UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

DECLARATION FOR THE RECORD OF DECISION

PICILLO FARM SITE
COVENTRY, RHODE ISLAND

STATEMENT OF PURPOSE

This Decision Document presents the selected remedial action for the Picillo Farm Superfund Site in Coventry, Rhode Island, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601 et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as amended, 40 C.F.R. Part 300. The Region I Administrator has been delegated the authority to approve this Record of Decision (ROD).

The State of Rhode Island has concurred with the selected remedy.

STATEMENT OF BASIS

This decision is based on the Administrative Record which has been developed in accordance with Section 113(k) of CERCLA and which is available for public review at the Coventry Public Library, 1672 Flat River Road, Coventry, Rhode Island, and at the Region I Waste Management Division Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix E to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for the Picillo Farm Site, which includes both source control and management of migration components to obtain a comprehensive remedy.

The major components of the selected source control remedy include:

- In situ enhanced vacuum extraction of contaminated soil to remove volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Activated carbon air emission control technology will prevent the transfer of VOCs and SVOCs from the soil to the atmosphere. Soil cleanup levels are predicted to be achieved within an estimated 3 years of operation. A pilot test will be conducted as part of the design to optimize the system prior to the full scale operation;

- Excavation and off-site disposal of surface soil contaminated with polychlorinated biphenyls (PCBs);

- Access restrictions to the source area, such as fence construction; and

- A soil monitoring program to demonstrate compliance with soil cleanup levels and a performance monitoring program to evaluate the effectiveness of the enhanced vapor extraction system and the need to adjust or modify operating parameters of the system.

The major components of the selected management of migration remedy include:

- Extraction of contaminated ground water from the overburden and shallow bedrock aquifers using extraction wells;

- Treatment of contaminated ground water using ultraviolet (UV)/oxidation with activated carbon adsorption. The treated water would be reinjected into the aquifer or discharged to the surface waters. Contingent upon cost estimates during design, EPA may implement air stripping with activated carbon air emission controls in place of UV/oxidation treatment technology;

- An environmental monitoring program to evaluate the extent of contamination over time; to demonstrate compliance with ground water and surface water cleanup levels and the need to adjust or modify operating parameters of the system. The monitoring program shall operate until the ground water and surface water are restored to the drinking water standards and are protective of human health and the environment, which is predicted to occur within approximately 20 years.

- Institutional controls to prevent the use of contaminated groundwater and surface water as a drinking water source until the cleanup levels are met.

DECLARATION

The selected remedy is protective of the human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that utilize treatment as a principal element to reduce the toxicity, mobility, or volume of hazardous substances. In addition, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Sept 27, 1993
Date

Paul Keough
Paul G. Keough
Acting Regional Administrator
U.S. EPA, Region I

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

RECORD OF DECISION

PICILLO FARM SITE
COVENTRY, RHODE ISLAND

SEPTEMBER 27, 1993

RECORD OF DECISION SUMMARY
PICILLO FARM SITE

TABLE OF CONTENTS

Contents | Page Number

RECORD OF DECISION SUMMARY
PICILLO FARM SITE

TABLE OF CONTENTS

Contents | Page Number

RECORD OF DECISION SUMMARY
PICILLO FARM SITE
SEPTEMBER 27, 1993

I. SITE NAME, LOCATION AND DESCRIPTION

The Picillo Farm Site is located on Piggy Hill Lane in Coventry, Rhode Island, southwest of the intersection of State Highway 102 and Perry Hill Road (Appendix A, Figure 1). Coventry is a town of approximately 31,000 residents and is located approximately 20 miles southwest of Providence. The Site was listed on the National Priority List (NPL) in September 1983. The Site includes the 7.5-acre disposal area where illegal disposal activities had been documented, which is currently fenced, and, based on the extent of contamination, approximately 35 acres of surrounding woodland and wetland areas.

The Site is located in a rural area and is surrounded by mixed woods and wetlands. Approximately 40 houses are located within a one mile radius north, northeast and east of the disposal area, along Perry Hill Road, West Log Bridge Road, and Victory Highway, with the closest two residences located on the Picillo Farm property, approximately 1,300 feet north from the disposal area boundary. A new development is being built along West Log Bridge Road northeast of the Site, with new houses as close as 2,000 feet from the disposal area. All these residences are served by private wells.

The disposal area is situated just west of the surface-water divide, which separates the Pawtuxet River watershed to the east from the Quinebaug River watershed to the west. The disposal area is an upland field located on the northwest slope of a broad, flat, northwest-sloping ridge. The Picillo Farm lies one mile west of the Quidnick Reservoir, which is used for recreational purposes. An Unnamed Swamp, bordering the Site to the west, drains into Whitford Pond and Great Cedar Swamp, located approximately one mile southwest of the farm. The wetlands and surface waters adjacent to the Site are considered Class A waters according to the Rhode Island Water Quality Regulations for Water Pollution Control.

The Site is underlain by unconsolidated overburden materials which include glacial outwash deposits ranging from 20 to 80 feet in thickness. The deposits consist primarily of fine to coarse sand and gravel with scattered boulders in upland areas and organic-rich swamp deposits in some lowland areas. Lenses of silty sand and clay have been observed at some locations but are not common.

Compact boulder-rich till consisting of a poorly sorted mixture of sand, gravel, silt and boulders underlies much of the Picillo study area. The till unit varies in thickness from 5 to 40 feet and is laterally discontinuous. A thick unit of boulders present in till often obscures the true bedrock surface. Silt-rich till rather than boulder-rich till was observed in portions of the disposal area, ranging from less than a few feet thick to more than 20 feet thick.

The glacial deposits are underlained by a generally highly fractured and weathered bedrock. From bedrock core observations it appears that ground water flows through fractures as well as through the weathered rock matrix. The remedial investigation (RI) determined that approximately 10 to 40 feet of weathered bedrock overlies competent bedrock in most locations. The degree of weathering and fracturing in bedrock varies considerably throughout the Site. Boring logs from two deep bedrock wells to the northwest and southwest of the disposal area show heavily weathered bedrock to ten feet below the bedrock surface and fractured and weathered zones to depths of over 100 feet. For the most part, the RI defined shallow bedrock as the uppermost 20 feet of bedrock.

Several significant features of the bedrock surface beneath the Site (Appendix A Figure 2) are: (1) a bedrock trough which extends from the northeast portion of the disposal area in a northeast direction and forms a bedrock low under a small pond on the Picillo Farm property in the vicinity of monitoring wells MW-35 and MW-59; (2) fractures extending in a north-northwest direction from the pond up to Perry Hill Road; (3) a local bedrock topographic high under the disposal area from which the bedrock slopes toward the west, north and east; and (4) a northeast-southwest treading fracture system underneath the Unnamed Swamp drainage. The highest bedrock elevations occur in the western portion of the disposal area and to the south of the disposal area. Bedrock lows coincide for the most part with surface water bodies in the area. Outcroppings of bedrock are also found throughout the area.

The unconsolidated sands and gravels are highly permeable with moderate to high hydraulic conductivities. Sand and silt mixtures are less permeable and have lower conductivities. Most of the till encountered at the Site contains predominantly sand, gravel and boulders, instead of fine silts and clays, and is moderately permeable. By contrast, the clay lenses and silt lenses appear to act as semi-permeable layers in highly localized areas. Weathered shallow bedrock, especially to the west, northwest and southwest of the disposal area has a moderate to high permeability. Less weathered shallow bedrock to the east and south of the disposal area, is much less permeable. Ground water flow in the competent bedrock takes place primarily in interconnected networks of fractures.

The predominant direction of overland runoff and ground water flow in the unconsolidated deposits and shallow weathered bedrock is from the disposal area toward west and southwest. Most of the ground water discharges into the Unnamed Swamp and Great Cedar Swamp; surface water flow in these water bodies is south and southwest. Ground water flow in the deep, more competent bedrock is controlled by the fractures and the bedrock matrix. Deep bedrock, shallow bedrock and overburden are found to be hydraulically connected, thus the ground water can readily move between the unconsolidated sediments and the bedrock.

A more complete description of the Site can be found in the Picillo Farm Remedial Investigation Report, December 1992 (RI Report), in Sections 1 and 3.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

The characterization of current land use was performed through the interpretation of aerial photographs, zoning maps and site visits. The Site is located in a central rural section of Rhode Island, is removed from metropolitan areas and is currently zoned for rural/residential use. In 1988, because of the concerns about Site contamination, the Town of Coventry placed a moratorium on building near the Site. A year later, a local developer successfully challenged the moratorium in court resulting in residential development in the vicinity of the Site. As a potential future land use, EPA considered residential development of upland portions of the Site and continued recreational use of the wetlands on the Site.

The Picillo Farm property had been used as a pig farm when drums containing hazardous wastes and bulk wastes were illegally disposed into several trenches within a 7.5-acre area of the farm over a period of months in 1977. Wastes disposed of at the Site included industrial solvents, oils, pesticides, PCBs, paint sludges, resins, still bottoms, and other hazardous materials. The total volume of the materials disposed at the Site is unknown. In September 1977 a sodium aluminum hydride explosion and fire at the Site brought the dumping activities to the attention of regulatory agencies.

Since September 1977, a number of investigations and remedial activities have been conducted at the Site. The State of Rhode Island and EPA engaged in joint cleanup activities/supervision and single-party cleanup activities/supervision. Between 1980 and 1982 the trenches located along the perimeter of a cleared field -- the northeast trench, northwest trench, west trench, south trench, and two slit trenches -- were excavated, approximately 10,000 drums and contaminated soil were removed and disposed off site. Some of the contaminated soil from this excavation was placed in three stockpiles on the Site and was designated as the PCB pile and the first and second phenol piles (Appendix A, Figure 3). In 1982, a RIDEM contractor performed land farming of the first phenol waste pile and decreased the phenol concentration from approximately 870 ppm to 60 ppm. Pilot studies conducted by RIDEM on the biodegradation of the soils contaminated with polychlorinated biphenyls (PCBs) proved to be unsuccessful.

In 1985, after conducting a Remedial Investigation/ Feasibility Study (RI/FS), EPA issued a Record of Decision (ROD) which called for disposal of contaminated soil in an on-site RCRA landfill. The State of Rhode Island contested the ROD, and in 1987, following the enactment of the Superfund Amendments and Reauthorization Act (SARA), EPA issued an amended ROD. The amended ROD called for the off-site disposal of stockpiled contaminated soil and the implementation of the Remedial Investigation/Feasibility Study (RI/FS) to determine the nature and extent of the residual contamination and to evaluate cleanup alternatives. In 1988, under an agreement with EPA, four of the Potentially Responsible Parties (PRPs) performed the off-site removal of the contaminated soil and site closure activities: filling, grading and revegetating the Site, constructing of a surface water runoff control system, and installing a fence.

A more detailed description of the Site history can be found in the RI Report, Sections 1 and 3.

B. Enforcement History

EPA initially proposed the Site for the NPL on October 23, 1981. On December 15, 1981, EPA notified approximately ten (10) parties who either owned or operated the facility, generated wastes that were shipped to the facility, arranged for the disposal of wastes at the facility, or transported wastes to the facility of their potential liability with respect to the Site and requested them to undertake the clean-up of the Site. On January 20, 1983, EPA notified approximately twenty (20) parties of their potential liability. Follow-up notice letters were sent to approximately eleven (11) parties on April 12, 1983, and approximately nineteen (19) parties on April 17, 1985 inviting them to participate in settlement negotiations. Negotiations commenced with these potentially responsible parties (PRPs) on May 3, 1985 regarding the settlement of the PRP's liability at the Site and continued in 1985 and 1987. On October 27, 1987, EPA notified approximately seventeen (17) additional parties of their potential liability with respect to the Site and the on-going negotiations with a group of PRPs.

These substantial negotiations resulted in four (4) settlements agreements with twelve parties for a total recovery of $1.6 million in EPA's past costs, plus an agreement by four of the parties to perform a source control remedial action specified in the 1987 Record of Decision. Rhode Island also recovered some of its past costs under these settlements.

In October 1989, EPA filed a lawsuit against two non-settlers to recover the remainder of its past costs. Pursuant to the March 1992 court judgment, EPA received a total of nearly $4 million toward cleanup of the Site. The court found the parties liable with respect to the Site and upheld EPA's authority to pursue responsible parties for the cost of cleanup actions performed by the government.

On March 8, 1993, EPA notified approximately 17 parties of their liability or potential liability and requested their voluntary participation in the remaining cleanup activities.

The PRPs have been active in the remedy selection process for the ground water contamination at the Site. In 1992 and 1993 EPA met several times with the PRPs' technical committee to discuss the findings of the RI/FS. Technical comments presented by PRPs during the public comment period are included in the Administrative Record. A summary of these comments as well as EPA's responses, which describe how these comments affected the remedy selection, are included in the Responsiveness Summary (Appendix D) of this document.

The State of Rhode Island also took enforcement actions at the Site. In October 1977, following the discovery of the illegal dumping, the State filed suit against the Site owners. The court ordered the Site owners to remove all contaminated materials and dispose of them at a facility approved by the state and to perform a study of the ground water contamination. The Site owners failed to comply and were found in civil contempt. In 1983 the State filed suit against thirty-five (35) parties (owners, generators and transporters), settled with twenty (20) of these parties, obtained default judgment against the Site owners and dismissed one (1) party. In May 1987, the court found three (3) parties liable with respect to the Site and ordered them to pay approximately $1.5 of the State's past costs.

The State filed several other lawsuits against the Site owners. In 1979 the State challenged the conveyance of the Site by the owners of the Site at that time. The conveyance was voided and the Town of Coventry eventually acquired the Site through a tax delinquency sale. The State also filed an action to seize property in Florida owned by the former Site owners.

III. COMMUNITY PARTICIPATION

Throughout the Site's early history, community concern and involvement has been moderate to high. Before 1981, most community relations activities were conducted by the State. In 1980, local citizens formed a group called Save our Water (SOW) which represented concerned citizens and became the primary point of contact between the community and involved agencies. Recently, the group has been less active.

During the removal and remedial actions and investigations, EPA has kept the community and other interested parties apprised of the Site activities through informational meetings, fact sheets, press releases and public meetings. EPA also maintained an information repository near the Site.

