-212. These assumptions are necessary because published risk factors do not include long-lived progeny. Therefore, it is necessary to consider the activities of parent isotope and long-lived progeny separately with regard to activity and risk.

10. Risk values are taken from "Health Effects Assessment Summary Tables (FY1992)" (EPA 1992) except as noted for the scenario involving irradiation by roadbed material.

6.3 Summary of Exposure Scenarios

This section discusses the rationale for selection of exposure pathways and routes of concern for both the current and future exposure scenarios.

Table 6-2 and 6-3 represent the carcinogenic and non-carcinogenic risk posed by chemical contaminants of concern for significant pathways. Table 6-4 represent a comparison of the maximum detection concentration of lead and the EPA Interim Soil cleanup level for residential soil.

6.3.1 Summary of the Chemical Exposure Scenarios

Current/Future Maintenance Worker

On-Site maintenance workers were assumed to be exposed to Site-related contaminants in surface soil or fugitive dust emissions during landscaping, mowing, or other outdoor activities. The routes of exposure considered for the on-Site maintenance worker were incidental ingestion and dermal contact with contaminants in surface soil and inhalation of fugitive dust. It was assumed that if the Site remains commercial/industrial in the future, a maintenance worker would still have the greatest potential for exposure to Site contaminants. Therefore, the future worker scenario is the same as the current worker scenario.

The air pathway was qualitatively evaluated as an exposure pathway for particulate emissions from surface soil. With the exception of the slag processing area, the majority of the Site is either vegetated or covered by impervious material. Inorganic chemicals present in surface soil in the slag processing area may adsorb to soil particles which could then potentially be transported via wind erosion. Although surface soil in the slag processing area are relatively homogeneous, the surface is not elevated and the soil is compact.

The closest residential areas and Gulfside Elementary School are north of the Site. The grassy area just east of the slag processing area represents the most critical (closest) area of concern for a maintenance worker. Based on the location of these receptors (maintenance worker, pupils at school, and nearby residents), winds from the south and west would provide the most critical wind conditions. Also, in order for wind erosion to occur from limited reservoir surfaces, wind speeds of approximately 22 miles per hour would be required. Since the average annual wind speed in the Tarpon Springs area is only 10 to 15 miles per hour in the afternoon and 5 to 10 miles per hour at night, and the prevailing winds in the Tarpon Springs area are from the north and east, it is assumed that exposure via inhalation of fugitive dust does not present a significant exposure pathway. Therefore, the air pathway was not quantitatively evaluated as an exposure pathway for particulate emissions.

The maintenance worker was quantitatively evaluated for exposure to surface soil via incidental ingestion and dermal contact.

Current Off-Site Resident

The Anclote River is classified as a Fish and Wildlife Class III-marine surface water body. Class III-marine surface waters are defined as suitable for fishing and swimming. Stormwater runoff and groundwater discharge flow directly into the Anclote River; therefore, it is assumed that nearby residents may be exposed to Site-related contaminants during recreational and fishing activities.

Direct contact with surface water and sediment was evaluated for an adult resident (age 7 to 30). Potential exposure routes included incidental ingestion and dermal contact with surface water and sediment. It was assumed that children under the age of seven would be under parental supervision and any direct exposure to the river would be negligible. An additional pathway that was evaluated for the off-Site resident (child and adult) included ingestion of contaminated fish that are caught in the Anclote River.

Future Resident

Based on surrounding land use, it was assumed that residential development might occur on-Site in the future. Potential pathways through surface soil exposure included in incidental ingestion and dermal contact. Sediment and surface water exposure were identical to that discussed in the current use scenario. These pathways included incidental ingestion and dermal contact using the adult (age 7-30 years) as the likely exposure receptor, and ingestion of locally caught fish (age 1-30 years). Groundwater was evaluated due to the hypothetical possibility of future contamination of off-Site private drinking wells or the installation of a residential well on-Site. The potential exposure pathways involved the ingestion of drinking water.

6.3.2 Summary of Radiological Exposure Scenarios

The scenarios considered for potential intakes to radioactive material are summarized in Table 6-5 and 6-6, along with the radiological data used for the risk assessment.

Table 6-5 presents the analytical results of samples collected during the Remedial Investigation as it relates to the assumptions used in the risk assessment and potential receptor scenarios.

Table 6-6 presents the estimated individual radiological pathway and cumulative radiological pathways exposure risk scenarios. The potential receptors are listed in the first row. Exposure scenarios are presented in the first column.

Table 6-2
Contaminants of Concern that Pose a Carcinogenic Risk
Greater Than 10^{-6} for Pathways That Exceed 10^{-4}

Exposure Medium/ Pathway	Current/Future Maintenance Worker	Current Off-Site Resident	Future On-Site Resident
Surface Soil	NONE	NE*	Benzo(a)anthracene.............. 2×10^{-6} Benzo(a)pyrene.................... 2×10^{-5} Benzo(b)fluoranthene........... 5×10^{-6} Dibenzo(a,b)anthracene........ 4×10^{-6} Indeno(1,2,3-cd)pyrene........ 2×10^{-6} Arsenic................................ 3×10^{-4} Beryllium.............................. 6×10^{-6}
Surface Water	NE*	NONE	NONE
Sediment	NE*	NONE	NONE

* Note that NE means that the pathway was not evaluated for this receptor.

Table 6-3
Contaminants of Concern with a Hazard Quotient Greater Than 0.1 for Pathways with a Hazard Index Exceeding 1.0

Exposure Medium/ Pathway	Current/Future Maintenance Worker	Current Off-Site Resident Adult	Future On-Site Resident Adult	Future On-Site Resident Child
Surface Soil	Arsenic......4 x 10^{-1} Thallium.....1 x 10^{-1}	NE	Arsenic......6 x 10^{-1} Thallium....1 x 10^{-1}	Fluoride....6 x 10^{-1} Antimony..6 x 10^{-1} Arsenic.....6 Cadmium..7 x 10^{-1} Thallium...1
Surface Water	NE	Arsenic.....2 x 10^{-1} Mercury....4	Arsenic......2 x 10^{-1} Mercury.....4	Arsenic.......2 x 10^{-1} Mercury......4
Sediment	NA	NA	NA	NA

Notes: * NE means that the pathway was not evaluated for this receptor.
** NA means that all hazard indices were less than 1.0 for sediment.

Table 6-4
Comparison of Maximum Detected Concentrations of Lead to ARARs

Surface Soil (mg/kg)	Residential Cleanup Levels (mg/kg)
324	500

Table 6-5 Scenarios Analyzed for the Radiological Risk Analysis

Scenario		Potential Receptor	Monitoring Data Used to Assess Risk
Incidental Ingestion of Soil		1. Current/Future Worker 2. Future On-Site Adult Resident 3. Future On-Site Child Resident	Surface Soil Ra-226: 73.8 pCi/g Pb-210: 73.8 pCi/g Ra-228: 29.3 pCi/g U-238: 29.1 pCi/g U-235: 0.7 pCi/g Ac-227: 0.8 pCi/g Th-228: 0.2 pCi/g
Ingestion of Vegetation Grown on Contaminated Soil		1. Future On-Site Adult Resident 2. Future On-Site Child Resident	Surface Soil (as above)
Direct Irradiation by Contaminated Soil		1. Current/Future Worker 2. Future On-Site Adult Resident 3. Future On-Site Child Resident	Surface Soil (as above)
Inhalation of Rn-222	Indoor Exposure	1. Current/Future Worker 2. Future On-Site Adult Resident 3. Future On-Site Child Resident	Rn-222 Flux: 8136 pCi/m²/hr
	Outdoor Exposure	1. Current Off-Site Adult Resident 2. Current Off-Site Child Resident	
Incidental Ingestion of Sediment		1. Current Off-Site Adult Resident	Sediment Ra-226: 2.4 pCi/g
Ingestion of Groundwater		1. Future On-Site Adult Resident 2. Future On-Site Child Resident	Groundwater Ra-226: 24.9 pCi/l
Irradiation by Roadbed Material		1. Current/Future Worker 2. Future On-Site Adult Resident 3. Future On-Site Child Resident	Radiation Survey Measurements of On-Site Roadway 150 µR/hr

Table 6-6 Estimated Radiological Risk Considering Major Pathways

Exposure Scenario	Lifetime Risk				
	Current/ Future Worker	Current Off-Site Adult Resident	Current Off-Site Child Resident	Future On-Site Adult Resident	Future On-Site Child Resident
Incidental Ingestion of Soil	4E-05			5E-05	3E-05
Ingestion of Vegetation Grown on Contaminated Soil				2E-02	6E-03
Irradiation by Contaminated Soil	3E-03			1E-02	3E-03
Inhalation of Rn-222 (Indoor Exposure)	1E-03			7E-03	2E-03
Inhalation of Rn-222 (Outdoor Exposure)		2E-05	4E-06		
Incidental Ingestion of Sediment		3E-08			
Ingestion of Groundwater				5E-05	6E-06
Irradiation by Roadbed Material	5E-03			4E-03	1E-03
TOTAL	9E-03	2E-05	4E-06	4E-02	1E-02

NOTE: Shaded boxes indicate that the given exposure scenario is not applicable for the indicated receptor.