During October 1981 EPA issued the first community relations plan for the Site. In 1984 and 1990, EPA released revised community relations plans which outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. EPA's informational meeting for the first ROD was held on April 22, 1985, followed by a public hearing on May 15, 1985. A public meeting was also held on May 7, 1987, following the issuance of the amended record of decision.

On September 7, 1990 EPA made the administrative record available for public review at EPA's offices in Boston and at the Coventry Public Library, 1672 Flat River Road, Coventry, Rhode Island. The administrative record was updated on January 31, 1991 and June 22, 1993. EPA published a notice and brief analysis of the Proposed Plan in the Kent County Daily Times on June 22, 1993, and in the Providence Journal Bulletin on June 25, 1993, and made the plan available to the public at the Coventry Public Library.

On June 29, 1993, EPA held an informational meeting to discuss the results of the Remedial Investigation and the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan. Also during this meeting, the Agency answered questions from the public. From June 30, 1993 to July

29, 1993, the Agency held a thirty day public comment period to accept public comments on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On July 13, 1993, the Agency held a public meeting to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the attached responsiveness summary (Appendix D).

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The remedy described in this Record of Decision addresses the remaining contamination at the Site. Removal of the drums and contaminated soil conducted in the early 1980s reduced the immediate threat to public health from exposure to hazardous waste contained in the drums and trenches. The first Record of Decision, signed in September of 1985, as amended in March of 1987, required removal of the remaining stockpiled soil and site closure activities. That remedy reduced the risk to public health from exposure to contaminated soil remaining onsite.

The selected remedy in this Record of Decision was developed by combining a source control and a management of migration alternative to cleanup the remaining contamination. In summary, the remedy provides treatment of contaminated ground water and of residual soil contamination. This remedial action will address the remaining principal threats to human health and the environment posed by the residual soil contamination, that presents a continuing source for leaching of contaminants into the ground water at the Site.

V. SUMMARY OF SITE CHARACTERISTICS

Chapter 2 of the Feasibility Study contains an overview of the Remedial Investigation. The significant findings of the Remedial Investigation are summarized below.

A. Ground water

Geological investigations, including fracture trace analysis, seismic refraction and very low frequency (VLF) surveys, soil boring and bedrock coring programs were used to determine how the area geology influences ground water flow and contaminant transport. Depth to ground water beneath the Site is fairly shallow, ranging from zero (at seep and wetland locations) to 30 feet (southeast of disposal area) below ground surface. The saturated thickness of the overburden varies between zero and 50 feet. The water level in the area fluctuates significantly in response to hydrologic events, with up to five feet of fluctuation observed in some monitoring wells.

Based on the monthly water level measurements in the monitoring wells, ground water flow patterns in the overburden and shallow bedrock are determined to generally follow surface drainage patterns. The RI has determined three ground water flow paths in the overburden and shallow bedrock, all originating in the disposal area and flowing in the general northwest, west and southwest directions and discharging into the Unnamed Swamp and Great Cedar Swamp. Data from historical pump tests and pump tests performed during this RI, demonstrated that overburden, shallow bedrock and deep bedrock are hydraulically connected. In the deeper, more competent bedrock, fractures are likely to be the major flow paths.

Thirty two (32) wells were installed in overburden and shallow bedrock during this RI, bringing the total number of monitoring wells to seventy five (75). Ground water samples were taken quarterly at each of the monitoring wells and analyzed for over 100 different contaminants. The RI found that the contaminated ground water flowing from the former disposal area consists of a wide variety of halogenated, aromatic, and water soluble solvents, phenols, phthalates, and their respective degradation products (Appendix A, Figures 4 through 7). Sampling to date has indicated that the volatile contaminants concentrations, while exhibiting some variation and seasonal fluctuation, have not decreased significantly since the mid-1980s.

Each flow path has some unique contaminants related to the materials originally disposed of in each trench. The northwest flow path is characterized by high concentrations of halogenated, aromatic, and water soluble solvents, phenols, ketones, acids, and esters suggesting origins from styrene copolymers, phenol-formaldehyde resins, and other polymers. Chlorinated phenols appear to be unique to this plume. In addition, there is a large number of tentatively identified volatile and semivolatile compounds (TICs), which are compounds not on the Target Compound List (TCL) that were identified in this flow path, consisting of xylenes, naphtha-based solvents and other petroleum hydrocarbons (see Appendix A of the Feasibility Study).

As much as 72,000 parts per billion (ppb) of halogenated volatile organics, 45,000 ppb of aromatic volatile organics, and 100,000 ppb of water soluble organics were detected in the northwest ground water flow path. Up to 6,900 ppb of total semivolatile organics were also found. In the vicinity of the west trench, total volatile and semivolatile organic contaminants range from 2,500 ppb (compounds on the TCL list) to 22,500 ppb if TICs, xylenes, and naphtha solvents are included.

The southwest flow path is characterized by halogenated and aromatic solvents, but contains several unique compounds including 1,2-dichloropropane, 2,6-dinitro-4-trifluoromethylphenol, and 1-chloro-2-nitro-4(trifluoro)-methylbenzene. The chloro-, fluoro-, and nitrobenzenes may be related to dye wastes. Concentrations of total volatile and semivolatile compounds in the southwest flow path (near the slit trench) are approximately 7,000 ppb with halogenated organics representing approximately 90 percent of the contaminants.

All contaminants found to date in ground water have been dissolved. However, the high concentrations of dissolved organic compounds found suggest the possible presence of undissolved liquid chemicals referred to as dense non-aqueous phase liquids (DNAPLs). Although shallow ground water was found to flow generally to the west, the bedrock topography and fractures may facilitate migration of any existing DNAPLs in both westerly and easterly directions.

Pesticides and PCBs are not significant ground water contaminants at the Site. Several pesticides were detected sporadically at trace concentrations, typically in the 0.02 to 0.10 ppb range. PCBs were detected in only one monitoring well at a concentration of 3.2 ppb. Metals concentrations were found at near naturally occurring levels. Slightly elevated levels of some naturally-occurring metals close to source areas are possibly due to enhanced solubility caused by solvents in ground water.

The current aerial extent of ground water contamination in overburden and shallow bedrock is approximately 35 acres. Based on the level of total volatile organic (TVO) contamination, the Feasibility Study (FS) divided the ground water contamination into three regions in order to develop remedial technologies most appropriate for each level of contaminant concentration. The regions of the plume are referred to as the source (TVO greater than 10,000 ppb), concentrated (TVO from 1,000 to 10,000 ppb) and dilute (TVO less than 1,000 ppb) regions.

Residences located in the area of the Site use bedrock and overburden wells for drinking water purposes. The residential well sampling of a total 26 wells did not indicate contamination above the limits of EPA Drinking Water Regulations and Health Advisories and most wells had no contamination detected. Two of the residential wells, those on the Picillo Farm property, extend only into the shallow overburden aquifer. The majority of the other residential wells are screened in the deep bedrock aquifer.

B. Soil

An analysis of historical aerial photography, a magnetometer survey, a soil gas survey, and test pit excavation were conducted on suspect areas, mostly outside of the disposal area, to supplement earlier studies. Results of these investigations verified that all drums were removed during earlier removal actions.

Sixty six (66) soil borings of various depths were drilled in and near historic trench locations and outside of the disposal area for installation of monitoring wells. Soil samples were collected at periodic intervals and were analyzed at an on-site laboratory. Approximately 20 percent of these samples were split and sent to CLP laboratories for confirmatory analysis. The chemical analysis indicated that significant subsurface soil contamination concentrations still exist in and near the northeast, northwest, and west trenches. Lower contamination concentrations exist in the south and slit trenches. A majority of the soil contamination was found 10 to 30 feet below the ground surface.

A variety of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) were detected in and near the former disposal trenches (Appendix A, Figures 8 through 11). In the vicinity of the northeast trench, up to 235,000 ppb of halogenated and aromatic VOCs were detected. Up to 4,600 ppb of water soluble VOCs were also detected. Highly contaminated soils were discovered as deep as 44 feet near this trench. Phenols (up to 31,000 ppb) and 1,2-dichlorobenzene (up to 22,000 ppb) were the two SVOCs detected at the highest concentrations in and near this trench.

Several aromatic and halogenated VOCs were also detected from samples collected in and near the northwest and west trenches. The most contaminated sample collected during the soil boring program revealed the presence of greater than 12,500,000 ppb (1.25%) of halogenated VOCs and 41,000,000 ppb (4.1%) of aromatic VOCs. Significant concentrations of phenols and 1,4-dichlorobenzene were also detected in the northwest and west trenches.

The sampling in the vicinity of the northeast, northwest, and west trenches indicates that "fingering" of DNAPLs contamination may have occurred, meaning that thin zones of high concentrations of contamination have spread out from the trenches. In at least the northwest and west trenches, this contamination has migrated back into the clean soil which had been used to backfill excavated trenches in the 1980s. The most highly contaminated soil samples were collected from the vadose zone just above the water table in and adjacent to these trenches.

Analysis of near-surface and surface soil samples collected throughout the former disposal area indicated lower concentrations of VOC contamination. The highest concentration of total VOC contamination was less than 120 ppb and the total SVOC concentrations typically were detected at less than 25,000 ppb. Based on the soil boring program, the volume of soil contaminated with VOCs and SVOCs was estimated to be approximately 131,000 cubic yards, most of which was found in a vicinity of historic trench locations.

In general, pesticides and PCBs were found sporadically throughout the Site mostly at the surface at low concentrations, with exception of the former PCB pile location. The highest PCB concentration was detected in a surface soil sample collected at the former PCB pile location, where 28,000 ppb was measured. PCBs were also measured (up to 7,000 ppb) in the drainage ditch that originates adjacent to the PCB pile and directs runoff to the northwest corner of the disposal area. PCBs were not detected in most other surface soil samples collected around the Site. The volume of surface soil contaminated with PCBs was estimated to be approximately 600 cubic yards (Appendix A, Figures 12 and 13).

Metals concentrations in soils were found at near naturally occurring levels.

C. Surface Water and Sediment

The disposal area is situated west of a surface water divide, which is approximately coincidental with the access road to the disposal area. The surface water hydrology in the vicinity of the disposal area is dominated by west-directed runoff into Unnamed Swamp and Great Cedar Swamp and the southwest-flowing drainage patterns of Unnamed Swamp. Surface water discharge measurements at the outlet of Unnamed Swamp were recorded during the second and third quarterly sampling events to determine discharge volumes during high and low runoff flow periods.

Two quarterly rounds of surface water and sediment samples were collected at more than twenty (20) locations within two square miles study area. A third round of surface water samples was collected at six (6) locations previously showing significant contamination. The pattern of surface water and sediment contamination corresponds with the patterns of the most concentrated ground water plumes (Appendix A, Figures 14 and 15). The most contaminated surface water and sediment sampling locations are at the ground water discharge points of the contaminated ground water plume originating in the disposal area. Lower concentrations of surface water contamination were observed north of the disposal area along a seepage slope, and at the edge of Unnamed Swamp.

Although similar to the contaminant profile observed in ground water, the profile of surface water and sediment contamination includes higher relative concentrations of degradation products (i.e., chloroethane, vinyl chloride, 1,1-dichloroethane), especially at the edge of Unnamed Swamp. The highest total VOCs concentration detected in surface water was 4,400 ppb. SVOCs were also detected in surface water, but at much lower concentrations than VOCs, usually less than 100 ppb. The primary SVOCs appear to be phenols, phthalates, and halogenated aromatics. Similar SVOCs were detected in sediments at concentrations up to 3,990 ppb of total SVOCs. Total SVOCs in sediment sometimes exceeded the total VOCs detected in the same samples. Significant concentrations of polynuclear aromatic hydrocarbons (PAHs) and ethers, in addition to those mentioned above, were also detected in sediment. The sediments in Unnamed Swamp remain contaminated at depth, where sediments from 18 to 24 inches had similar contaminant concentrations as the samples from 0 to 6 inches depth.

Pesticides and PCBs do not appear to be significant contaminants in surface water and sediment, although these chemicals were detected sporadically around the Site. The highest concentration, 27 ppb of the pesticide Methoxychlor, was detected in a sediment sample collected from a seep in the southwest portion of the Site. Additional PCB sampling will be conducted in surface water and sediment to verify the presence of PCBs in these media.

Metals concentrations were found at near naturally occurring levels. Slightly elevated levels in surface water and sediment of some naturally-occurring metals are possibly due to enhanced solubility caused by solvents in ground and surface water.

D. Air

Ambient air monitoring conducted immediately above the ground surface and in the breathing zone at the most contaminated surface water locations indicated the presence of volatile organic contaminants (1,1-dichloroethane and cis-1,2-dichloroethylene) at one ground water discharge point for the northwest plume directly above a seep. The levels did not exceed federal or state air quality standards.

A complete discussion of Site characteristics can be found in the RI Report in Sections 2, 3 and 4.

VI. SUMMARY OF SITE RISKS

A Baseline Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) were performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site. The public health risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks. The results of the public health risk assessment for the Picillo Farm Site are discussed below followed by the conclusions of the environmental risk assessment.

A. Human Health Risk Assessment (HHRA)

Sixteen (16) media-specific exposure zones were delineated based on chemical concentration, geographic location, and hydrologic characterization. A detailed explanation of rational and delineation of each zone can be found in Section 2 of the HHRA. In summary, (1) two exposure zones have been identified for ground water - source and distant zones; (2) two soil exposure areas were identified - source and outlying, and each exposure area was divided vertically into two zones - surface and subsurface; and (3) five exposure zones have been identified for surface water and sediment (Appendix A, Figures 16 through 18).

All chemicals identified at the Site for which dose response data were available, approximately 80 compounds listed in Table 1 found in Appendix B of this Record of Decision, were evaluated in the risk assessment. These Tables are compiled for each exposure zone within each environmental media. In addition, approximately 450 tentatively identified compounds (TICs) were found during the remedial investigation sampling program. TICs are compounds that were not on the Target Compound List (TCL), but were identified as peaks on chromatograms during sample analyses. A complete list of TICs is presented in Appendix E of the HHRA.

The contaminants evaluated in the risk assessment constitute a representative subset of contaminants identified or tentatively identified at the Site during the Remedial Investigation. The contaminants evaluated in the risk assessment represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A summary of the health effects of each of the contaminants of concern can be found in Section 2.6 and Appendix B of the HHRA.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The population identified as a potential receptor in the current land use scenario is trespasser population which is considered to visit the Site for recreational activities (e.g., biking, hiking, swimming, and wading). Although no residences are currently located in the contaminated area, several residences are located near the Site, as close as 1,300 feet from the disposal area.

Future potential land use scenarios include potential residential and trespasser populations, since it is possible that residential housing will be constructed in the contaminated area at a future time and recreational activities are expected to be similar to the current land use scenario. The following is a brief summary of the exposure pathways evaluated. A more thorough description can be found in Section 4 of the HHRA.

Under future potential residential land use, exposure to contaminated ground water was considered through ingestion as drinking water, inhalation of vapors as showering and basement seepage and dermal contact. The exposure pathway through ingestion as drinking water was quantified and the remaining exposure pathways were estimated qualitatively. Ingestion rates of 2 liters per day for adults and 1 liter per day for children were presumed over 30 years, which includes 6 years as young child and 24 years as an adult.

Exposure to contaminated soil was considered through incidental ingestion, dermal contact and inhalation of particulates for the current trespassing population. The same exposures plus inhalation of volatiles were considered for future residential population. Out of these exposure pathways, ingestion and dermal contact were evaluated quantitatively. Dermal contact and incidental ingestion of soils for trespassers were evaluated for older child/young adult (age 6-15 years) who may be exposed 50 days per year for 10 years. For potential residents, dermal contact and incidental ingestion of soils were evaluated for 30 years of exposure including 6 years as young child and 24 years as an adult who may be exposed 150 days per year.

Exposure to sediment was considered for a trespassing scenario under both, current and future land use. The exposure pathways for sediment included incidental ingestion, dermal contact and inhalation while wading. Incidental ingestion and dermal contact with sediment were evaluated quantitatively to reflect an older child/young adult who may wade in the shallow areas of the swamp, seeps and pond for 50 days (under current land use scenario) and 100 days (under future land use scenario) each summer for 10 years.

Exposure to surface water was evaluated similar to sediment. For the swamp and pond, incidental ingestion and dermal contact while swimming and wading was evaluated. For the shallow seeps, only dermal contact while wading was considered. Incidental ingestion and dermal contact with surface water reflect older child/young adult swimming 20 days each summer (under current land use scenario) and 50 days (under future land use scenario) each summer for 10 years. Additional dermal contact while wading was evaluated for older child/young adult considering 50 days and 75 days under current and future land uses respectively for 10 years.

For the residential population, ingestion of fish caught from the open water of the swamp and the pond was evaluated under a current land use scenario. Use of surface water as drinking water (including ingestion, dermal contact and inhalation while showering) in addition to the fish ingestion, was considered under a future residential land use scenario. Ingestion as drinking water and fish ingestion were quantitatively evaluated. Exposure from ingestion of fish was calculated assuming 10 meals per year for 30 years. Ingestion of surface water as drinking water was evaluated utilizing the same exposure parameters as for ingestion of ground water.

For each pathway evaluated, an average and a reasonable maximum exposure estimate were generated corresponding to exposure to the average and the maximum concentration detected in that particular medium.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical specific cancer slope factor. Cancer slope factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure as defined to the compound at the stated concentration. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard index was also calculated for each pathway as EPA's measure of the potential for non-carcinogenic health effects. A hazard quotient is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects for an individual compound. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard quotient is often expressed as a single value (e.g., 0.3) indicating the ratio of the stated exposure as defined to the reference dose value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard quotient is only considered additive for compounds that have the same or similar toxic endpoint and the sum is referred to as the hazard index (HI). (For example: the hazard quotient for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Table 2 of Appendix B depicts the carcinogenic and non-carcinogenic risk summary for the contaminants of concern in ground water, soil, sediment and surface water evaluated to reflect present and potential future exposure pathways corresponding to the average and the reasonable maximum exposure (RME) scenarios. A detailed summary of the carcinogenic and non-carcinogenic risk for each contaminant of concern for each exposure pathway can be found in Table 3 of Appendix B.

Carcinogenic and non-carcinogenic risk estimates were evaluated relative to the EPA's risk management criteria. The carcinogenic risks or ILCR (Incremental Lifetime Cancer Risks) are compared to a risk range of 10^{-6} ("point of departure") to 10^{-4}. Non-carcinogenic risks, or HIs (Hazard Indices), are compared to a value of one (1), below which adverse health effects from exposures are not anticipated. Highlighted values in Table 2 of Appendix B represent those risk estimates which exceed the upper limit of the risk range (10^{-4}) for an ILCR or HI of one (1).

Of the exposure media for which risk estimates were calculated, ingestion of ground water as drinking water, and ingestion of fish and surface water from the swamp as drinking water are associated with significant human health risks due to exceedance of EPA's risk management criteria for both the average and the reasonable maximum exposure scenarios. For ingestion of ground water, 1,2-dichloroethane, chloroform and beryllium were the chemicals contributing significantly to the overall carcinogenic risk estimate. Chloroform was the largest contributor to the non-carcinogen risk estimate. For ingestion of surface water and fish from the swamp, vinyl chloride, 1,1-dichloroethene, benzo(a)pyrene, Aroclor 1260 and Aroclor 1248 (PCBs) were significant contributors to the carcinogenic risk estimate and cis-1,2-dichloroethene and manganese were the highest contributors to the non-carcinogenic risk estimate. Current carcinogenic risk is primarily contributed to ingestion of fish contaminated with PCBs. However, these PCBs were each detected once in the surface water at the swamp, approximately 600 feet west and northwest of the disposal area, while none of the monitoring wells west and northwest of the Site showed PCB contamination in ground water. Additional PCB sampling will be conducted in surface water and sediment to verify the presence of PCBs.

In addition, approximately 24 contaminants exist in ground water at concentrations that were found to exceed both state and federal maximum contaminant levels (MCLs). Of the compounds detected in surface water, approximately 26 exceed MCLs or Rhode Island Ambient Water Quality Standards. Potential risks associated with ground water and surface water contamination are primarily attributed to the presence of VOCs and SVOCs.

Exposure to soil and sediment through direct contact are not considered to pose significant human health risks as the risks from exposure to these media are within EPA's acceptable risk range of 10^{-4} to 10^{-6} for ILCRs and less than one (1) for HIs. The soil contamination, however, provides leaching of contaminants into the ground water at concentrations greater than MCLs and is considered a media of concern because the residual contamination is a continuing source of contamination for the ground water.

B. Ecological Risk Assessment (ERA)

A baseline Ecological Risk Assessment was performed to estimate the magnitude of potential adverse effects on wildlife from exposure to contaminants associated with the surface water, sediments, and soil.

The following four indicator species were selected for evaluation in the ERA because of their sensitivity and exposure to contaminants and expected use of the habitats at and nearby the Site:

- Green Frog;
- American Woodcock;
- Short-tailed Shrew; and
- Mink.

In addition, risks were estimated for the entire aquatic community of both the aquatic and wetland zones of exposure.

Four distinct zones of ecological exposure were identified to reflect the diversity of ecosystems and habitats of the study area. These four exposure zones are:

- Terrestrial areas within the disposal area;
- Terrestrial areas outside the disposal area;
- Wetland habitats that are not permanently flooded; and
- Permanently flooded aquatic habitats.

Potential effects on the wildlife from exposure to site contaminants were estimated for several pathways based on the characterization of the Site and the study area. The primary pathways are direct contact and food-chain exposure.

Methods for evaluation included a comparative analysis of contaminant concentrations with regulatory criteria and guidelines, food-chain contaminant uptake modeling, and the performance of a chronic sediment toxicity test for two invertebrate species.

No obvious symptoms of vegetation or animal stress were observed on site or in the larger study area. No adverse effects were observed from chronic toxicity tests performed using sediment collected from the Site.

However, food chain contaminant uptake calculations indicated unacceptable ecological risks for the American Woodcock and Short-tailed Shrew due to the presence of PCBs and to a lesser degree pesticides in the surface soils within the disposal area (in the drainage ditch and at the former PCB pile location). A small component of the total risk was from exposure to lead, a non-site related contaminant.

Aquatic species and green frog tadpoles were estimated to be at unacceptable risk from exposure to surface water, which in some cases exceeded water quality criteria (Appendix B, Table 4). Sediments in localized areas outside the disposal area also were estimated to pose a risk to indicator species through consumption of contaminated food items. Because most of the risk is from non-site related contaminants, and the contaminated sediments are found in localized areas, it is felt that this pathway may represent a conservative risk scenario that may not warrant direct intrusion into the wetland habitat.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. The human health risk assessment identified ground water and surface water media as posing unacceptable health risks. In order to prevent migration of contaminants into ground water and for the ground water to be restored to drinking water standards, soil needs to be remediated. Surface soil within the disposal area and surface water are the media posing unacceptable risk to environmental receptors. Therefore, all these media are designated as media of concern and will be targeted as the focus of the remedial actions.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment. These response objectives were:

- Restore contaminated ground water to drinking water standards, and to a level that is protective of human health and the environment, as soon as practicable;

- Restore contaminated surface water to drinking water standards and ambient water quality criteria (AWQCs), and to a level that is protective of human health and the environment, as soon as practicable;

- Prevent or mitigate the continued release of hazardous substances to the ground water and surface water from the soils by reducing the concentration of contaminants in the soil so that the concentration in ground water and surface water will not exceed drinking water standards or AWQCs and will not pose a risk to human health and the environment;

- Prevent or mitigate releases of contaminants to the Unnamed Swamp;

- Reduce contaminant exposure of wildlife through food-chain bioaccumulation and direct contact with contaminated surface water, sediments, and surface soils; and

- Minimize impact on wetlands due to operation of the remedial alternative.

B. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives was developed for the Site.

With respect to source control, the RI/FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; and a no action alternative.

With respect to ground water response action, the RI/FS developed a limited number of remedial alternatives that attain site specific remediation levels within different timeframes using different technologies; and a no action alternative.

As discussed in Section 3.0 of the Feasibility Study, the RI/FS identified, assessed and screened technologies based on implementability, effectiveness, and cost. These technologies were combined into source control (SC) and management of migration (MM) alternatives. Section 3.0 of the Feasibility Study presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated and screened in Section 4.0 of the Feasibility Study.

In summary, of the 4 source control and 3 management of migration remedial alternatives screened in Section 3 of the Feasibility Study, all 7 were retained for detailed analysis. Table 5 in Appendix B identifies the 7 alternatives that were retained through the screening process.

VIII. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative evaluated. A detailed assessment of each alternative can be found in Section 4.0 of the Feasibility Study.

The time frames and costs of each SC and MM alternative are presented in this ROD as part of a cleanup scenario, when a source control and management of migration alternative are combined for implementation together. A description of the institutional controls and environmental monitoring program is presented as part of the description of MM alternatives, but applies to both, SC and MM portions of the cleanup scenario.

A. Source Control (SC) Alternatives Analyzed

The source control alternatives analyzed for the Site include the following:

- SC-1 - No Action;
- SC-2 - In-Situ thermally enhanced vapor extraction of the soil to remove volatile and semivolatile contaminants;
- SC-3 - In-Situ vapor extraction of soils to lower risk due to volatile emissions and to reduce volume of soil that has to be remediated followed by excavation and thermal desorption of the contaminated soil to remove the remaining volatile and semivolatile contaminants; and
- SC-4 - In-Situ vapor extraction of soils to lower risk due to volatile emissions and to reduce volume of soil that needs to be remediated followed by excavation and off-site incineration of the soil to remove the remaining volatile and semivolatile contaminants.

The existence of DNAPLs within the soil and the source and concentrated plume area will be further investigated during the design studies. EPA may perform periodic reviews of advances in soil and ground water cleanup technology to determined if new techniques have been developed to effectively remediate DNAPLs conditions and to determine whether any modifications to the remedy are appropriate.

Additional sampling of sediment and surface water for PCBs will be performed as part of a pre-design to verify the presence of PCBs and to determine if remediation of PCB-contaminated sediment is required.

SC-1 No Action

Alternative SC-1 is evaluated in detail in the FS to serve as a baseline for comparison with the other remedial source control alternatives under consideration. Under this alternative, no action would be taken. Natural attenuation of the contaminated soil would occur over time through diffusion, biological degradation, and abiotic degradation. The No Action response does not supersede the March 1987 ROD for the Picillo Farm Site, and therefore, any requirements of that document would continue to apply, including the maintenance of the disposal area, the drainage ditch, and the fence around the disposal area.

The No Action alternative would require reviews at least every five years to monitor contaminant concentrations over time and to determine whether cleanup activities would be required. The five-year reviews would continue until no contaminants remain at the Site above levels that would allow for unrestricted use and unlimited exposure.

The volatile soil contamination would persist for approximately 500 years and the semivolatile contamination would persist for approximately 400 years.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: Not Applicable
ESTIMATED TIME FOR RESTORATION: Approximately 500 years
ESTIMATED CAPITAL COST: None
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): None
ESTIMATED TOTAL COST (present worth): None

SC-2 In-Situ Thermally Enhanced Vapor Extraction

This alternative is designed to treat the contamination in the subsurface soils while in place. A thermally enhanced vapor extraction system would be installed on-site in the areas where the soil contamination exceeds the soil cleanup levels established to prevent migration of contaminants into the ground water. The vacuum extraction system would be operated in conjunction with a dewatering system. The extracted ground water would be treated by UV/Oxidation or air stripping described in alternatives MM-2 and MM-3.

With the enhanced soil vapor extraction (SVE) technology, heated air would be pumped through contaminated soil to remove volatile and semivolatile contaminants. Vapor extraction wells and hot air injection wells would be installed in the area near the disposal trenches. The volatilized contaminants would be treated by a thermal oxidation system such as catalytic oxidizer. The resultant compounds would be water, carbon dioxide and hydrochloric acid. The hydrochloric acid would be removed using a caustic scrubber to adsorb the acid gases and to produce a brine solution which would be sent off-site. Typical destruction efficiency for the catalytic oxidizer would be greater than or equal to 97% for TCE and 99% for DCA, TCA, and other hydrocarbons. The scrubber would typically remove 98% of the acid gases.