6.4 Ecological Risks

The objective of ecological risk assessment was to use available toxicological and ecological information to estimate the probability that some undesired ecological event will occur. The baseline ecological risk assessment (BERA) evaluated the actual and potential risks to the environment due to releases of contaminants at the Site. The general objective of a BERA is to provide the information necessary to assist in the decision-making process at remedial Sites.

Media of concern for ecological receptors generally include surface water, sediments, surficial soil, and air. These are media that may have direct or indirect effects on the community and population composition of an ecological habitat or on individual species that are part of those communities or populations.

Ecological chemicals of concern may often include more individual chemicals than the human health assessment because the screening criteria for human health do not apply to ecological receptors. As a result, different screening criteria are used to limit the chemicals evaluated in the ecological assessment. The preliminary list of ecological chemicals of concern initially included all chemicals detected during previous environmental sampling events. No protected species were found at the Site This list was then evaluated as follows:

1) Chemicals were eliminated if they were not detected in RI/FS environmental samples.

2) Inorganic chemicals were eliminated if the detected concentrations did not exceed the sample quantitation limit or the background concentration (provided that the sample quantitation limit or the background concentration do not themselves exceed screening levels).

3) Organic chemicals were eliminated if the detected concentrations did not exceed the sample quantitation limit (provided that the sample quantitation limit itself does not exceed screening levels).

4) All chemicals were eliminated if they were only tentatively identified.

5) All chemicals with a low frequency of detection (less than 5 % for each medium) were eliminated from consideration.

6) All chemicals in groundwater for which the range of detection did not exceed the Region 4 Screening Values were eliminated from consideration.

7) Chemical concentrations in sediments that did not exceed the screening values established by Region 4 for hazardous waste Sites were eliminated.

The following is a list of contaminants which include all those exposure point concentrations which exceed screening concentrations.

Table 6-7 Ecological Summary of the Contaminants of Concern

Contaminants of Concern for Ecological Risk	
Aluminum	Acenaphthalene
Arsenic	Anthracene
Cadmium	Benzo(a)pyrene
Copper	Bis(2-ethylhexyl)phthalate
Iron	Chrysene
Mercury	Dibenz(a,h)anthracene
Nickel	Fluorene
Phosphorus	Fluoranthene
Silver	Phenanthrene
Thallium	Pyrene
	Zinc

The overall risk to the extended community on or immediately adjacent to the Stauffer Chemical Site is considered low to moderate. Causes for concern are that several contaminants currently exceed screening values in both sediment and surface water. In addition several contaminants were detected in shallow groundwater samples at relatively high concentrations and would be expected to contribute to the overall contaminant load in the adjacent wetland and deepwater habitats. Moderating the overall risk to the extended community is the dilution effect of the Anclote River and the tendency of the wetlands adjacent to the Site to partition some contaminants to deeper sediments, restricting their effect to a limited area. Based on information currently available to the EPA contractor, the BERA was developed primarily based on chemical contaminants since minimal information was found on the ecological impact of radiological contamination. All available information concerning the ecological impact of chemical and radiological contamination was considered in the decision making process. Further ecological or eco-toxicological investigation is not warranted at the Site.

6.5 Cleanup Levels

Cleanup levels for the Site were established to ensure that any person exposed in the future will not be exposed to unsafe levels of Site-related chemicals. Cleanup levels are either the Federal Maximum Contaminant Limits (MCLs), other Applicable or Relevant and Appropriate Requirements (ARARs), or risk-based concentrations. At the Site, EPA requires that soil be remediated up to a 10^{-6} residential risk level for cancer causing contaminants and a Hazard Index (HI) of 1 for non-carcinogenic chemicals. For the radiological contamination, a ARAR is used as the cleanup standard. These levels are consistent with the National Contingency Plan (NCP) and EPA requirements for cleanup levels of carcinogenic chemicals with in the 10^{-4} to 10^{-6} risk range and are protective of human health and the environment in a residential setting. This risk range of 10^{-4} to 10^{-6} means that exposure to Site-specific contaminants as defined as in the risk assessment would result in an estimated increase in an individual's chance of developing cancer ranging from one in ten thousand to one in a million. For non-cancer causing risks, EPA compares the highest dose known to be safe (not cause harmful effects) to the estimated dose from exposure to levels found on-Site. These comparisons were used to develop cleanup levels for Contaminants of Concern for the soil/waste at the Site. Elemental phosphorus is a CERCLA listed Hazardous Substance.

Arsenic, a Contaminant of Concern at this Site, is a naturally occurring mineral that is considered by EPA to be a systemic toxicant and a human carcinogen. However, there is considerable uncertainty concerning its ability to cause cancer at low exposure levels, especially the less soluble form that occurs in contaminated soil. The Superfund program of EPA Region 4 regulates arsenic in soil as a systemic toxicant in deriving protective cleanup levels. As an additional precaution, EPA also requires soil cleanup levels to fall within the protective cancer risk range of 10^{-4} to 10^{-6} for the most sensitive likely receptor even though the calculated risk may be significantly over predictive. The co-location of arsenic with other contaminants that are to be addressed in soil remediation will likely result in soil arsenic residuals at the more protective end of the calculated risk range.

Table 6-8
Cleanup Standards: Remedial Goals

Soil/Waste Contaminant	Maximum Concentration Detected (mg/kg)	Remedial Cleanup Goals (mg/kg)
Arsenic	127	#
Antimony	32.3	28.1
Beryllium	1.6	0.192
Elemental Phosphorus	0.854	1.4
Thallium	13.4	1.4
Radium-226 (Lead-210)*	73.8 pCi/g	5 pCi/g
Total CPAHs**	–	0.089

* Note that this cleanup level is measured above the background (normal) concentration. The background (normal) concentration will be established during the Remedial Design.

** Total CPAHs include Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.

EPA Region 4 regulates arsenic in soil as a systemic toxicant with a reference dose of 0.0003 mg/kg/day. The safe soil level for residential use that would not exceed this RfD for a child was determined in the Site's risk assessment to be 21.1 mg/kg. EPA also considers arsenic to be a carcinogen in the form that may occur in drinking water and has included an oral slope factor in its IRIS database. The application of the slope factor here, though not considered appropriate, would yield a calculated safe soil level for a child at the most protective 10^{-6} risk level of 0.46 mg/kg. The latter soil cleanup level for arsenic is likely to be achieved since soil containing arsenic above this level also contains other contaminants that will require remediation.

All Cleanup Standards have been derived from the Final Baseline Risk Assessment with the exception of Radium-226 which has been establish in accordance with the relevant and appropriate requirement (Federal Standards for the Cleanup of Land and Buildings Contaminated with Residual Radioactive Material 40 CFR 192).

7.0 DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

Remedial action alternatives were formulated to address the environmental contamination at the Site. Seven remedial action alternatives were considered for the Site through the Final Feasibility Study Report. The alternatives in this ROD address the source of contamination at the Site (Operable Unit 1). Alternative 6 will not be evaluated in this document since groundwater will be addressed in a separate operable unite. The seven considered remedial action alternatives include:

- Alternative 1: No Action with Continued Monitoring
- Alternative 2: Institutional Controls
- Alternatives 3a and 3b: Consolidation and Cover (Commercial and Residential)
- Alternatives 4a and 4b: Consolidation and Capping (Commercial and Residential)
- Alternatives 5a and 5b: Consolidation, Capping, and Saturated Zone Source Control (Commercial and Residential)
- Alternatives 7a and 7b: Consolidation, Stabilization, and Cover (Commercial and Residential).

Table 7-1
Response Actions and Associated Remedial Technologies Screening

General Response Action	Associated Remedial Technologies Considered after the Screening Process
<u>Elemental Phosphorus-Containing Material</u>	
No Action	None
Institutional Controls	Access restrictions Land use restrictions Groundwater monitoring
Treatment	Conversion to phosphoric acid Incineration Aqueous oxidation Low temperature air oxidation Stabilization/Solidification
<u>Site Soil</u>	
No Action	None
Institutional Controls	Access restrictions Land use restrictions Groundwater monitoring Groundwater use restrictions
Excavation/Consolidation	Excavation and Consolidation of affected soil
Containment	Capping/Cover Liner
Treatment	Stabilization/Solidification Volume reduction

A summary of how the alternatives address affected media and the associated technologies utilized are presented in Table 7-2.

<u>Alternative 1: No Action</u>

The No Action Alternative is carried through detailed evaluation as a point of reference to the other alternatives. For this FS, it is assumed that groundwater monitoring would be continued, even if no further remedial action were initiated.

<u>Alternative 2: Institutional Controls</u>

Institutional controls provide some degree of control of future land use. As was the case under the no action alternative, groundwater and surface water monitoring would be provided and in addition, the property fence would be maintained. In addition, deed restrictions would be placed on the property, which would not allow it to be developed for residential use, nor for any commercial activities requiring that personnel be assigned to the Site. Furthermore, the deed restrictions would preclude the installation of any groundwater wells in the surficial aquifer beneath the Site.

Alternative 3a: Consolidation and Cover (Commercial Use)

Alternative 3a, Consolidation and Cover, consists of the evacuation, consolidation, and cover of radiological and chemical waste material on-Site. All waste material, above commercial use action levels, would be consolidated in several different areas. By utilizing several areas the movement of contaminated material will be minimized. In addition to radiologically and chemically identified contaminated material, waste present in Ponds 39 and 42 along with other contaminated soil and waste would be excavated and placed in the consolidation areas. The consolidation areas would then be covered with a layer of soil, sufficient to reduce radiological exposure and support a vegetative cover to prevent wind or soil erosion of this material. Any existing locations of soil contamination, over which this soil cover would be placed, would not require excavation because the soil would be covered in place.

Radiologically contaminated material would be consolidated and covered in several locations if they exceed 5 pCi/g above background for surface soil. The areas above the surficial limit includes much of the developed Plant area. Areas where the 5 pCi/g above background criterion is exceeded are comprised of the slag processing area, roads, railroads, and parking lots.

As with the Institutional Controls Alternative, groundwater and surface water monitoring would be continued, and the fences which currently surround the entire property would be maintained. Notification of Site conditions would be included in the property deed to alert prospective buyers of Site conditions and deed restrictions would be implemented. These restrictions would prohibit future development of the covered pond areas, and would restrict the remainder of the Site to commercial use. A final restriction would be that no surficial groundwater wells, for any purpose, could be installed on any portion of the property.

Alternative 3b: Consolidation and Cover (Residential Use)

This alternative includes the same remediation activities and institutional controls noted for Alternative 3a, except that remediation action levels and deed restrictions would be based on future residential use of the Site. Compared to Alternative 3a, this alternative would require additional remediation of radiologically and chemically contaminated soil due to lower cleanup goals for residential use. Based on residential cleanup goals, radiologically contaminated material would be remediated if they exceed 5 pCi/g above background for soil, regardless of depths. The areas requiring remediation under the residential land use scenario encompass those for the commercial use scenario plus all soil that has radiation levels between 5 and 15 pCi/g at depths greater than 15 cm. In addition to the areas described for commercial use, an additional area in the west central portion of the Main Plant Area would require remediation at depth to meet the 5 pCi/g above background standard.

In addition to excavating and consolidating radiological contaminated material/soil and Ponds 39 and 42, soil exceeding a chemical carcinogenic risk level of 1×10^{-06} or a hazard index of 1.0 would also be excavated and placed in one of the consolidation areas. As noted in Alternative 3a, locations over which cover would be placed would not be excavated.

Alternative 4a: Consolidation and Capping (Commercial Use)

This alternative includes the same activities and institutional controls noted for Alternative 3a: excavation and consolidation of radiologically and chemically contaminated material/soil in several consolidation areas exceeding commercial use levels. However, under this alternative, the consolidated material in the main pond areas would be capped, rather than covered, to further decrease the potential migration of contaminants from the consolidated material into the surficial aquifer. A synthetic membrane and drainage system would be included as part of the cap.

In addition to reducing contaminant migration into the surficial aquifer, based on the Soil Cover Depth Study (WESTON, 1994a) findings, the cap would reduce gamma radiation exposure to someone working on the cap. Under the Consolidation and Capping Alternative, institutional controls would prevent the development of the capped area; therefore, reducing the gamma radiation exposure. Also, the synthetic membrane of the cap would reduce the escape of radon gas from the consolidation area.

As with the Institutional Controls Alternative, groundwater and surface water monitoring would be continued, and the fences which currently surround the entire property would be maintained. Notification of Site conditions would be included in the property deed to alert prospective buyers of Site conditions and deed restrictions would be implemented. These restrictions would prohibit

future development of the covered pond areas, and would restrict the remainder of the Site to commercial use. A final restriction would be that no surficial groundwater wells, for any purpose, could be installed on any portion of the property.

Alternative 4b: Consolidation and Capping (Residential Use)

This alternative includes the same activities and institutional controls noted for Alternative 3b: excavation and consolidation of radiologically and chemically contaminated material/soil found on Site exceeding residential use levels. However, under this alternative, the consolidated material at locations on-Site would be capped, rather than covered, to further decrease the potential migration of contaminants from the consolidated material into the surficial aquifer. The cap would be constructed in the same way as mentioned in Alternative 4a. Based on residential cleanup goals, radiologically contaminated material would be remediated if they exceed 5 pCi/g above background for soil, regardless of depths. The areas requiring remediation under the residential land use scenario encompass those for the commercial use scenario plus all soil that has radiation levels between 5 and 15 pCi/g at depths greater than 15 cm. In addition to the areas described for commercial use, an additional area in the west central portion of the Main Plant Area would require remediation at depth to meet the 5 pCi/g above background standard.

Alternative 5a: Consolidation, Capping, and Saturated Zone Source Control (Commercial Use)

This alternative includes the same activities and institutional controls noted for Alternative 4a (excavation, consolidation, and capping), plus a provision to further reduce contaminant migration to the surficial aquifer by in situ solidification, and subsequent immobilization, of contaminants within pond material that are below the water table. In situ solidification would be performed by injecting and mixing admixtures/binding agents into the saturated pond material to form a solid, low permeability matrix. Contaminants would be bound in the matrix, unable to migrate into the surficial aquifer..

As with the Institutional Controls Alternative, groundwater and surface water monitoring would be continued, and the fences which currently surround the entire property would be maintained. Notification of Site conditions would be included in the property deed to alert prospective buyers of Site conditions and deed restrictions would be implemented. These restrictions would prohibit future development of the covered pond areas, and would restrict the remainder of the Site to commercial use. A final restriction would be that no surficial groundwater wells, for any purpose, could be installed on any portion of the property.

Alternative 5b: Consolidation, Capping, and Saturated Zone Source Control (Residential Use)

This alternative includes the same activities and institutional controls noted for Alternative 4b (excavation, consolidation, and capping), plus the provision identified in Alternative 5a for in situ solidification, and subsequent immobilization, of pond material below the water table.

Based on residential cleanup goals, radiologically contaminated material would be remediated if they exceed 5 pCi/g above background for soil, regardless of depths. The areas requiring remediation under the residential land use scenario encompass those for the commercial use scenario plus all soil that has radiation levels between 5 and 15 pCi/g at depths greater than 15 cm. In addition to the areas described for commercial use, an additional area in the west central portion of the Main Plant Area would require remediation at depth to meet the 5 pCi/g above background standard.