The effluent water and air streams from the treatment plant and ambient air would be sampled and analyzed as necessary to ensure that ARARs are met. In addition, treatment residuals would be disposed of in compliance with ARARs.

At the design stage, a pilot test for a limited number of vacuum extraction and air injection wells would be conducted to optimize the system prior to full scale operation. The pilot test would assist in determining design characteristics such as the precise number and location of vapor extraction and air injection wells; site specific vapor flow rates; radius of influence measurements; contaminant recovery rates; site specific subsurface air temperatures; precise dewatering techniques and specific water and off-gas treatment options, to ensure that the SVE system most effectively captures and removes the contamination. During design and implementation of the thermally enhanced vapor extraction, other methods may be evaluated to enhance the effectiveness of the system in meeting cleanup levels. Such methods may include other enhancements to vapor extraction, such as radio frequency heating, steam injection and air sparging.

Although this alternative may potentially impact the wetlands by dewatering the seeps and part of the Unnamed Swamp, based on current data, the water balance is expected to be maintained. Evaluation of provisions to maintain the water balance in the area would be performed at the design stage.

The PCB contaminated surface soil, in the drainage ditch and at and near the former PCB pile, would be excavated (approximately 600 cubic yards) and disposed of at an off-site, TSCA-regulated, treatment, storage, and disposal facility. Excavation and storage of PCB contaminated soil would be performed in compliance with ARARs.

The thermally enhanced SVE system is estimated to require approximately 3 years to pilot test, develop a full-scale design and achieve operational conditions. The operation time needed for the enhanced SVE to meet cleanup levels is estimated to be 3 years based on a computer model described in Appendix L of the FS which was used to calculate the contaminant removal rates.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 3 years
ESTIMATED TIME FOR OPERATION: 3 years
ESTIMATED CAPITAL COST: $2,700,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $1,400,000*
ESTIMATED TOTAL COST (present worth): $4,100,000*

* Based on 3 years of operation at a discount rate of 5%

SC-3 Thermal Desorption

This alternative involves the excavation and on-site treatment of the contaminated subsurface soil through the use of thermal desorption. Prior to excavating the soils, however, the volatile contamination would be reduced by approximately 60% using in-situ vapor extraction and thermal oxidation as described in the alternative SC-2. Vapor extraction would be used in order to reduce the potential short-term risk to the local residents and workers from the VOCs emitted during excavation. After vapor extraction, approximately 94,000 cubic yards of contaminated soil (a total of 240,000 cubic yards, which includes clean soil above the contamination) would be excavated and transported to the on-site thermal desorption system where the soils would be heated in a system such as rotary drum thermal desorber. The volatilized contaminants will be destroyed in a thermal oxidation unit, such as catalytic oxidizer.

After the soil is treated or shown to meet the cleanup levels for soils, it would be returned to the trenches where it was removed. The area would be regraded and revegetated.

The effluent water and air streams from the SVE and thermal desorption treatment plants and ambient air would be sampled and analyzed as necessary to ensure that ARARs are met. In addition, treatment residuals would be disposed of in compliance with ARARs. Engineering controls would be used to minimize emissions during excavation, thermal desorption and backfilling.

This alternative may potentially impact the wetlands by dewatering the seeps and part of the Unnamed Swamp. However, based on current data, the water balance is expected to be maintained. Evaluation of provisions to maintain the water balance in the area would be performed at the design stage.

The PCB contaminated surface soil, in the drainage ditch and at and near the former PCB pile, would be excavated (approximately 600 cubic yards) and disposed of at an off-site, TSCA-regulated, treatment, storage, and disposal facility. Excavation and storage of PCB contaminated soil would be performed in compliance with ARARs.

This alternative would be implemented in two phases: 1) the implementation of vapor extraction system; and 2) the excavation and thermal desorption and excavation and disposal of the PCB contaminated surface soil. The vapor extraction system is estimated to take 2 years to design, construct and achieve operational conditions and 3 years to operate. While the vapor extraction system is operating, the thermal desorption system would be designed and installed in order to be operational when 60% of volatile contaminants are removed. The excavation and thermal desorption is estimated to operate for 2 years. Overall, this alternative would take two years to design and install and 5 years to operate to achieve cleanup levels.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR OPERATION: 5 years
ESTIMATED CAPITAL COST: $1,900,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $22,000,000*
ESTIMATED TOTAL COST (present worth): $23,900,000*

* Based on 5 years of operation at a discount rate of 5%

Alternative SC-4: Off-Site Incineration

The off-site incineration alternative involves excavation of the contaminated soil and transportation of the soil to an off-site incinerator facility. Prior to excavating the soils, however, the VOC contamination would be reduced by approximately 60% using in-situ vapor extraction and thermal oxidation as described in alternative SC-2. Vapor extraction would be used in order to reduce the potential short-term risk to the local residents and workers from the

VOCs emitted during excavation. After vapor extraction, approximately 94,000 cubic yards of contaminated soil (a total of 240,000 cubic yards which includes clean soil above the contamination) would be excavated and transported off-site for incineration. The excavated areas would then be backfilled with clean fill material.

The effluent water and air streams from the SVE plant and ambient air would be sampled and analyzed as necessary to ensure that ARARs are met. In addition, treatment residuals would be disposed of in compliance with ARARs. Engineering controls would be used to minimize emissions during excavation, loading of trucks and backfilling.

This alternative may potentially impact the wetlands by dewatering the seeps and part of the Unnamed Swamp. However, based on current data, the water balance is expected to be maintained. Evaluation of provisions to maintain water balance in the area would be performed at the design stage.

The PCB contaminated surface soil, in the drainage ditch and at and near the former PCB pile, would be excavated (approximately 600 cubic yards) and disposed of at an off-site, TSCA-regulated, treatment, storage, and disposal facility. Excavation and storage of PCB contaminated soil would be performed in compliance with ARARs.

This alternative would take place in two phases: 1) the implementation of the vapor extraction system; and 2) the excavation and off-site incineration of the contaminated soil, including disposal of the PCB-contaminated surface soil. The vapor extraction system is estimated to take 2 years to design, construct and achieve operational conditions and 3 years to operate. While the vapor extraction system is operating, the excavation of the contaminated soil would be planned to begin when 60% of volatile contaminants have been removed. The excavation and transport of the soils off-site is estimated to proceed for approximately 7 months. Overall, this alternative would take two years to design and install and 4 years to operate.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR OPERATION: 4 years
ESTIMATED CAPITAL COST: $2,200,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $99,000,000*
ESTIMATED TOTAL COST (present worth): $101,200,000*

* Based on 4 years of operation at a discount rate of 5%

B. Management of Migration (MM) Alternatives Analyzed

The development of the management of migration alternatives was done using the available information, historical knowledge of the Site area, and generally applied scientific approaches to solving hydrogeologic issues. Extraction well locations and pumping rates for all alternatives are approximate. The estimated times for cleanup of the aquifer are based on a model which uses a mass balance approach (see Appendix K of the FS).

Design studies will be performed prior to cleanup to determine the number, pumping rate, and placement of extraction wells that will most effectively capture, recover, and treat the contaminants. Similarly, the exact location and method of discharge for treated water may be altered if negative impacts on wetlands in the area are predicted through the design studies or become apparent after the cleanup has started.

The RI presented evidence that petroleum solvents may be present near the northwest and west trenches. Sampling and analysis for total petroleum hydrocarbons (TPH) in ground water would be required as part of the design to verify their presence and to ensure that the ground water and soil treatment system are able to effectively treat the additional contaminants.

Management of migration alternatives address contaminants that have migrated from the original source of contamination. At the Picillo Farm Site, contaminants have migrated via ground water in westerly, northwesterly and southwesterly directions from the disposal trenches and have discharged to the Unnamed Swamp and Great Cedar Swamp. Contamination that has migrated to the overburden and shallow bedrock will be withdrawn using wells placed to remove the ground water in that zone. If any contamination is present in the less fractured deeper zone of bedrock, it is expected to diminish as ground water remediation progresses in the shallow bedrock and overburden. Water quality in this deeper zone will be monitored, and if it appears to be deteriorating, EPA will address the need for expanding the extraction and treatment systems.

Because the surface water contamination is directly related to the ground water contamination, by remediating the ground water to interim cleanup levels, the surface water will be remediated to meet the surface water cleanup levels.

The Management of Migration alternatives evaluated for the

Site include the following:

- MM-1 No Action;
- MM-2 Air Stripping of the dilute portion of the plume and Ultraviolet (UV)/oxidation or air stripping of the concentrated and source portion of the plume. The air stripper and/or UV/oxidation would be followed by carbon adsorption; and
- MM-3 Natural attenuation of the dilute portion of the plume and UV/oxidation or air stripping of the concentrated and source portion of the plume. The air stripper or UV/oxidation would be followed by carbon adsorption.

MM-1 No Action

Alternative MM-1 would include a minimal comprehensive sampling and analysis program. Quarterly sampling events are proposed to address ground water, surface water and sediment. Site reviews would be performed at least every five years to decide whether the program should be expanded, reduced, or discontinued. This alternative is referred to as the Limited Action alternative in the FS report.

Natural attenuation of the contaminated ground water and soil would occur over time through dilution, biological degradation, and abiotic degradation. The No Action response would not supersede the March 1987 ROD for the Picillo Farm Site and, therefore, any requirements of that document continue to apply.

The environmental monitoring program would be implemented to evaluate the rate of natural attenuation. The monitoring program would include installation of additional deep bedrock monitoring wells. Environmental monitoring would include periodic sampling of selected monitoring wells, residential wells, surface water and sediment. All monitoring data would be evaluated annually and a report prepared at least every five years. Based on results of the evaluation, the monitoring program, including sampling of residential wells, would be modified as necessary.

Without implementation of an active treatment source control alternative, the volatile contamination in ground water would persist for approximately 500 years and the semivolatile and nonvolatile contamination would exist for approximately 400 years. With an active treatment source control alternative, *which would reduce leaching of* contamination from the soil, the volatile ground water contamination is estimated to persist for 40 years and the semivolatile and nonvolatile contamination would exist for approximately 20 years.

The No Action alternative for groundwater has been retained and evaluated in two scenarios: one with an active source treatment and one without an active source treatment (as presented below). This was done to establish a baseline to which all other alternatives are to be compared as required by the NCP.

If an active treatment source control alternative is implemented, such as SC-2, SC-3 or SC-4, which would reduce leaching of contamination from the soil:

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: Not Applicable
ESTIMATED TIME FOR RESTORATION: Approximately 40 years
ESTIMATED CAPITAL COST: None
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $3,700,000*
ESTIMATED TOTAL COST (present worth): $3,700,000*

If the No Action Source Control alternative, SC-1, is implemented:

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: Not Applicable
ESTIMATED TIME FOR RESTORATION: Approximately 500 years
ESTIMATED CAPITAL COST: None
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $4,300,000**
ESTIMATED TOTAL COST (present worth): $4,300,000**

* Based on 40 years at a discount rate of 5%
** Based on 500 years at a discount rate of 5%

Alternative MM-2: UV/Oxidation or Air Stripping of the Source and Concentrated Regions and Air Stripping of the Dilute Region

Alternative MM-2 involves the extraction and treatment of ground water in the source and concentrated regions of the plume in order to limit the effect the residual contamination has on the entire aquifer. Alternative MM-2 would also remediate the dilute region of the plume as quickly as possible by pumping and treating the ground water in that region.

EPA has selected a combination of two treatment options in Alternative MM-2 to treat the contaminated ground water in the source and concentrated regions of the plume: UV/Oxidation and carbon adsorption and air stripping and carbon adsorption. Based on the cost estimate in the FS, the UV/Oxidation treatment system is more cost-effective than the treatment option of air stripping and carbon adsorption for the source and concentrated regions of the plume. However EPA is proposing a second treatment option, air stripping and carbon adsorption, so that if the cost estimates change to the extent that air stripping becomes more cost-effective than UV/Oxidation, EPA has the option of selecting air stripping and carbon adsorption.

Extraction wells would be installed in the source and concentrated regions of the ground water plume. Ground water from the dewatering wells would be mixed with the water from the containment wells and treated in the ground water treatment system. Additional extraction wells would be installed in the dilute portion of the plume (Appendix A, Figure 21). In order for the wells most effectively capture and recover the contaminated ground water, the precise number, pumping rate, and placement of extraction wells would be determined during the remedial design phase.

After pretreatment, i.e., equalization and metal precipitation systems, ground water would be pumped to the UV/oxidation system and/or air stripper. Ground water from the source and concentrated regions of the plume and dewatering operations would be treated by UV/oxidation or air stripping. Ground water from the dilute portion of the plume would be treated by air stripping.

In the UV/oxidation system, hydrogen peroxide, ozone, or a combination of both, would be added to the ground water. The ground water then would be exposed to ultraviolet light in a reactor. Based on a laboratory-scale treatability study (Laboratory-Scale Treatability Study, Arthur D. Little, Inc., June 10, 1993), up to 99% of the organic contamination would be destroyed. The ultraviolet light causes the hydrogen peroxide or ozone to form molecules that, because they are highly reactive, break down the VOCs and SVOCs into water, carbon dioxide, and harmless chloride salts. The remaining contaminants would be treated by carbon adsorption. If ozone is used, air from the treatment system would pass through a catalytic decomposer such as activated carbon filters to convert the remaining ozone to oxygen and to remove the contaminants prior to discharging to the atmosphere.

For air stripping and carbon adsorption, the only difference in the treatment train will be the use of an air stripper in place of a UV/oxidation unit. All other components of the MM-2 alternative would remain the same. In the air stripping unit, contaminated water would be contacted with clean air to volatilize the majority of the volatile organic contaminants. Based on the pilot studies (RI/FS, Tighe and Bond/SCI, August 1983) the air stripper would remove 90% of VOCs, and the remaining 10% of VOCs and SVOCs would be removed by the carbon adsorption (RI/FS, Tighe and Bond/SCI, August 1983 and Laboratory-Scale Treatability Study, Arthur D. Little, Inc., June 10, 1993). The contaminated air would be passed through activated carbon to remove VOCs before the air is released to the atmosphere. The contaminated carbon would be periodically regenerated, a process in which the contaminants are destroyed and the carbon is recycled. The resultant treated water would be reinjected into the aquifer or discharged to surface water.