Alternative 7a: Consolidation, Stabilization, and Cover (Commercial Use)

This activity is similar to Alternative 5a, where material below the water table was stabilized. Under Alternative 7a, all material in one of several consolidation areas would be treated by stabilization. This would include all soil, pond material, and slag material. In-situ stabilization would generally be used for material presently located within the pond area; ex-situ stabilization would be performed on excavated material. A combination of material stabilization and placement of a soil cover will reduce contaminant migration and shield low-level radiation.

As with the Institutional Controls Alternative, groundwater and surface water monitoring would be continued, and the fences which currently surround the entire property would be maintained. Notification of Site conditions would be included in the property deed to alert prospective buyers of Site conditions and deed restrictions would be implemented. These restrictions would prohibit future development of the covered pond areas, and would restrict the remainder of the Site to commercial use. A final restriction would be that no surficial groundwater wells, for any purpose, could be installed on any portion of the property.

Alternative 7b: Consolidation, Stabilization, and Cover (Residential Use)

This alternative would provide the same treatment and capping identified for Alternative 7a. However, the extent of soil excavated/stabilized would be expanded to meet residential use criteria.

Based on residential cleanup goals, radiologically contaminated material would be remediated if they exceed 5 pCi/g above background for soil, regardless of depths. The areas requiring remediation under the residential land use scenario encompass those for the commercial use scenario plus all soil that has radiation levels between 5 and 15 pCi/g at depths greater than 15 cm. In addition to the areas described for commercial use, an additional area in the west central portion of the Main Plant Area would require remediation at depth to meet the 5 pCi/g above background standard.

8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

8.1 Comparative Analysis - Nine Criteria

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in Section 121 of CERCLA, 42 USC 9621, and in the NCP, 40 CFR 300.430. The major objective of the feasibility study (FS) was to develop, screen, and evaluate alternatives for the remediation of the Site. A wide variety of alternatives were identified as candidates to remediate the contamination at the Site. These were screened based on the contaminants present and Site characteristics. After the initial screening, the remaining alternatives/technologies were combined into potential remediation alternatives and evaluated in detail. The selected remedial alternative emerged from the screening process using the following nine evaluation criteria:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Short-Term Effectiveness

- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, and Volume of Contaminants
- Implementability
- Cost
- State Acceptance
- Community Acceptance

The NCP Categorizes the nine criteria into three groups:

(1) *Threshold Criteria* - overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection;

(2) *Primary Balancing Criteria.* - long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; and cost are the primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies; and

(3) *Modifying Criteria* - state and community acceptance are the modifying criteria that are formally taken into account after public comments are received on the proposed plan and incorporated into the ROD.

The following analysis is a summary of the evaluation of alternatives for remediating the Site under each criteria. A comparison is made between each of the alternatives for achievement of a specific criterion.

8.2 Threshold Criteria

8.2.1 Overall Protection of Human Health and the Environment

With the exception of the No Action Alternative (Alternative 1) and the Institutional Controls Alternative (Alternative 2), all of the alternatives would provide protection for human health and the environment to some degree. Alternatives 3, 4, 5, and 7 would limit access and exposure. By simply consolidating and capping or covering the contamination, the contamination would still be available to be transported off-Site through the groundwater. Therefore, only alternatives 5 and 7 provide scenarios in which the source of contamination has been controlled. Alternatives 5 and 7 would limit the migration of contaminants and contain the contaminants within the Site boundaries.

8.2.2 Compliance with ARARs

The remedial action for the Site, under Section 121(d) of CERCLA, must comply with federal and state environmental laws that either are Applicable or Relevant and Appropriate Requirements

(ARARs). Applicable requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA Site. Relevant and Appropriate Requirements are those that, while not applicable, still address problems or situations sufficiently similar to those encounter at the Site and that their use is well suited to the particular Site. To-Be-Considered Criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While the TBCs do not have the status of ARARs, EPA's approach is to determine if a remedial action is protective to human health and the environment involves consideration of TBCs along with ARARs.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely on the basis of location . Examples of location-specific ARARs include state and federal requirements to protect floodplains, critical habitats, and wetlands, and solid and hazardous waste facility siting criteria. Table 8-1 summaries the potential location specific ARARs and TBCs for the Site.

Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by particular remedial activities that are selected to accomplish a remedy. Since there are usually several alternative actions for any remedial Site, various requirements can be ARARs . Table 8-2 lists potential action-specific ARARs and TBCs for the Site.

Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemically-specific ARARs include the MCLs specified under the Safe Drinking Water Act as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Since there are usually numerous contaminants of potential concern for any remedial Site, various numerical quantity requirements can be ARARs. Table 8-3 lists potential chemical-specific ARARs.

Alternatives 4, 5, and 7 met or exceed all ARARs (action-, location-, and chemical-specific). Alternative 4 currently meets surface water ARARs, but this alternative may not provide a permanent solution for the surface water. Alternatives 1, 2, 3, and 4 would leave the contamination in a state where it is still available to move off-Site through the surficial aquifer.

Table 8-1
Location-Specific ARARs

Applicable (A) or Relevant & Appropriate (R & A)	Citation	Comments
R & A	RCRA Disposal Subtitle D 40 CFR 258.40	Outlines top cover design criteria.
R & A	Land Disposal Restrictions 40 CFR Part 268	Identifies hazardous wastes that are restricted from land disposal and describes those circumstances under which an otherwise prohibited may be land disposed.
R & A	Endangered Species Act 42 USC 6901, 6905, 6912, & 6925	Only applies if threatened or endangered species or critical habitats of the endangered species are identified near the Site.
R & A	Coastal Zone Management Act 16 USC Sec.1951 et seq.	It is national policy to preserve, protect, and, when possible, restore costal land.
R & A	FDEP Solid and Hazardous Waste FAC 62-296.705	Regulations include closure and operations& maintenance requirements.
R & A	FAC 62-701.050	Regulations cover the criteria for the top cover design.
R & A	Rivers and Harbors Act of 1899(Section 10 Permit) 33 USC Sec 403	Requires that the substantive requirements of permits for work in affected navigable waters be met.
R & A	Floodplain Management Executive Order 11988, 40 CFR 6.302	Activities that occur in the floodplain should avoid adverse effect, minimize potential harm, and preserve natural and beneficial values.

Table 8-2
Action-Specific ARARs

Applicable (A) or Relevant & Appropriate (R & A)	Citation	Comments
A	Identification and Listing of Hazardous Waste 40 CFR Part261	Identifies those solid wastes which are subject to regulation as hazardous waste. Defines "hazardous waste" and "solid waste"
R & A	Generators of Hazardous Waste 40 CFR Part 262	Establishes Standards for generators of hazardous waste.
R & A	Transporters of Hazardous Waste	Establishes the responsibility of generators and transporters of hazardous waste.
A	Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities 40 CFR 264	Establishes minimum national standards for which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.

Table 8-3
Chemical-Specific ARARs

Applicable (A) or Relevant and Appropriate (R & A)	Citation	Comments
R & A	Federal Standards for the Cleanup of Land and Buildings Contaminated with Residual Radioactive Material 40 CFR 192	Establishes soil and waste standards for radioactive constituents at the Site.
To Be Considered*	National Oceanic and Atmospheric Administration (NOAA) (Effects Range Low, Effects Range Medium, & Effects Range High)	Guidance that evaluates sediment values.

Note that additional To Be Considered requirements are found in Section 9.2 Performance Standards.

8.3 Primary Balancing Criteria

8.3.1 Long-Term Effectiveness and Permanence

Alternatives 5 and 7 are effective and permanent, but both would require a period of time to reach a clean and safe condition. Alternative 4, as stated above, is not a permanent source control alternative. Under Alternative 4, the contamination remains uncontrolled and may allow a future release to the surface water.

8.3.2 Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative 4 would have a limited impact on the mobility of contaminants by slowing the horizontal migration of contamination. However, the toxicity and volume would not be reduced. Alternative 7 would be the most effective in immobilizing and shielding all the contaminants. Also, Alternative 7 contains the toxic material by binding these contaminants into a relatively impermeable matrix. This alternative does have one drawback - it would provide a dramatic increase in volume.