Alternative MM-2 may impact wetlands by dewatering the seeps and part of the Unnamed Swamp by extracting water in the dilute region of the plume. Based on current data, because of the large volume of water withdrawn and the proximity of the extraction wells to the Unnamed Swamp, it would be very difficult to maintain the water balance in the Unnamed Swamp and the Great Ceder Swamp at current levels. Erosion control techniques during construction of the reinjection system would minimize long-term impacts on wetlands.

While the ground water is being remediated, institutional controls would be implemented to restrict access around the areas of active soil remediation and to restrict use of the contaminated ground water and surface water where the concentrations of the compounds of concern are greater than the cleanup levels. The restrictions would remain in place until the cleanup levels are met.

The environmental monitoring program would be implemented to evaluate the performance of the treatment system, the rate of natural attenuation, and the overall effectiveness of the remedy. The monitoring program would include installation of additional deep bedrock monitoring wells. Environmental monitoring would include periodic sampling of selected monitoring wells, residential wells, surface water and sediment. All monitoring data would be evaluated annually and a report prepared at least every five years. Based on the results of the evaluation, the monitoring program, including sampling of residential wells, would be modified as necessary.

The effluent water and air streams from the treatment plant(s) and ambient air would be sampled and analyzed as necessary to ensure that ARARs are met. In addition, treatment residuals would be disposed of in compliance with ARARs.

Based on current data, the estimated time for restoration of the aquifer in the concentrated and source regions of the plume, including source control, is approximately 20 years for volatile and 10 years for semivolatile contamination. In the dilute region of the plume, the volatiles and semivolatiles will persist for approximately 4 and 8 years, respectively, after implementation of the source control remedy.

UV/Oxidation of the Source and Concentrated Regions and Air Stripping of the Dilute Region

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR RESTORATION: Approximately 20 years
ESTIMATED CAPITAL COST: $2,200,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $12,000,000*
ESTIMATED TOTAL COST (present worth): $14,200,000*

Air Stripping of the Source, Concentrated and Dilute Regions

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR RESTORATION: Approximately 20 years
ESTIMATED CAPITAL COST: $1,300,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $19,000,000*
ESTIMATED TOTAL COST (present worth): $20,300,000*

* Based on 20 years of operation at a discount rate of 5%

MM-3 UV/Oxidation or Air Stripping of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

Alternative MM-3 involves the extraction and treatment of ground water in the source and concentrated regions of the plume in order to limit the effect the residual contamination has on the entire aquifer. Alternative MM-3 includes no active remediation efforts in the dilute portion of the plume. Instead, this alternative would reduce migration of contaminants into the dilute portion of the plume and allow the dilute portion of the plume to naturally attenuate to the cleanup levels over time.

EPA has selected a combination of two treatment options in Alternative MM-3 to treat the contaminated ground water: UV/Oxidation and carbon adsorption and air stripping and carbon adsorption. Similar to alternative MM-2, if the cost estimates change to the extent that air stripping becomes more cost-effective than UV/Oxidation, EPA has the option of selecting air stripping and carbon adsorption.

Extraction wells would be installed in the source and concentrated regions of the plume (Appendix A, Figure 22). Pretreatment, UV/oxidation, air stripping and carbon adsorption systems would be similar to the systems described in alternative MM-2. In order for the wells to most effectively capture and recover the contaminated ground water in the source and concentrated regions of the plume, the precise number, pumping rate, and placement of the extraction wells would be determined during the remedial design.

The resultant treated water would be returned into the aquifer or discharged to surface water to maintain the water balance in the Unnamed Swamp and the Great Ceder Swamp at current levels.

This alternative may potentially impact the wetlands by dewatering the seeps and part of the Unnamed Swamp, however, based on current data, the water balance is expected to be maintained. Evaluation of provisions to maintain the water balance in the area would be performed at the design stage.

The effluent water and air streams from the treatment plant(s) and ambient air would be sampled and analyzed as necessary to ensure that ARARs are met. In addition, treatment residuals would be disposed of in compliance with ARARs.

While the ground water is being remediated, the same institutional controls described in alternative MM-2 would be implemented where cleanup levels are exceeded. Those controls would remain in place until the ground water cleanup levels are met.

The environmental monitoring program would be similar to the monitoring program described in alternative MM-2. The environmental monitoring program would be implemented to evaluate the performance of the treatment system, the rate of natural attenuation, and the overall effectiveness of the remedy. The monitoring program would include installation of additional deep bedrock monitoring wells. Environmental monitoring would include periodic sampling of selected monitoring wells, residential wells, surface water and sediment. All monitoring data would be evaluated annually and a report prepared at least every five years. Based on results of the evaluation, the monitoring program, including sampling of residential wells, would be modified as necessary.

Based on current data, the estimated time for restoration of the aquifer, after implementation of source control, is approximately 15 years for volatile and 6 years for semivolatile contamination. In the dilute region of the plume, the volatiles and semivolatiles will persist for approximately 20 and 10 years, respectively.

UV/Oxidation of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR RESTORATION: Approximately 20 years
ESTIMATED CAPITAL COST: $1,600,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $10,000,000
ESTIMATED TOTAL COST (present worth): $11,600,000

Alternative MM-3: Air Stripping of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 2 years
ESTIMATED TIME FOR RESTORATION: Approximately 20 years
ESTIMATED CAPITAL COST: $900,000
ESTIMATED OPERATION AND MAINTENANCE COST (present worth): $18,000,000
ESTIMATED TOTAL COST (present worth): $18,900,000

* Based on 20 years of operation at a discount rate of 5%

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Evaluation Criteria

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. These criteria and their definitions are as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP.

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all of the ARARs of other Federal and State environmental laws and/or provides grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup levels are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and Operation and Maintenance (O&M) costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used on the final evaluation of remedial alternatives generally after EPA has received public comments on the RI/FS and Proposed Plan.

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

A detailed tabular assessment of each alternative according to the nine criteria can be found Table 6 (Source Control) and Table 7 (Management of Migration) in Appendix B. Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted.

B. Comparative Analysis of Alternatives

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following summarizes the comparison of each alternative strength and weakness with respect to the nine evaluation criteria.

1. Overall Protection of Human Health and the Environment

With the exception of alternative SC-1, No Action, all source control alternatives evaluated are considered protective of human health and the environment. Alternatives SC-2 would provide overall protection to human health and the environment through treatment of all the contaminated soils in the disposal area. Alternatives SC-3 and SC-4 would also provide protection of human health and the environment by excavating and treating the contaminated soil. Treatment of the contaminated soils would reduce further migration and contamination of the ground water enabling the ground water to be restored to drinking water standards more quickly. Excavation and off-site disposal of the PCB contaminated surface soil in all active treatment SC alternatives would provide protection of human health and the environment. Alternative SC-1, No Action does not utilize adequate controls to prevent exposure to the contaminants because contaminants would remain in soil and continue to be released into ground water for about 500 years.

Alternative MM-3, as well as alternative MM-2, if implemented in conjunction with any of the active treatment SC alternatives, would provide protection to human health and the environment through capture and treatment of the contaminated ground water and through limiting discharge of the contaminated ground water to surface water, and through institutional controls restricting the use of the contaminated ground water and surface water.

Alternative MM-1 (No Action) would not provide adequate controls to prevent exposure to the contaminated ground water during the restoration time period. Without the implementation of an active treatment Source Control alternative, the aquifer would likely be returned to its beneficial use in approximately 500 years. With the implementation of an active treatment Source Control alternative, the aquifer would likely be returned to its beneficial use in approximately 40 years.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

With the exception of the No Action alternatives (SC-1) and (MM-1), all of the other alternatives that received detailed analysis in the FS would ultimately meet Federal and State ARARs. Implementation of MM-2 or MM-3 with any of the active treatment source control alternatives would achieve compliance with ARARs in approximately 20 years. Without implementation of any active treatment source control alternative, implementation of either MM-2 or MM-3 would achieve ARARs compliance in approximately 500 years. The No-Action alternatives would not meet ARARs because they would allow continued release of contaminants from source areas to the ground water. Implementation of No-Action alternative MM-1 in conjunction with any of the active treatment SC alternatives would not achieve compliance with all ARARs for 40 years. Joint implementation of MM-1 and SC-1 would not achieve compliance with all ARARs for 500 years.

3. Long-Term Effectiveness and Permanence

All SC alternatives (except SC-1, No Action) provide similar degrees of long-term effectiveness and permanence since treatment of all hazardous materials is provided prior to disposal. The No Action SC alternative (SC-1) would not provide effective or permanent reductions to long-term risk.

All of the MM alternatives, with the exception of MM-1 (No Action), provide similar degrees of long-term effectiveness and permanence since all of the active treatment alternatives provide for treatment of the source and concentrated plume. The long-term risks associated with implementing alternatives MM-2 and MM-3 would be eliminated in approximately 20 years, if any of the active treatment SC alternatives are also implemented.

Alternative MM-3 relies on natural attenuation of the dilute portion of the plume which is estimated to take approximately 20 years, when the source and concentrated regions of the plume would be captured and treated. Alternative MM-2 utilizes treatment of the dilute portion of the plume which is estimated to take approximately 8 years. The restoration time for the source and concentrated regions of the plume is approximately 20 years in both alternatives. Thus, the overall restoration time for MM-2 and MM-3 alternatives are the same.

Extraction and treatment technologies used in the alternatives utilizing treatment are generally reliable and achieve a high degree of effectiveness and permanence. Treatment technologies in SC-2 and SC-3, SVE and thermal desorption, destroys contaminants on site, while alternative SC-4, includes remediation of contaminated soils by vapor extraction on-site and subsequent off-site incineration. In all three active treatment SC alternatives, excavation and off-site disposal of the PCB contaminated surface soil provides long-term effectiveness and permanence. For the MM alternatives, both air stripping with carbon adsorption and UV/oxidation with carbon adsorption permanently destroy the contaminants removed from the ground water. UV/oxidation destroys more contaminants on site; the alternative using air stripping destroys the contaminants when the activated carbon is regenerated.

If no active treatment SC alternative is implemented, the No Action MM alternative (MM-1) would not provide a long-term, effective reduction in risks for 500 years. If an active treatment SC alternative is implemented the No Action MM alternative (MM-1) would not provide a long-term, effective reduction in risks for 40 years.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

All of the source control alternatives, with the exception of SC-1 (No Action), reduce the extent of toxicity, mobility, and volume of the contamination since all would employ treatment prior to disposal. SC-4 would provide the greatest reduction since it involves incineration of all hazardous wastes. The off-site incinerator would destroy approximately 99% of the contamination. Alternatives SC-2 and SC-3 provide a lesser degree of treatment than incineration. Between 97% and 99% of the contamination would be oxidized in a catalytic oxidation system. All three active treatment source control alternatives are estimated to remove approximately 380,000 lbs of contamination from 130,000 cubic yards of soil to be treated. Alternative SC-1 would not reduce the toxicity, mobility, or volume of the contamination.

Both MM-2 and MM-3 reduce the extent of toxicity, mobility, and volume of the contamination by use of a ground water extraction and treatment system. UV/oxidation is expected to remove approximately 99% of the contamination. The remaining contaminants would be treated by activated carbon. Air stripping is expected to remove 90% of VOCs from the contaminated ground water; the remaining approximately 10% of VOCs and SVOCs would be removed by the activated carbon. MM-2 would provided the greatest reduction since it involves the collection and treatment of the dilute, concentrated and source regions of the plume. Alternative MM-3 would capture and treat ground water from the source and concentrated regions and would limit migration of contaminants outside the source and concentrated regions of the plume. Alternative MM-3 would allow the level of toxicity to decrease over time in the dilute region through natural attenuation. MM-1 (No Action) would not reduce the toxicity, mobility, or volume of the contamination through treatment.

5. Short-Term Effectiveness

Alternatives SC-2, SC-3, and SC-4 would be effective in the short term. However, the excavation of the soils in close proximity to nearby residents and the high concentration of VOCs in the soils cause a potential for release of contaminants during the excavation activities and a concern for short-term risk to the community and workers. To minimize the potential for contaminant emissions during cleanup related activities in alternatives SC-3 and SC-4, vapor extraction would be performed prior to excavating the soils and approximately 60% of the contaminants would be removed, but the actual air emissions that would result for the excavation would still pose an unknown risk to the community. Alternative SC-4 would also require the use of a large number of trucks to transport the contaminated soil off-site. This activity would impact the residents surrounding the Picillo Farm Site.

Implementation of alternative SC-2 potentially could release small amount of vapors and fugitive dusts during excavation of the PCB contaminated surface soils and installation of the wells system. Since alternative SC-1 does not achieve protection of human health or the environment, it is also not effective in the short term.

Alternative MM-3 would have no adverse impacts on human health. Alternative MM-3 could present a short-term impact to the wetlands by modifying the water balance in the area and by disturbing wetlands for construction of pipes and wells. To minimize the impact, a water balance would be maintained during extraction and recharge of ground water and erosion controls would be implemented during the construction activities. Alternative MM-2 presents greater short-term risks to the environment than MM-3, since it could potentially dewater the wetlands surrounding the Picillo Farm Site because of the need to extract and treat the ground water in the dilute region of the plume in the immediate proximity to the wetlands. Since alternative MM-1 does not achieve protection of human health or the environment, it is also not effective in the short term.

The treatment methods in all alternatives are not expected to have any adverse impact on the local community, nor on properly trained workers.

6. Implementability

Alternative SC-2 (thermally enhanced vapor extraction) is an innovative technology having been tested only at a few sites; therefore, it would have to be pilot tested prior to implementation. The treatment technology used in alternative SC-3 (thermal desorption) is readily implementable and has been successfully implemented at other sites. Alternative SC-4 may be difficult to implement due to the volume of soil that would have to be shipped to a hazardous waste disposal facility for incineration and limited ability of local roads to handle high-volume heavy truck traffic. The No Action alternative SC-1 raises no issues regarding implementability since it requires no technical or administrative actions.