Alternative 5 provides the best balance of the feasible alternatives. By utilizing a top cover and solidification, Alternative 5 effectively contains the Site-related contamination. Toxic material is rendered immobile, and the volume increase would be limited and small compared to Alternative 7's increase.

8.3.3 Short-Term Effectiveness

Alternative 1 is the only alternative that is completely ineffective in the Short-Term. Alternative 2 which restricts access and places institutional controls on the Site would be effective in the Short-Term. Alternatives 3, 4, 5 and 7 would represent minor short-term risks related to excavation and construction activities.

8.3.4 Implementability

The implementability of an alternative is based on technical feasibility, administrative feasibility and the availability of services and material. Alternative 2 involves only access restrictions and deed restrictions, which are easily implemented, given a cooperative property owner. Alternative 3 and 4 are relatively easy to implement since most of the contaminated soil located in the top cover/consolidation area. Alternative 5 and 7 would require pilot studies and would require more additional work to complete their solidification components.

8.3.5 Cost

A summary of the present worth costs which include capital as well as operations and maintenance costs for each alternative is presented in Table 8-5.These cost were presented in the FS. The present worth costs to attain the recommended performance standards (**Section 9.2**) and to meet the requirements of the compliance testing (**Section 9.3**) must remain within the range which is considered accurate (+50% or -30% of the present worth cost).
Alternative 2 is the least costly alternative, other than the No Action alternative. Of the treatment alternatives, Alternative 5 is less expensive than Alternative 7 and affords the same level of protection. The residential scenarios are only slight more expensive than the commercial use scenarios, but the residential scenarios are found to be the more protective than the commercial scenarios.

8.4 Modifying Criteria

8.4.1 State Acceptance

The State of Florida, as represented by the Florida Department of Environmental Protection (FDEP), has been the support agency during the Remedial Investigation/Feasibility Study (RI/FS) process for the Site. In accordance with 40 CFR 300.430, FDEP as the support agency, has provided input during the process by reviewing and providing comments to EPA on all major documents in the Administrative Record. Based upon comments received from FDEP, it is expected that written concurrence will be forthcoming; however , letter formally recommending concurrence with EPA's selected remedy has not been received.

8.4.2 Community Acceptance

Based on written comments received during the extended comment period, it appear that the public would prefer off-Site disposal; even though, it may be more expensive, more difficult to implement, and riskier (may exposure them to the contamination). Atkemix Thirty-seven Incorporated (the PRP) commented that they preferred the commercial use as opposed to the residential use scenario. Zeneca does recommend Alternative 5. Specific response issues raised by the community and other interested parties are summarized in Appendix A, the Responsiveness Summary.

Table 8-4
Summary of Remedial Action Alternatives
for the Tarpon Springs Site

Alternative	Effectiveness	Implementability
1. No Action with Continued Monitoring		
• Under this alternative no remedial action will be conducted at the Site. • Long-term semi-annual groundwater and surface water monitoring will be conducted. • Inspection and maintenance of facility fence to restrict access to Site will be conducted.	• Compliance with ARARs will not be met. • Implementation of this alternative will cause no additional environmental impact. • This alternative will not provide an effective long-term solution for the Site. • Exposure to Site constituents will be limited by access restrictions. • Toxicity, mobility, and volume of contaminants are not changed in this alternative.	• Can be readily implemented. • No construction activities required.
2. Institutional Controls		
• Incorporation of features from the No Action with Continued Monitoring alternative with the addition of a caretaker. • Internal fences at the slag processing area and the main pond area. • Placement of deed restrictions prohibiting. - installation of groundwater supply wells. - excavation in designated areas where elemental phosphorus is known to exist. - development of any portion of the property for residential use. - development of any portion of the property for commercial/industrial use unless approved by EPA.	• Compliance with ARARs will not be met. • Implementation of this alternative will cause no additional environmental impact. • This alternative will substantially reduce the risk to human health in the long-term by: - insuring that the surficial aquifer will not be used in the future. - not allowing the Site to be used for residential use. - greatly restricting commercial or industrial future use. • Toxicity, mobility, and volume of contaminants are not changed in this alternative.	• Can be readily implemented. • No substantive construction activities required.

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Alternative	Effectiveness	Implementability
3a and b. Consolidation and Cover		
• Excavation and consolidation of on-Site contaminated soil. A soil cover will be placed over the consolidated material and the area will be fenced to restrict access. The consolidation area will include the entire main pond area, plus additional ground to the north. • Includes Excavation of Pond 39 and 42. • Deed restrictions: - prohibiting installation of groundwater supply wells. - restricting the property to commercial/industrial use only (Alternative 3a only; 3b allow residential use), - prohibiting excavation or development of the consolidation area. • Long-term semi-annual groundwater and surface water monitoring maintenance of facility fence, and grounds keeping.	• Compliance with radiological ARARs. For Alternative 3a (Commercial Use), this ARAR is expressed as a concentration that will result in a dosage equivalent to Alternative 3b (Residential Use). The capping, groundwater quality criteria, and surface water quality ARARs would not be met. • This alternative will substantially reduce the risk to human health in the long-term by: - isolating waste material from human and ecological contact. - insuring that the surficial aquifer will not be used in the future. - restricting the property to commercial use (Alternative 3a only). • A reduction in the mobility of the contaminants is achieved by excavating the slag processing area and Ponds 39 and 42, and by covering the consolidation area. • Toxicity and volume of contaminants are not changed in this alternative.	• Can be readily implemented. • Excavation and cover construction are conventional operations. • Shoring and slope stabilization may be required if groundwater is encountered during excavation activities. • In the short-term, implementation of this alternative can be achieved without adverse effects on the environment. However, actions will be taken to limit potential risks involved in excavation, transport, placement and covering of soil/material.

Alternative	Effectiveness	Implementability
4a and b. Consolidation and Capping		
• Incorporation of institutional controls and waste isolation features from the Consolidation and Cover alternative. However, this alternative provides a cap, rather than a cover soil, over the consolidation area. • The cap will comply with the FDEP regulations for capping solid waste management units.	• Compliance with radiological and capping ARARs. Groundwater quality in the surficial aquifer would improve, but the groundwater and surface water quality criteria ARARs would not necessarily be met. • This alternative will substantially reduce the risk to human health in the long-term by: - isolating waste material from human and ecological contact. - insuring that the surficial aquifer will not be used in the future. - restricting the property to commercial use (Alternative 4a only). • A reduction in the mobility of the contaminants is achieved by excavating the slag processing area and Ponds 39 and 42, and by capping the consolidation area. • Toxicity and volume of contaminants are not changed in this alternative.	• Excavation and capping are readily implementable construction procedures. • Shoring and slope stabilization may be required if groundwater is encountered during excavation activities. • In the short-term, implementation of this alternative can be achieved without adverse effects on the environment. However, actions will be taken to limit potential risks involved in excavation, transport, placement, and covering of soil/material.

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Alternative	Effectiveness	Implementability
5a and b. Consolidation, Capping, and Saturated Zone Source Control		
• Incorporation of features from the Consolidation and Capping alternative plus the additional remediation of pond material below the water table. • Before consolidation and capping, waste material in the ponds below the water table will be solidified in place.	• Compliance with radiological and capping ARARs. Groundwater and surface water quality ARARs will also be met, although not immediately. • This alternative will substantially reduce the risk to human health and the environment in the long-term by: - isolating waste material from human and ecological contact. - preventing use of surficial aquifer until the remedial action objectives are achieved. - restricting the property to commercial use (Alternative 5a only). • A reduction in the mobility of the contaminants is achieved by excavating Ponds 39 and 42, and the slag processing area, and capping the consolidation area. This, in conjunction with remediating the pond material below the water table, will prevent further contamination of the surficial aquifer. • Toxicity and volume of contaminants are not changed in this alternative.	• The excavation/capping portions of this alternative can be readily implemented for the same reasons as outlined in the previous alternative. In situ solidification is a readily available technology, provided by several vendors, although a pilot study will be required before solidification can begin. • In the short-term, implementation of this alternative can be achieved without adverse effects on the environment. However, actions will be taken to limit potential risks involved in excavation, transport, placement, and covering of soil/material.