The MM-2 and MM-3 alternatives are implementable. The extraction/treatment systems (installation of the ground water extraction wells, UV/oxidation system, air stripper and carbon adsorption) are well-developed technologies and all have been used successfully at other sites. The No action alternative MM-1 can also be implemented and would use established and reliable well drilling, monitoring, and analytical procedures.

7. Cost

Alternative SC-4 would be the most expensive of all of the alternatives with an estimated total cost of approximately $101,200,000. The second most expensive source control alternative would be alternative SC-3 with estimated total costs of approximately $23,900,000. Alternative SC-2 has the lowest cost of the active treatment source control alternatives with an estimated total cost of approximately $4,100,000. The above costs are for the SC alternatives when they are implemented in conjunction with an active treatment MM alternative. The No action alternative SC-1 requires no cost.

Alternative MM-2 is the most expensive management of migration alternative with estimated total costs of approximately $14,200,000 (UV/oxidation and air stripping) or $20,300,000 (alternative air stripping). Alternative MM-3 has estimated total costs of

$11,600,000 (UV/oxidation system) or $18,900,000 (alternative air stripper). The No action alternative MM-1 would require the least amount of money with estimated total costs of approximately $3,700,000, if implemented in conjunction with an active treatment source control remedy, or $4,300,000, if No Action alternative SC-1 is implemented.

These costs are estimates made during the Feasibility Study that are expected to provide accuracy of +50 percent to -30 percent. In calculating present worth a discount rate of 5 percent was used.

8. State Acceptance

The State's comments on the RI/FS and Proposed Plan, as received during the public comment period, and the EPA's responses to the comments are summarized in the Responsiveness Summary in Appendix D of the ROD.

In general, the State supported the preferred alternative set forth in the Proposed Plan. Among other specific issues, the State commented on the desirability of a residential well monitoring program at specific frequency; the need for a sentinel well system west and east of the Site and possible better delineation of the plume; the need for routine monitoring and options for improvement to the systems; and the need to maintain institutional controls. The State of Rhode Island' Letter of Concurrence, provided in Appendix C of the ROD, documents the State's position on the selected remedy.

9. Community Acceptance

The comments received from the community on the RI/FS and the Proposed Plan during the public comment period, and the EPA's responses to the comments are also summarized in the Responsiveness Summary in Appendix D of the ROD.

In general, comments received from the community did not raise serious objections to the preferred alternative set forth in the Proposed Plan. One of the cementers, however, asked EPA to consider active remediation of the entire plume. Main concerns of the community were related to the residential well monitoring and safety issues during construction and operation of the remedy. Several potentially responsible parties also submitted comments.

Potentially Responsible Parties objected to EPA's preferred alternative and disagreed with EPA's position on active remediation.

X. THE SELECTED REMEDY

The remedy for the Picillo Farm Superfund Site selected to address the remaining contamination at the Site includes: source control alternative SC-2 and management of migration alternative MM-3. A detailed description of the cleanup levels and the selected remedy is presented below.

A. Interim Ground Water Cleanup Levels

Interim cleanup levels have been established in ground water for all contaminants of concern identified in the Baseline Risk Assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels have been set based on the ARARs (e.g., Drinking Water Maximum Contaminant Level Goals (MCLGs) and MCLs) as available, or other suitable criteria described below. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by exposure to ground water (e.g., ingestion of ground water from domestic water usage). If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

The aquifer under the Site is a Class IIB type aquifer, which is a potential source of drinking water. Therefore, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs.

Interim cleanup levels for known, probable, and possible carcinogenic compounds (Classes A, B, and C) have been established to protect against potential carcinogenic effects and to conform with ARARs. Because the MCLGs for Class A & B compounds are set at zero and are thus not suitable for use as interim cleanup levels, MCLs and proposed MCLs have been selected as the interim cleanup levels for these Classes of compounds. Because the MCLGs for the Class C compounds are greater than zero, and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the interim cleanup levels for Class C compounds.

Interim cleanup levels for Class D and E compounds (not classified, and no evidence of carcinogenicity) have been established to protect against potential non-carcinogenic effects and to conform with ARARs. Because the MCLGs for these Classes are greater than zero and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the interim cleanup levels for these classes of compounds.

In situations where a promulgated State standard is more stringent than values established under the Safe Drinking Water Act, the State standard was used as the interim cleanup level. In the absence of an MCLG, an MCL, a proposed MCLG, proposed MCL, State standard, or other suitable criteria to be considered (i.e., health advisory, state guideline) an interim cleanup level was derived for each compound having carcinogenic potential (Classes A, B, and C compounds) based on a 10^{-6} excess cancer risk level per compound considering the ingestion of ground water from domestic water usage. In the absence of the above standards and criteria, interim cleanup levels for all other compounds (Classes D and E) were established based on a level that represent an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1) considering the ingestion of ground water from domestic water usage. If a value described by any of the above methods was not capable of being detected with good precision and accuracy or was below what was deemed to be the background value, then the practical quantification limit or background value was used as appropriate for the Interim Ground Water Cleanup Level.

Table 1 below summarizes the Interim Cleanup Levels for carcinogenic and non-carcinogenic contaminants of concern identified in ground water.

TABLE 1: INTERIM GROUND WATER CLEANUP LEVELS

Carcinogenic Contaminants of Concern (Class)	Interim Cleanup Level (ug/l)	Basis	Level of Risk
Volatiles:			
Benzene (A)	5.0	MCL	2e-06
Carbon tetrachloride (B)	5.0	MCL	8e-06
Chloroform (B)	100	MCL	7e-06
1,2-Dichloroethane (B)	5.0	MCL	5e-06
1,1-Dichloroethene (C)	7.0	MCL	5e-05
Dichloromethane (B)	5.0	MCL	4e-07
1,2-Dichloropropane (B)	5.0	MCL	4e-06
Styrene (B)	100	MCL	4e-05
Tetrachloroethene (B)	5.0	MCL	3e-06
1,1,2-Trichloroethane (C)	3.0	MCLG	2e-06
Trichloroethene (B)	5.0	MCL	7e-07
Vinyl Chloride (A)	2.0	MCL	5e-05
Semi-Volatiles:			
Bis (2-chloroethyl) ether (B)	5.0	Quant. Limit[a]	7e-05
Bis (2-ethylhexyl) phthalate (B)	6.0	MCL	1e-06
Isophorone (C)	90	Risk	1e-06
Pesticides and PCBs:			
Aldrin (B)	0.01	Quant. Limit[a]	2e-06
Aroclor 1248 (B)	0.5	MCL	5e-05
Dieldrin (B)	0.02	Quant. Limit[a]	5e-06
Heptachlor (B)	0.4	MCL	2e-05
Heptachlor epoxide (B)	0.2	MCL	2e-05
Metals:			
Beryllium (B)	4.0	MCL	2e-05
Lead (B)	15	Action Level	-
		SUM	**4e-04**

Non-carcinogenic Contaminants of Concern (Class)	Interim Cleanup Level (ug/l)	Basis	Target Endpoint of Toxicity	Hazard Quotient
Volatiles:				
Acetone (D)	3,700	Risk	liver and kidney	1
2-Butanone (D)	22,000	Risk	lethal toxicity	1
1,1-Dichloroethene (C)	7.0	MCL	liver	0.02
1,2-Dichloroethene (total) (D)	70	MCL	HMT	0.2
Ethylbenzene (D)	700	MCL	liver and kidney	0.2
Toluene (D)	1,000	MCL	liver & kidney, weight	0.1
1,1,1-Trichloroethane (D)	200	MCL	liver	0.1
Semi-Volatiles:				
1,2-Dichlorobenzene (D)	75	MCL	liver and kidney	0.02
2,4-Dichlorophenol (D)	110	Risk	immunological	1
Nitrobenzene (D)	18	Risk	HMT, ADR, liver, kidney	1

All Interim Ground water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and the protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance throughout the plume (defined here as approximately 35 acres of contaminated ground water), as indicated on Figure 22 of Appendix A). EPA has estimated that these levels will be obtained within approximately 20 years. The ability to meet this time frame would be dependent on the effectiveness of the source control remedy; the ability to contain the contamination in the source and concentrated regions of the plume while the source control remedy is implemented; and whether DNAPLs exist, and to what extent that they exist, in the bedrock.

B. Soil Cleanup Levels

Based upon data developed in the RI and the HHRA, remedial measures to address risk associated with possible exposure to source soils are not warranted because present and future risks are within or below EPA's acceptable carcinogenic risk range or for the non-carcinogens generally below a Hazard Index of one. However, available data suggest that area soils are a source of release of VOCs to ground water. This phenomenon may result in an unacceptable risk to those who drink contaminated ground water in the foreseeable future. Therefore, cleanup levels for soils were established to protect the aquifer from potential soil leachate. The Summer's Leaching Model was used to estimate residual soil levels that are not expected to impair future ground water quality. The interim cleanup levels for ground water were used as input into the leaching model. If the predicted protective soil level was not capable of being detected with good precision and accuracy, then the practical quantification limit was selected as the cleanup level for soils. The table below summarize the soil cleanup levels required to protect public health and the aquifer and were developed for the ground water contaminants of concern detected above the interim ground water cleanup levels.

TABLE 1: INTERIM GROUND WATER CLEANUP LEVELS (cont.)

Non-carcinogenic Contaminants of Concern (Class)	Interim Cleanup Level (ug/l)	Basis	Target Endpoint of Toxicity	Hazard Quotient
Metals:				
Antimony (ND)	6.0	MCLG	lifespan, HMT	0.4
Cadmium (B)	5.0	MCLG	kidney	0.3
Chromium (A)	100	MCLG	ND	0.5
Manganese (D)	180	Risk	CNS	1
Target Endpoints for which Hazard Index exceeds 1:				
	Liver			**2.4**
	Kidney			**2.6**
	HMT			**1.6**

Notes:
HMT - hematological
ADR - adrenal
CNS - central nervous system
(a) Sample quantitation limit (SQL) for the compound, CLP low concentration method.

While these interim cleanup levels are consistent with ARARs or suitable TBC criteria for ground water, a cumulative risk that could be posed by these compounds may exceed EPA's goals for remedial action. Consequently, these levels are considered to be interim cleanup levels for ground water. At the time that these Interim Ground water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by exposure to ground water (e.g., ingestion of ground water from domestic water usage). If, after review of the risk assessment the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

Notes:
HMT - hematological
ADR - adrenal
(a) Quantitation limit of the compound in soil; for volatiles method 8240, for semivolatiles and pesticides/PCBs CLP Method OLM01.0

These cleanup levels in soils are consistent with ARARs for ground water, attain EPA's risk management objective for remedial actions, and have been determined by EPA to be protective. These cleanup levels must be met at the completion of the remedial action throughout all soils in the areas near the former disposal trenches at varying depths, with the majority of soil contamination found 10 to 30 feet below ground, with some contamination found at depths of more than 50 feet below the ground, as indicated on the Figures 8 through 11 and Figure 19 in Appendix A. The volume of soil contaminated with compounds at concentrations above their ground water protection limits is estimated to be 130,000 cubic yards.

Cleanup levels for surficial soils were developed to reduce risks associated with the exposure of environmental receptors (Table 2B). The cleanup level for PCBs was developed using a multi-zone foraging scenario presented in the ecological risk assessment which represents a probable foraging scenario for American Woodcock and Short-tailed Shrew populations. Based on the multi-zone scenario, which includes area-weighed foraging in the disposal area, in the uplands, and in the wetlands, the PCBs cleanup level of 1,300 ug/kg was selected for the Site for the protection of the environment. This level is considered by EPA to be protective of human health and the environment at the Site.

TABLE 2B: SURFICIAL SOIL CLEANUP LEVELS

Contaminants of Concern	Soil Cleanup Level (ug/kg)	Basis	Ecological Hazard Quotient[a]
PCBs	1,300[b]	ERA	10

ERA - Ecological Risk Assessment
(a) An acceptable risk of 10 to American Woodcock is based on accounting for safety factors inherent in the toxicity benchmark and is appropriate for risk estimates based on a NOAEL. The endpoint selected for the short-tailed shrew for adverse effects to an individual may represent a very conservative basis for cleanup given the population dynamics for shrews. Cleanup level of 1,300 ug/kg, which results in a risk of 16 to the shrew, will be protective for the shrew population.
(b) Carcinogenic level of risk to human health associated with the PCB cleanup level of 1,300 ug/kg is 3e-06 based on future potential residential exposure to contaminated soil through direct contact and incidental ingestion.

TABLE 2A: SOIL CLEANUP LEVELS FOR THE PROTECTION OF HUMAN HEALTH AND THE AQUIFER BASED ON THE SUMMER'S MODEL

Carcinogenic Contaminants of Concern (Class)	Soil Cleanup Level (ug/kg)	Basis for Model Input	Residual Ground water Risk
Volatiles:			
Benzene (A)	5.0[a]	MCL	2e-06
Carbon tetrachloride (B)	5.3	MCL	8e-06
Chloroform (B)	71	MCL	7e-06
1,2-Dichloroethane (B)	5.0[a]	MCL	5e-06
1,1-Dichloroethene (C)	6.0	MCL	5e-05
Dichloromethane (B)	5.0[a]	MCL	4e-07
1,2-Dichloropropane (B)	5.0[a]	MCL	4e-06
Styrene (B)	460	MCL	4e-05
Tetrachloroethene (B)	11	MCL	3e-06
1,1,2-Trichloroethane (C)	5.0[a]	MCLG	2e-06
Trichloroethene (B)	5.1	MCL	7e-07
Vinyl Chloride (A)	10[a]	MCL	5e-05
Semi-Volatiles:			
Bis (2-chloroethyl) ether (B)	330[a]	Quant. Limit	7e-05
Bis (2-ethylhexyl) phthalate (B)	330[a]	MCL	1e-06
Isophorone (C)	330[a]	Risk	1e-06
Pesticides:			
Aldrin (B)	4.2	Quant. Limit	2e-06
Dieldrin (B)	3.3[a]	Quant. Limit	5e-06
Heptachlor (B)	21	MCL	2e-05
Heptachlor epoxide (B)	1.7[a]	MCL	2e-05
		SUM	**3e-04**

Non-carcinogenic Contaminants of Concern (Class)	Soil Cleanup Level (ug/kg)	Basis for Model Input	Target Endpoint of Tox.	Residual Ground water Hazard Quot.
Volatiles:				
Acetone (D)	2,400	Risk	liver & kidney	1
2-Butanone (D)	13,000	Risk	lethal toxicity	1
1,1-Dichloroethene (C)	6.0	MCL	liver	0.02
1,2-Dichloroethene (D)	53	MCL	HMT	0.2
Ethylbenzene (D)	1,200	MCL	liver & kidney	0.2
Toluene (D)	990	MCL	liver and kidney	0.1
1,1,1-Trichloroethane (D)	270	MCL	liver	0.1
Semi-Volatiles:				
1,2-Dichlorobenzene (D)	600	MCL	liver and kidney	0.02
2,4-Dichlorophenol (D)	330[a]	Risk	immunological	1
Nitrobenzene (D)	330[a]	Risk	HMT, ADR, liver & kidney	1
Target Endpoints for which Hazard Index exceeds 1:				
	Liver			2.4
	Kidney			2.3
	HMT			1.2

AWQC was used as the cleanup level for these classes of compounds.