Alternative	Effectiveness	Implementability
7a and b. Consolidation, Stabilization, and Cover		
• Incorporation of features from the Consolidation, Capping and Saturated Zone Source Control alternative (with the exception of cover instead of capping) plus the additional stabilization/solidification of all material in the consolidation area. • Stabilization/solidification of all consolidation material would include all soil, pond material, and slag material. In situ stabilization would generally be used for material presently located within the consolidation area; ex-situ stabilization would be performed on excavated material.	• Compliance with radiological ARARs. Groundwater and surface water quality ARARs will also be met, although not immediately. • This alternative will substantially reduce the risk to human health and the environment in the long-term by: - isolating waste material from human and ecological contact. - preventing use of surficial aquifer until the remedial action objectives are achieved. - restricting the property to commercial use (Alternative 7a only). • A reduction in the mobility of the contaminants is achieved by excavating Ponds 39 and 42, and the slag processing area, and by covering the consolidation area. This, in conjunction with stabilizing/solidifying the consolidation material, will prevent further contamination of the surficial aquifer. • Toxicity and volume of contaminants are not changed in this alternative.	• The excavation/cover portions of this alternative can be readily implemented for the same reasons as outlined in the previous alternatives. In situ and ex-situ stabilization/ solidification is a readily available technology, provided by several vendors, although a pilot study will be required before stabilization/ solidification can begin. • In the short-term, implementation of this alternative can be achieved without adverse effects on the environment. However, actions will be taken to limit potential risks involved in excavation, transport, placement, and covering of soil/material.

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Table 8-5
Cost Comparison of Remedial Action Alternatives

Alternative	Capital Cost ($)	Annual O&M Cost ($)	Present Worth Cost[a] ($)
1 - No Action with Continued Monitoring	0	31,250	540,000
2 - Institutional Controls	117,000	81,250	1,522,000
3 - Consolidation and Cover			
3a - Commercial Use	4,720,000	71,250	5,952,000
3b - Residential Use	4,769,000		6,001,000
4 - Consolidation and Capping			
4a - Commercial Use	6,903,000	71,250	8,135,000
4b - Residential Use	6,952,000		8,184,000
5 - Consolidation, Capping, and Saturated Zone Source Control			
5a - Commercial Use	8,075,000	71,250	9,307,000
5b - Residential Use	8,124,000		9,356,000
7 - Consolidation, Stabilization, and Cover			
7a - Commercial Use	32,991,000	71,250	34,223,000
7b - Residential Use	34,457,000		35,689,000

[a] Based on a 30 Year Operation with a net interest rate of 4%. Includes both capital and O&M costs.

9.0 SUMMARY OF SELECTED REMEDY

Based upon the comparison of alternatives in the feasibility study (FS) and upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, EPA has selected Alternative 5b (Consolidating, Capping, and Zone Source Control - Residential Use Scenario)for the Site. The selected alternative for the Site is consistent with the requirements of Section 121 of CERCLA and the NCP. Based on the information available at the time, the selected alternative represents the best balance among the criteria used to evaluate remedies. The selected alternative will reduced the mobility and contain the toxicity of the contaminants at the Site. In addition the selected alternative is protective of human health and the environment, will attain federal and state ARARs, is cost effective, and utilizes permanent solutions to the maximum extent practicable. The estimated present worth cost of the selected remedy is $9,356,000 and will take approximately 3 years to complete.

Actual or threatened release, if not addressed by the implementation of the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

9.1 Major Components of the Selected Alternative

The selected remedy includes Institutional Controls, Excavation/Consolidation, Capping, and Saturation Zone Source Control. Institutional Controls in the form of deed restrictions must be placed on the consolidation area to prevent any construction or other activity that would threaten the integrity of the selected remedy. A buffer zone (as determined in the Remedial Design) must be established around this consolidation area to limit access to this area. Since the contamination will be removed from the other areas of the Site and consolidated, these other areas which comply with the Performance Standards will not require institutional control; however, the property owner may voluntarily place deed restrictions or land use restrictions on the Site property. Site fences and security must be maintained at an adequate level to ensure the security of the Site and its remedy. The surface water must be monitored to ensure the source control remedy continues to be effective. All waste material and soil that exceeds any of the Performance Standards for the Site (Table 9-2) must be excavated and consolidated in the several consolidation areas. One of the possible consolidation areas includes the areas where the clarifier is found, the water tower area, the power house area, and the area where Ponds 44 through 51 are located..

This is the first of two operable units planned for the Site. This action addresses the source of the soil contamination by treating and containing the source material.

The major components of the selected remedy include:

- Excavation of radiologically and chemically contaminated material/soil which exceed Residential Cleanup Standards.
- Consolidation of the radiologically and chemically contaminated material/soil in the main

pond area. A Top Cover Cap which meets Florida's FAC 62-701.050 must be placed over the Consolidation Area.

- Institutional Controls must be placed on the Site. Institutional controls must include deed restrictions, land use ordinances, physical barriers, and water supply well permitting prohibitions. These restrictions will limit access to the Site and prohibit the disturbance of the remedy.

- Source Control will require the Insitu Solidification/ Stabilization of pond material and contaminated soil below the water table.

The total present worth cost for the selected remedy as presented in the feasibility study is $9,356,000.

9.2 Performance Standards

The performance standards for source remediation are based on the protection of the ground water and/or protection of human health (**Table 9-1 - Performance Standards: Remedial Goals**). The entire Site is considered an Area of Concern and a Corrective Action Management Unit under the Resource, Conservation, and Recovery Act (RCRA).

9.2.1 Performance Standards - Cap

The selected remedy must adhere to the FDEP Land Disposal Requirements which are presented in FAC 62-701.050. FDEP requires that unlined landfills specify a final cover consisting of a final 18-inch thick layer of soil that will sustain vegetation to control erosion and placed on top of a barrier layer which has a permeability of 1×10^{-7} or less.

9.2.2 Performance Standards - Solidification

The Solidification Stabilization must utilize an binding mixture that meets the following criteria: a compressive strength of 100 psi, a permeability equal to 1×10^{-6}, pass the Toxicity Characteristic Leaching Procedure (TCLP) Test for Arsenic, and pass the SPLP Test for Arsenic. All design specifications will be will be developed through the remedial design process as to achieve performance standards.

9.2.3 Performance Standards - Design

The design and construction of the selected remedy must be conducted in accordance with all ARARs, including the RCRA requirements set forth in 40 CFR. Part 264 (Subpart F), 40 CFR Part 268, and 40 CFR Part 264. See table 8-1, 8-2, and 8-3 for a detailed description of the Performance Standards which are listed as ARARs.

Table 9-1
Performance Standards: Remedial Goals

Soil/Waste Contaminant	Maximum Concentration Detected (mg/kg)	Remedial Cleanup Goals (mg/kg)
Arsenic	127	#
Antimony	32.3	28.1
Beryllium	1.6	0.192
Elemental Phosphorus	0.854	1.4
Thallium	13.4	1.4
Radium-226 (Lead-210)*	73.8 pCi/g	5 pCi/g
Total CPAHs **	–	0.089

* Note that this cleanup level is measured above the background (normal) concentration. The background (normal) concentration will be established during the Remedial Design.

** Total CPAHs include Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.

EPA Region 4 regulates arsenic in soil as a systemic toxicant with a reference dose of 0.0003 mg/kg/day. The safe soil level for residential use that would not exceed this RfD for a child was determined in the Site's risk assessment to be 21.1 mg/kg. EPA also considers arsenic to be a carcinogen in the form that may occur in drinking water and has included an oral slope factor in its IRIS database. The application of the slope factor here, though not considered appropriate, would yield a calculated safe soil level for a child at the most protective 10^{-6} risk level of 0.46 mg/kg. The latter soil cleanup level for arsenic is likely to be achieved since soil containing arsenic above this level also contains other contaminants that will require remediation.

The Remedial Goals have been derived from the Final Baseline Risk Assessment with the exception of Radium-226 which has been establish in accordance with the relevant and appropriate requirement (Federal Standards for the Cleanup of Land and Buildings Contaminated with Residual Radioactive Material 40 CFR 192).

9.3 Compliance Testing

Surface water monitoring will be conducted at the Site. After the remedy has been completed the Site will be evaluated and samples will be collected to verify that Site soil have been remediated. Site soil outside of the consolidation area must meet the Performance Standards (Table 9-1). The exact locations and sampling plan will be outlined in the Remedial Design/Remedial Action. If monitoring indicates that the remedy is no longer effective or the Site contamination is being released into the surface water additional remedial action measures may be required.