In situations where a promulgated State standard for surface water quality is more stringent than values established under the Safe Drinking Water Act or the Clean Water Act, the State standard was used as the cleanup level. In the absence of an MCLG, an MCL, a proposed MCLG, proposed MCL, AWQC, State standard, or other suitable criteria to be considered, a cleanup level was derived for each compound having carcinogenic potential (Classes A, B, and C compounds) based on a 10^{-6} excess cancer risk level per compound considering the ingestion of surface water from domestic water usage; dermal contact with surface water; and incidental ingestion of surface water. In the absence of the above standards and criteria, cleanup levels for all other compounds (Classes D and E) were established based on a level that represent an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1) considering the ingestion of surface water from domestic water usage; dermal contact with surface water and incidental ingestion of surface water. If a value described by any of the above methods was not capable of being detected with good precision and accuracy, then the practical quantification limit was used as appropriate for the Surface Water Cleanup Level. Also, where the background concentration for a compound was greater than the most stringent standard, the background concentration was used for the Surface Water Cleanup Level.

Table 3A and Table 3B below summarizes the Cleanup Levels for carcinogenic and non-carcinogenic contaminants of concern identified in surface water.

TABLE 3A: SURFACE WATER CLEANUP LEVELS AND THE RESIDUAL HUMAN HEALTH RISKS

Carcinogenic Contaminants of Concern (Class)	Cleanup Level (ug/l)	Basis	Level of Risk
Volatiles:			
Benzene (A)	5.0	MCL	2e-06
Chloroform (B)	32	RIAWQC	2e-06
1,2-Dichloroethane (B)	5.0	MCL	5e-06
1,1-Dichloroethene (C)	7.0	MCL	5e-05
Dichloromethane (B)	5.0	MCL	4e-07
1,2-Dichloropropane (B)	5.0	MCL	4e-06
Tetrachloroethene (B)	5.0	MCL	3e-06

The cleanup levels for PCBs must be met throughout the surface soil in a vicinity of the former PCB pile and the drainage ditch (Appendix A, Figures 12, 13 and 20). The volume of surface soil contaminated with PCBs is estimated to be approximately 600 cubic yards.

C. Surface Water Cleanup Levels

Cleanup levels have been established in surface water for all contaminants of concern identified in the Baseline Risk Assessment found to pose an unacceptable risk to either public health or the environment. Cleanup levels have been set to be protective of human health and aquatic life based on the ARARs as available, or other suitable criteria described below.

The Unnamed Swamp and unclassified surface waters at the Site have been designated by the State of Rhode Island as Class A waters, which are a potential source of drinking water. Therefore, MCLs and non-zero MCLGs established under the Safe Drinking Water Act and Ambient Water Quality Criteria (AWQCs) established under the Clean Water Act are ARARs.

Cleanup levels for known, probable, and possible carcinogenic compounds (Classes A, B, and C) have been established to protect against potential carcinogenic effects to human health and adverse effects to the environment, and to conform with ARARs. Because the MCLGs for Class A & B compounds are set at zero and are thus not suitable for use as cleanup levels, MCLs and proposed MCLs have been selected as the cleanup levels for these Classes of compounds. Because the MCLGs for the Class C compounds are greater than zero, and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the cleanup levels for Class C compounds. In situations were AWQC is more stringent than MCL and proposed MCL or non-zero MCLG and proposed non-zero MCLG, the AWQC was used as the cleanup level for these classes of compounds.

Cleanup levels for Class D and E compounds (not classified, and no evidence of carcinogenicity) have been established to protect against potential non-carcinogenic effects to human health and adverse effects to the environment, and to conform with ARARs. Because the MCLGs for these Classes are greater that zero and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the cleanup levels for these classes of compounds. In situations were AWQC is more stringent than non-zero MCLG and proposed non-zero MCLG, the

TABLE 3A: SURFACE WATER CLEANUP LEVELS AND THE RESIDUAL HUMAN HEALTH RISKS (cont.)

Carcinogenic Contaminants of Concern (Class)	Cleanup Level (ug/l)	Basis	Level of Risk
Trichloroethene (B)	5.0	MCL	7e-07
Vinyl Chloride (A)	2.0	MCL	5e-05
Semi-Volatiles:			
Benzo [a] pyrene (B)	5.0	Quant. Limit[(a)]	4e-04
Bis (2-ethylhexyl) phthalate (B)	6.0	MCL	1e-06
Pesticides and PCBs:			
Aroclor 1248 (B)	0.2	Quant. Limit[(a)]	2e-05
Aroclor 1260 (B)	0.2	Quant. Limit[(a)]	2e-05
Metals:			
Beryllium (B)	4.0	MCL	2e-05
Lead (B)	2.0	Background[(b)]	-
		SUM	**6e-04**

Non-carcinogenic Contaminants of Concern (Class)	Cleanup Level (ug/l)	Basis	Target Endpoint of Toxicity	Hazard Quotient
Volatiles:				
Chlorobenzene (D)	18	RIAWQC	liver and kidney	0.02
1,1-Dichloroethene (C)	7.0	MCL	liver	0.02
1,2-Dichloroethene (total) (D)	70	MCL[(c)]	HMT	0.2
trans-1,2-Dichloroethene (D)	100	MCL	Increased SAP	0.1
Ethylbenzene (D)	36	RIAWQC	liver and kidney	0.01
Toluene (D)	14	RIAWQC	liver and kidney	0.002
1,1,1-Trichloroethane (D)	200	MCL	liver	0.1
Pesticides and PCBs:				
Methoxychlor (D)	0.1	Quant. Limit[(a)]	development	0.0005
Metals:				
Manganese (ND)	180	RBHH	CNS	1

Cumulative Hazard Indices do not exceed one (1) any Target Endpoints

Notes:
SAP - serum alkaline phosphatase
HMT - hematological
CNS - central nervous system
(a) Sample quantitation limit (SQL) for the compound, CLP low concentration method.
(b) Background - The values presented are compound concentrations reported at SW-03 and are considered to be representative of background levels.
(c) Maximum Contaminant Level for cis-1,2 dichloroethene
RIAWQC - Rhode Island Ambient Water Quality Criteria
MCL - Maximum Contaminant Level
RBHH - Risk Based Human Health

TABLE 3B: SURFACE WATER CLEANUP LEVELS AND THE RESIDUAL ECOLOGICAL RISKS

Contaminants of Concern	Cleanup Level (ug/L)	Basis	Ecological Hazard Quotient
Volatiles:			
Benzene	5.0	MCL	0.8
Chlorobenzene	18	RIAWQC	1
Chloroform	32	RIAWQC	1
1,1-Dichloroethene	7.0	MCL	0.54
1,2-Dichloroethane	5.0	MCL	0.04
1,2-Dichloropropane	5.0	MCL	0.09
Ethylbenzene	36	RIAWQC	1
Tetrachloroethene	5.0	MCL	0.9
Toluene	14	RIAWQC	1
Trichloroethene	5.0	MCL	0.12
Semi-Volatiles:			
Benzo [a] pyrene	5.0	Quant. limit[a]	2 (18)*
Bis (2-Ethylhexyl) phthalate	6.0	MCL	2 (18)*
Diethyl phthalate	5.0	Quant. Limit[a]	2
Dimethyl phthalate	5.0	Quant. Limit[a]	2
Pesticides and PCBs:			
Aroclor 1248	0.2	Quant. Limit[a]	14 (82)*
Aroclor 1260	0.2	Quant. Limit[a]	14 (82)*
Dieldrin	0.02	Quant. Limit[a]	11 (7)*
Heptachlor	0.01	Quant. Limit[a]	3 (12)*
Methoxychlor	0.1	Quant. Limit[a]	3 (62)*
Metals:			
Aluminum	748	AWQC	1
Cadmium	1.20	Background[b]	3
Copper	7.0	Background[c]	2
Iron	1,000	AWQC	1
Lead	2.0	Background[c]	4 (3)*
Mercury	0.2	Background[b]	17 (10)*
Zinc	33	RIAWQC	1
		Total Risk	89 (294)*

Notes:
* Risk levels to the mink resulting from the cleanup level are presented parenthetically when they are greater than or equal to 1.
(a) Sample quantitation limit (SQL) for the compound, CLP low concentration method.
(b) The compound was not detected at SW-03. The value presented is the sample quantitation limit (SQL) for the compound.
(c) The values presented are compound concentrations reported at SW-03 and are considered to be representative of background levels.
AWQC - Federal Ambient Water Quality Criteria
RIAWQC - Rhode Island Ambient Water Quality Criteria
MCL - Maximum Contaminant Level

These cleanup levels for surface water must be met at the completion of the remedial action at the points of compliance in all surface waters, including the Unnamed Swamp and other wetlands and open water bodies on the Site. Because the surface water contamination is directly related to the ground water contamination, by remediating the ground water to interim cleanup levels, the surface water will be remediated to meet the surface water cleanup levels. This can be shown by mixing the water that infiltrates into the ground water above the plume and estimating the resulting contaminant concentration. Based on current data, the water infiltrating into the ground water plume would reduce the contaminant concentration by approximately 20 percent from the disposal area to the discharge into surface water. Therefore, if the ground water in the disposal area has a contaminant concentration equal to or less than the ground water interim cleanup levels, the water discharging into the swamp and the seeps will have contaminant concentration equal to or less than the surface water cleanup levels.

Sediment cleanup levels are not being established at this time. No active cleanup of the sediment is being proposed. Additional sampling of surface water and sediment to verify the presence of PCBs in surface water and sediment will be performed prior to or during the design.

D. Description of Remedial Components

The selected remedy, consists of a combination of source control alternative SC-2 and management of migration alternative MM-3, to address the soil, ground water and surface water contamination. The selected remedy has the following seven components: 1) treatment of contaminated soils by thermally enhanced vapor extraction and catalytic oxidation; 2) excavation and off-site disposal of surface soils contaminated with PCBs; 3) extraction of contaminated ground water in the source and concentrated regions of the plume and natural attenuation of the dilute region of the plume; 4) treatment of the extracted ground water by ultraviolet (UV)/oxidation and carbon adsorption or air stripping and carbon adsorption; 5) recharge of the treated ground water into the aquifer; 6) long-term environmental monitoring and periodic reviews of the Site; and 7) institutional controls. Each component is described below.

<u>1) Treatment of contaminated soils by thermally enhanced vapor extraction and catalytic oxidation</u>

This alternative is designed to treat the contamination in the subsurface soils while in place and thus to avoid the need for excavating the soils and exposing the contamination. To meet this objective, a thermally enhanced vapor extraction system would be installed on-site in the areas where the soil contamination exceeds the soil cleanup levels established to reduce migration of contaminants into the ground water. The ground water table in these areas would be lowered by pumping and hot air would be injected into the soils to enhance the volatilization of both VOCs and SVOCs. The volatilized organics would then be collected in vapor extraction wells and piped to a thermal oxidation system, such as catalytic oxidation unit, where the organics would be oxidized. The extracted ground water would be treated by UV/Oxidation or air stripping (see Treatment of the extracted ground water by ultraviolet (UV)/oxidation and carbon adsorption or air stripping and carbon adsorption component of the remedy). Access to the areas of active remediation would be restricted by a fence or application of an equivalent method to secure the Site for the protection of human health and equipment.

The vacuum extraction system would be operated in conjunction with a dewatering system. A Dual Vapor Extraction (DVE) well system could be installed to lower the water table and extract contaminants from the soil. In the DVE system, the vapor extraction wells would extend to the depth where the volatile compounds are to be extracted. The dewatering wells, smaller in diameter, would extend through the soil vapor extraction wells below the lowered water table. The ground water pumped from the dewatering wells would be collected and pumped to the treatment building in a pipeline to be buried below frost depth or application of an equivalent method that would prevent potential freezing problems.

To enhance the volatilization of the contaminants, ambient air would be compressed and heated to approximately 600 degrees F. The air would then be injected into the contaminated soil through evenly spaced, multiple stainless steel injection wells. The temperature of the air extracted from the ground is estimated to increase from 55 degrees F to approximately 100 degrees F. Multiple PVC vapor extraction wells would be used to collect the volatilized contaminants (Appendix A, Figure 23). Vapor extraction wells would be installed in and near the area of contaminated soil and would be evenly spaced so that their radius of influence overlap. The extraction wells would be capable of having a submersible pump installed at the bottom for dewatering if the DVE system is selected during the design studies. The dewatering, vapor extraction and air injection wells would be drilled into the shallow bedrock to a sufficient depth to allow for the removal of residual contamination from the soil in the area near the water table, and the remediation of any DNAPLs that may be present in the highly fractured shallow bedrock. The system will also allow for the upward flow of ground water from the bedrock to capture dissolved contamination, once the ground water table is lowered.

In order to enhance recovery of the vapor extraction system, a temporary cap would be installed over the area. The cap would be installed after the wells were in place and would consist of an impermeable membrane with clay or soil top layer.