10.0 STATUTORY DETERMINATION

Under Section 121 of CERCLA, 42 USC 9621, EPA must select remedies that are protective of human health and the environment , comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions or permanent treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous waste as their principle element. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

The selected remedy provides protection of human health and the environment by eliminating reducing, and controlling the risks through engineering controls and/or institutional controls and soil treatment as delineated through the performance standards described in Section 9.0 - **SUMMARY OF THE SELECTED REMEDY**. The residual risk due to individual contaminants will be reduced to a probability of 1×10^{-6} for carcinogens and a hazard Quotient of 1 for non-carcinogens. The residual carcinogenic risk at the Site, which is the sum of individual carcinogenic risks, will be reduced to acceptable levels (i.e., cancer risks between 1×10^{-4} and 1×10^{-6})once performance standards are achieved. The implementation of this remedy will not pose an unacceptable Short-Term risks or cross media impact.

10.2 Attainment of Applicable or Relevant and Appropriate Requirements (ARARs)

Remedial actions performed under Section 121 of CERCLA , 24 USC. 9621, must comply with all applicable or relevant and appropriate requirements (ARARs). All alternatives considered were evaluated on the basis of the degree to which they complied with these requirements. The selected remedy was found to meet ARARs identified in Table 8-1 through 8-3. The following is a short narrative explaining the attainment of relevant ARARs.

Chemical-Specific ARARs
Performance Standards are consistent with the ARARs identified in Table 8-3.

Action-Specific ARARs
Performance Standards are consistent with the ARARs identified in Table 8-2.

Location-Specific ARARs
Performance Standards are consistent with the ARARs identified in Table 8-1.

The selected remedy is protective of species listed as endangered or threatened under the Endangered Species Act . The requirements of the Interagency Section 7 Consultation Process b50 CFR Part 402, will be met. The Department of Interior, Fish and Wildlife Services, will be consulted during the Remedial Design to ensure that the endangered and threatened species are not adversely impacted by the implementation of the remedy.

Waivers
Waivers are not anticipated at this Site at this time.

10.3 Cost Effectiveness

After evaluating all alternatives which satisfy the two threshold criteria, protection of human health and the environment and attainment of ARARs, EPA has concluded that the selected remedy, Alternative 5b affords the highest level of overall effectiveness proportional to its cost. Section 300.430(1)(ii)(D) of the NCP also requires EPA to evaluate three out of five balancing criteria to determine the overall effectiveness: long-term effectiveness and permanence; reduction of mobility, toxicity, or volume through treatment and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. The selected remedy provides for overall effectiveness proportional to its cost.

The selected remedy has a moderate present worth, capital, and operation and maintenance cost compared to other remedies, and best satisfies the criteria for long-term effectiveness and permanence and short-term effectiveness. This alternative will reduce toxicity, mobility, or volume through treatment.

The estimated present worth costs for the soil/source selected remedy is $9,356,000.

10.4 Utilization of Permanent Solution to the Maximum extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final remediation at the Site. Of those alternatives that are protective of human health and the environment and comply with the ARARs, EPA has determined that Alternative 5b provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment.

10.5 Preference for Treatment as a Principal Element

The statutory preference for treatment is satisfied by the selected remedy.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

Two significant differences have been added to the selected remedy, Alternative 5b, from the preferred remedy described in the proposed plan. The addition of Asbestos to the list of Potential Contaminants of Concern is the first significant difference from the proposed plan. This change was necessitated by the detection of Asbestos on-Site. The second significant difference allows for flexibility in the design and construction of consolidation areas. The ROD permits the creation of one or more than one consolidation areas on-Site. The actual determination will be presented and documented in the Final Remedial Design.

Responsiveness Summary

Appendix A

Responsiveness Summary

The U.S. Environmental Protection Agency (EPA) originally established a public comment period from May 29, 1996, through August 29, 1996 in order to allow the public an opportunity to comment on the Proposed Plan for Operable Unit One for the Stauffer Chemical Company, Tarpon Springs, Superfund Site (Site). At the request of Pi-Pa-Tag (the Technical Assistance Grant Group set up to aid the community), the public comment period was extended through September 16, 1996. The comment period followed a public meeting held on May 29, 1996 at the Gulfside Elementary School. At the public meeting, EPA presented the Proposed Plan for Remedial Action for the Site for Operable Unit One. The meeting presented the results of the studies undertaken and the preferred remedial alternative for Operable Unit One for the Site.

This Responsiveness Summary provides a summary of the citizens comments and concerns as raised during the comment period. Public comments are specifically addressed through EPA responses. All comments summarized by this document have been factored into the final decision for the cleanup of the Site.

This responsiveness summary for the Stauffer Chemical/Tarpon Springs Site is divided into the following sections:

I. Overview This section discusses the recommended alternative for remedial action and the public response to this alternative.

II. Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns regarding the Site.

III. Summary of the Major Questions and Comments Received During the Public Comment Period This section presents written comments submitted during the public comment period, and provides responses to these comments.

IV. Remaining Concerns This section discusses community concerns that EPA should be aware of in design and implementation of the remedial action alternative for the Site.

I. Overview

The preferred remedial alternative was presented to the public in a fact sheet released April 29, 1996, and presented to the public at the proposed plan public meeting on May 29, 1996. The recommended alternative addresses the source of the contamination by excavating the contaminated material, consolidating it, solidifying the material that is below the water table, and capping the contaminated material.

In general, the community favors the selection of the recommended alternative. However, the community is concerned about the height of the mound containing the consolidated material. Some community members recommended that the waste be sent off-site to a disposal facility.

II. Background on Community Involvement

The Tarpon Springs community has been aware of the contamination at the Site for several years. The Site operated in this community from 1947 through its shutdown in 1987. The first fact sheet was distributed to the community by EPA in March 1993. A total of four public meeting have been held by EPA to solicit public input in the decision-making process. Interviews have been conducted with members of the Tarpon Springs community.

At the fourth public meeting, on May 29, 1996, the recommended alternative was presented to the community. Sampling results, the Remedial Investigation, the Feasibility Study, and alternatives for the cleanup were discussed at this meeting. EPA answered specific questions and informed the public that their comments will be addressed in the responsiveness summary.

At the meeting the key issues and concerns were as follows:

- Off-site Disposal of Contaminated Material. Many of the residents of the surrounding community recommended that EPA excavate and transport all contaminated material to a an off-Site landfill. Many of these citizens voiced their opinion that the hazardous waste should be dug up and transported out of their community.

- Cap the Contaminated Material. Meyer's Cove residents recommended that EPA not move the contaminated material, but only cover it in place. These residents are very concerned that the contamination will become airborne. Some residents expressed concern about the proposed location of the consolidated zone and the height of the resulting mound of consolidated material.

III. Summary of the Major Questions and Comments Received During the Public Comment Period

Thirty-six letters were received during the extended comment period, including two letters that requested an extension to the comment period. Many of the comments and suggestions were the same although they were sent by different individuals or groups. These duplicated comments will be addressed only once in this summary. Topics relevant to the selected remedy are addressed in this summary. Comments related to the Remedial Design phase of the Superfund process will be addressed when the Remedial Design documents are written, finalized, and approved.

Comment #1: Several comments stressed that the material should not be moved. They stated that it should be left in place and "not disturbed".

EPA Response #1: One of the nine balancing criteria used to evaluate the selected remedy is the **Reduction in Toxicity, Mobility, or Volume through Treatment**. The consolidation and solidification/stabilization is needed to fulfill this requirement. To address the communities concern, EPA has modified the remedy proposed in the Proposed Plan by creating more than one consolidation area. By making this change, the movement of hazardous substances is kept to a minimum. Some movement of hazardous substances will be necessary to bring the Site from an uncontrolled state to a controlled state.

Comment #2: Several letters expressed concerns about the health and welfare of the children, faculty, and staff at Gulfside Elementary School.

EPA Response #2: Every practical precaution will be taken to ensure the safety of the children, faculty and staff at the elementary school. Also, precautions will be taken to protect the surrounding residents.

Comment #3: Many of the comments received during the public comment period were related to the Remedial Design (top cover design, engineering controls, real-time air monitoring, siren/alarm, dust suppression, etc.).

EPA Response #3: EPA will address all issues that pertain to the Remedial Design during the next phase of the Superfund process. Design details and specifications will be presented in the Final Remedial Design.

Comment #4: A number of letters commented that EPA should remove the hazardous material from the Site either by sea, by rail, or by truck.

EPA Response #4: As presented previously in the feasibility study, off-site disposal was eliminated through the screening process. First, the excavation and removal of all contaminated hazardous substances would not be protective of human health and the environment. In fact due to the presence of elemental phosphorus and radium-226 which is air reactive, the excavation of all hazardous substances and contaminated soil would create an even greater hazard than the one that currently exists at the Site. Contaminated substances would have a greater opportunity to be released to the atmosphere. Second, the cost as documented in the feasibility study make the option impractical (the low cost estimate = $200 Million and the high cost estimate = $1.6 Million). Third, the truck traffic would be extremely high (15,000 trucks per year). Fourth, transportation by rail and by truck would unnecessarily expose or potentially expose residences in Tarpon Springs and other communities to hazardous substances. Finally, after considering all of these factor, EPA views the off-site alternative as inappropriate and unsafe. EPA rejects this alternative.

Comment #5: A few comments mentioned the fact that EPA's decision was based on old demographic data. Also, many commented that they felt that residential cleanup standards should be used.

EPA Response #5: EPA has made the decision to use residential cleanup standards which are the most conservative available. The fact that EPA is using the most stringent standards possible makes the question of demographics irrelevant.

Comment #6: A few groups asked EPA to extend the public comment period.

EPA Response #6: EPA granted an extension from August 29, 1996, until September 16, 1996.

Comment #7: Several people commented that the height and the aesthetics of the consolidation area were unacceptable.

EPA Response #7: In an effort to provide flexibility in the design and to minimize the release of hazardous substances to the environment, EPA has added flexibility to the ROD to allow more than one consolidation area to be created. A final decision concerning the number of consolidation areas will be decided during the Remedial Design phase.

Comment #8: A few comments were made concerning the groundwater (the surficial and the Floridan aquifers).

EPA Response #8: Since groundwater will not be addressed by this operable unit, comments concerning the groundwater will be addressed in a subsequent (second) Record of Decision.

Comment #9: One person commented that the consolidation area may collapse into the Floridan Aquifer.

EPA Response #9: The hydro-geologic studies that have been performed do not indicate that this is a likely outcome. On the contrary, the semi-confining layer should support the consolidation areas proposed for the Site. There is no evidence that the consolidation areas will created an unnecessary burden on the confining layer.

Comment #10: A few residents of Myers Cove wrote and expressed concern about how the remediation would affect their property and their health.

EPA Response #10: EPA will make every effort to ensure the safety of the Meyers Cove residents. Engineering controls will be specified in the Remedial Design.

Comment #11: One person commented that she was concerned that the Site may have been used for military exercises.

EPA Response #11: The fact that the Site may have been used for military exercises is not relevant to the cleanup of the Site. The investigation conducted for this Site was comprehensive and was independent of any biases. The contamination that exists has been documented by collecting samples using the full scan of constituents.

Comment #12: One letter received during the comment period commented that a building moratorium should be placed on the property and permits in the area should be restricted.

EPA Response #12: Deed restrictions will be placed on the property once the Remedial Action has been completed. Permits and zoning are under the jurisdiction of the county and other local government agencies.

Comment #13: One person stated that he was concerned that the Potentially Responsible Party (PRP) was monitoring the Site as opposed to EPA monitoring the Site. He suggested that EPA take a more active role in monitoring the Site.

EPA Response #13: EPA has collected samples in all media at the Site, and EPA collected split samples during the Remedial Investigation. The nature and extent of contamination at the Site is well known and well documented. EPA will continue to monitor the situation and if conditions change appropriate actions will be taken.

Comment #14: One letter commented that the 1×10^{-6} risk level should not be used at the Site. The letter also included several attachments supporting this statement. The letter asked EPA to consider utilizing a commercial/industrial scenario and cleaning to the 1×10^{-4} risk level.

EPA Response #14: EPA views the risk level of 1×10^{-6} as appropriate. The proximity of the elementary school and other sensitive populations must be protected.

Comment #15: One letter suggested several action levels for different chemicals of concern.

EPA Response #15: EPA considered all suggestions; however, no changes were recommended by the EPA which are less stringent than the 1×10^{-6} risk level.

Comment #16: One group asked where the slag material generated at the Site was transported?

EPA Response #16: Some slag material remains on-Site and will be consolidated with other contaminated materials. EPA is currently investigating the off-Site locations where the Stauffer material may have been deposited.

Comment #17: One group stated that there has never been a health survey to determine how many people were affected by this Site.

EPA Response #17: The Agency for Toxic Substance and Disease Registry (ATSDR) is the agency that addresses health related issues. ATSDR has begun the notification process. The notification process included contacting the former employees of the Site and informing them that the Site is on the National Priorities List.

Comment #18: Another group asked - Can it be guaranteed without a shadow of a doubt that no contamination exists on the areas not included in the remediation plans including the groundwater beneath them?

EPA Response #18: Although EPA does not provide guarantees, EPA has conducted extensive sampling of soil and groundwater. EPA will outline specific plans to cleanup the soil within the RD. Remediation of the groundwater will be handled through a separate ROD (Operable Unit 2).

Comment #19: Another group asked - What has been the experience of dealing with similar phosphate site? Where are these sites and how have they been cleaned up?

EPA Response #19: EPA Region 4 has consulted with other Region's that have handled similar phosphate sites and has considered the information received in formulating cleanup options for this Site. However, it is EPA's policy not to directly compare one site to another, but instead to judge each site on a site-specific basis using the Nine Criteria evaluation method as specified by the National Contingency Plan, 40 CFR 300.430.

Comment #20: Another question asked - What will be the effect of the proposed desalination plant on this Site?

EPA Response #21: The construction and operation of a desalination plant should have no effect on the remediation of the Site, and the remediation of the Site should have no effect on the plant.

Comment #21: One comment stated that there was a large pit that was used for disposal. The group wanted to know - what will be done to this area?

EPA Response #21: This comment is ambiguous and unclear as to where the "pit" is located. If the intent of the comment was to ask about a pit on-Site, then it will be cleaned up and addressed during the Remedial Action at the Site. If the comment was directed towards an area off-Site, further investigation would be necessary. All disposal areas on-Site will be addressed as part of the Remedial Action.

Comment #22: Another person asked - How will the horizontal movement of the contaminated water be dealt with when solidification is carried out?

EPA Response #22: By eliminating the source of contamination by solidifying it in a matrix that has a low permeability, the volume of contaminated groundwater will decrease. Groundwater will be specifically addressed in the next operable unit ROD.

Comment #23: Another group wanted to know - How many sites did Stauffer pollute?

EPA Response #23: To ascertain information about other sites that Stauffer Management Company (SMC) owns, SMC has been contacted. The answer to this question will be made available to the public.

Comment #24: A group asked - Have you contacted the union in order to contact former employees of Stauffer?

EPA Response #24: Health related issues are addressed by ATSDR.

Comment #25: Another asked - Who will carry out the Five Year Review?

EPA Response #25: Five year reviews will be necessary for this Site because contamination will be left on Site above levels that allow for unlimited use and unrestricted exposure. EPA will compile the documentation for the Five Year reviews. It is too early in the process to predict who will collect samples.

Comment #26: Another question asked - Who will decide who will perform the remediation work?

EPA Response #26: This question will be determined once the Consent Decree negotiations for the Remedial Design/Remedial Action are completed. If a Potentially Responsible Party (PRP) signs the Consent Decree, then the PRP will conduct the RD/RA with EPA oversight.

Comment #27: Finally, one group asked - Since it appears that many questions cannot be answered before the RD, how can the best option be chosen?

EPA Response #27: Many of the questions posed to EPA can only be answered when the final RD is written and approved. As stated earlier, the nine criteria comparative analysis was used to evaluate cleanup alternatives.

IV. Remaining Concerns

EPA believes that all relevant issues that have been raised are addressed in this responsiveness summary.