A vacuum pump would remove the contaminated air from the soil. From the vacuum pump the contaminated gas would be piped to a thermal oxidation unit to be located in a treatment building within the disposal area. The first step in the system would be a vapor liquid separator. The liquids removed from the air stream would be sent off-site for treatment and disposal. The air stream would then be passed through a heat exchanger to recover approximately 50% of the heat from the treated gas in the effluent of the thermal oxidation system. Following the heat exchanger, the temperature of the gas stream would be raised further in the preheater and then the contaminants would be destroyed in the thermal oxidation system. The resultant compounds would be water, carbon dioxide and hydrochloric acid (formed due to the presence of chlorinated solvents).

After the destruction of the contaminants, the gas would be passed through the heat exchanger again, this time to lower the temperature of the treated gas stream. Acid gases from the oxidation of the chlorinated hydrocarbons would then be absorbed and neutralized in a caustic scrubber. The scrubber would generate a brine solution that would be disposed of off-site. From the scrubber, the treated air would then be released to the atmosphere.

<u>2) Excavation and off-site disposal of surface soil contaminated with PCBs</u>

The PCB contaminated surface soil, in the drainage ditch and near the former PCB pile, will be excavated (approximately 600 cubic yards) and disposed of at an off-site, TSCA-regulated, treatment, storage, and disposal facility. The exact amount of soil to be excavated is to be determined based on the sampling and analysis for PCB contamination to be performed during the design stage and the excavation activities.

3) Extraction of contaminated ground water in the source and concentrated regions of the plume and natural attenuation of the dilute region of the plume

Ground water from the source and concentrated regions of the ground water plume would be collected using a multi-well extraction system located in the source and concentrated region of the plume (Appendix A, Figure 23). The ground water extraction wells would be constructed with stainless steel or equivalent well casing to minimize degradation of the well. Destruction of PVC well casing has been noted at the Site, necessitating the use of the higher grade casing material. Each of the wells would be drilled into the shallow bedrock. The ground water pumped from these wells would be collected and pumped to the treatment building in a pipeline to be buried below frost depth or application of an equivalent method that would prevent potential freezing problems.

The dilute region of the plume would be isolated from the source contamination by using the extraction system as described above to provide active containment. The dilute portion of the plume would then be allowed to naturally attenuate. Natural attenuation is the reduction of contamination levels through three main processes: diffusion; biodegradation; and physical and chemical (abiotic) degradation. The isolation and natural attenuation of the dilute region of the plume would be enhanced by the reinjection of the treated ground water downgradient of the extraction wells.

4) Treatment of the extracted ground water by ultraviolet (UV)/oxidation and carbon adsorption or air stripping and carbon adsorption

The extracted ground water would be combined with water from the dewatering operations and pumped into an equalization tank to be located in the ground water treatment building within the disposal area. The equalization tank would also be used to remove any pure contaminants or solids which would be drummed and sent to an off-site facility.

From the equalization tank the ground water would be pumped to a metal precipitation unit where manganese, iron and other inorganic (metallic) compounds would be removed. The metals removal system would minimize the chances for adversely affecting the UV/oxidation system and would also reduce any elevated metal concentrations in the ground water to naturally occurring levels. The metal sludge would be sent to an off-site RCRA facility for reclamation or treatment prior to disposal.

After the metal precipitation system, the pH of the ground water would be adjusted and the ground water would be pumped to the UV/oxidation system and/or air stripper. Hydrogen peroxide, ozone, or a combination of both, would be added to the ground water. The ground water then would be exposed to ultraviolet light in a reactor. The ultraviolet light causes the hydrogen peroxide or ozone to form molecules that, because they are highly reactive, break down the VOCs and SVOCs into water, carbon dioxide, and harmless chloride salts. Based on the laboratory treatability study, a 60 minute retention time would degrade approximately 99% of the organic contamination.

After treatment by the UV/oxidation system, the ground water would be passed through activated carbon filters to remove the remaining contaminants. If ozone is used, air from the treatment system would also pass through a catalytic decomposer such as activated carbon filters to convert the remaining ozone to oxygen and to remove the contaminants prior to discharging to the atmosphere.

The only component of the preferred alternative that could change is the implementation of an air stripper instead of the UV/oxidation unit. Air stripping and carbon adsorption would be used to treat the contaminated ground water collected from the ground water extraction wells and the dewatering system. All other components of the remedy would remain the same. In the air stripping unit, contaminated water would be countercurrently contacted with clean air to volatilize the majority of the volatile organic contaminants. Based on the pilot studies performed by Tighe and Bond, the air stripper would remove about 90% of VOCs, and the remaining 10% of VOCs and SVOCs would be removed by the carbon adsorption treatment. Since either of these treatment options (UV/Oxidation and air stripping with carbon adsorption) will effectively achieve the treatment levels, the decision on which system will be used will be based upon more refined data and cost analysis during the design.

For the air stripping option, the vapor phase activated carbon filter would be preceded by a heater to raise the temperature and to reduce the relative humidity of the contaminated air stream, thereby increasing the adsorptive capacity of the carbon filter. The contaminated carbon would be periodically regenerated for reuse. Based on the data collected during the design and the system operation, other off-gas treatment options, such as thermal destruction, may be considered by EPA.

The remedial investigation of the source and concentrated regions of ground water suggests that DNAPLs may be present. The source control part of the remedy, enhanced SVE, is expected to effectively remove and treat the DNAPLs that may exist. The ground water extraction wells will initially contain that portion of the plume where any DNAPLs may be found so that the remainder of the contaminated aquifer and surface water can be restored to their beneficial uses. EPA will collect and periodically assess monitoring data and periodically review advances in ground water cleanup technology to determine if new techniques have been developed to effectively remediate DNAPLs conditions and whether any modifications to the remedy are appropriate to provide more effective attainment of cleanup levels.

5) Recharge of the treated ground water into the aquifer

The resultant treated water would be pumped from the ground water treatment building to reinjection wells or discharged into surface waters to maintain the water balance in the Unnamed Swamp and the Great Ceder Swamp at current levels. The piping to the reinjection wells would be buried below frost depth or would incorporate an alternative design that would minimize the potential for winter freeze-ups.

6) Long-term environmental monitoring and periodic reviews of the Site

The environmental monitoring program would be implemented to evaluate the performance of the treatment system, the rate of natural attenuation, and the overall effectiveness of the remedy. The remedy would include installation of additional deep bedrock monitoring wells to monitor for dissolved contamination in the deep bedrock northeast and west of the disposal area and to act as early warning wells for contamination approaching the residential wells. If contamination is found to spread, an evaluation of the effectiveness of the entire ground water extraction and treatment system will be performed. Based on this evaluation, adjustments or modifications to the ground water extraction system will be implemented to prevent or limit further contaminant migration.

Selected ground water monitoring wells would be sampled on a quarterly basis for VOCs and SVOCs. Selected surface water and sediments locations would be sampled for VOCs and SVOCs on at least an annual basis. Ground water, surface water and sediments would be analyzed at least annually for metals, PCBs and pesticides. TICs positively identified in the RI and TICs from the monitoring program would be periodically analyzed for in the subsequent sampling rounds. Since evidence exists for the presence of petroleum solvents near the northwest and west trenches, the total petroleum hydrocarbons (TPH) analysis would need to be performed at least annually. Residential wells in the area would be monitored annually during the initial startup period of cleanup activities. The number and location of wells sampled and the frequency of sampling and analysis, including sampling of residential wells, may be changed based upon the evaluation of the sampling data results.

The influent and effluent from the treatment plants would be monitored as necessary to determine efficiency of the treatment systems and to ensure compliance with ARARs. Air monitoring would be done at the treatment plants as necessary to ensure that air emissions are in compliance with ARARs.

The details of the monitoring program would be developed during remedial design to be tailored to the specifics of the design. Additional monitoring wells and surface water and sediment sampling locations may be needed to evaluate the extent of the contamination over time and to monitor for changes in the preferential contaminant movement and discharges to the surface water system.

A soil monitoring program to demonstrate compliance with soil cleanup levels and a performance monitoring program for the enhanced SVE system would also be performed to determine if the SVE system is working effectively. Results will be evaluated to determine future operating parameters of the system.

Selected bedrock and overburden wells would be monitored upon initiation of remedial design until completion of the remedial design.

Reports assessing the results of the sampling and analysis events would be done after every sampling event. All monitoring data would be evaluated during the implementation of the remedial action to ensure that response objectives are achieved. Monitoring data would be evaluated to determine effectiveness of the remedy, suggest remedy improvements and to refine predicted cleanup time. Modifications to the remedial action, including the evaluation and possible implementation of advances in ground water cleanup technology may also require changes in monitoring frequency, locations or techniques.

7) Institutional controls

Institutional controls could include access restrictions around areas of active soil remediation and restrictions on use of the contaminated ground water and surface water. The institutional controls would remain in place until the cleanup levels are met. The objective of the institutional controls shall be to insure that no activities take place at the Site which either affect implementation of the selected remedy or cause exposures to hazardous substances.

8) Remedial Design Issues

At the design stage, a pilot test for the enhanced SVE utilizing a limited number of vacuum extraction and air injection wells would be conducted to optimize the system prior to full scale operation. Design components such as, the precise number and location of vapor extraction and air injection wells, site specific vapor flow rates, radius of influence measurements, contaminant recovery rates, site specific subsurface air temperatures, precise dewatering techniques (e.g., trenches or horizontal wells), and specific water and off-gas treatment options, so that the SVE system most effectively captures and removes the contamination would be determined based on the pilot test results.

During design and implementation of the thermally enhanced vapor extraction, other methods may be evaluated to enhance the effectiveness of the system in meeting cleanup levels. Such methods may include other enhancements to vapor extraction, such as radio frequency heating, steam injection and air sparging.

Design studies would be performed for the dewatering operation to determine system parameters such as: the time period needed to dewater the area; exact depth of dewatering; need for DVE system; number and location of dewatering wells; radius of influence; and pumping rates and operational mode (partial vs. simultaneous).

The dewatering of the soils for the enhanced SVE operation and extraction of the ground water in the source and concentrated regions of the plume may potentially impact the wetlands by dewatering the seeps and part of the Unnamed Swamp. Studies would be conducted to determine the effect of the remedy on the water table in the area. Similarly, both the specific location for the discharge of treated water and the method of discharge for the treated water would be examined during the design phase. Evaluation of recharge options or structural or hydrogeological barriers to maintain the water balance in the area would also be performed.

The exact amount of the PCB contaminated surface soil to be excavated and the area and depth of the excavation would be determined based on the sampling and analysis for PCB contamination to be performed during the design stage and the excavation activities.

Design studies would be performed to determined the precise number, pumping rates and placement of ground water extraction wells that contain, recover and treat contaminants in the most effective and efficient manner.

During operation of the enhanced SVE system and ground water extraction and treatment, the systems' performance will be carefully monitored on a regular basis and operation of the systems will be adjusted as warranted by the performance data.

Approximately 450 compounds were tentatively identified in the RI. Also, evidence exists for the presence of petroleum solvents near the northwest and west trenches. Sampling and analysis for total petroleum hydrocarbons (TPH) would be performed during the remedial design to ensure that soil and ground water treatment systems are capable to effectively treat the additional contamination. Long-term environmental monitoring would include positive identification of the major TICs and sampling and analysis for these compounds and TPH.

Since several of the PCB analyses in sediment and surface water were invalidated during the RI, additional sampling of PCBs in sediment and surface water would be performed prior to or during the design to verify the presence of PCBs and a risk assessment may need to be performed. If PCBs do pose a concern, the remedy may need to be modified to address this contamination.

The goal of this remedial action is to restore the ground water and surface water to their beneficial uses, which is, at this Site, a potential future drinking water source. Based on information obtained during the remedial investigation, and the analysis of all remedial alternatives, EPA believes that the selected remedy may be able to achieve this goal. Although not detected during the RI, DNAPLs may be present at the Site. Studies to further investigate the possibility of DNAPLs presence may need to be undertaken in the remedial design stage or during construction and operation of the remedy.

The ability to achieve cleanup levels at all points throughout the area of attainment, or plume, cannot be determined until after implementation of the source control remedy and until after the ground water extraction and treatment system has been implemented and operated for a reasonably significant period of time, modified as necessary, and contaminated ground water plume response is monitored over time.

Based on current data, EPA estimates that the ground water will be extracted and treated for approximately 20 years. During operation, the soil treatment and ground water extraction and treatment systems' performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. These adjustments or modifications may include any or all of the following: enhancements to the SVE system; relocation or addition of extraction wells; modification of withdrawal and pumping rates; alternating pumping rates; and switching from continuous pumping to pulsed pumping.

If, following a reasonable period of the ground water system operation, EPA determines that the selected remedy cannot meet cleanup levels, EPA may consider contingency measures as a modification to the selected remedy. Such contingency measures may include the following:

a) engineering controls such as physical barriers, or long-term gradient control provided by low level pumping, as containment measures;

b) ARARs may be waived for the cleanup of the relevant portions of the aquifer based on the technical impracticability of achieving further contaminant reductions and revised cleanup levels may be established for the relevant portion of the aquifer;

c) institutional controls will be maintained to prevent use of ground water that remains above health-based levels;

d) continued monitoring of specified wells; and

e) periodic reevaluation of remedial technologies for ground water restoration; or

f) such other measures as EPA determines are necessary to further reduce the mass of the contaminants and to ensure that the remedy remains protective of human health and the environment.

The decision to invoke any or all of these measures may be made by EPA during a future review, following a reasonably significant period of operation of the selected remedy. If EPA determines that such contingency measures are necessary, and are significant or fundamental modifications to the remedy, such changes will be documented in a future decision document.

To the extent required by law, EPA will review the Site at least once every five years after the initiation of remedial action at the Site if any hazardous substances, pollutants or contaminants remain at the Site to assure that the remedial action continues to protect human health and the environment. EPA will also review the Site before the Site is proposed for deletion from the NPL.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Picillo Farm Superfund Site is consistent with CERCLA and the NCP. The selected remedy is protective of human health and the environment, attains ARARs and is cost effective. The selected remedy also satisfies the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. Additionally, the selected remedy utilizes alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

A. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will permanently reduce the risks posed to human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls, and institutional controls. Specifically, the risk presented at the Site to human health is the potential ingestion of the contaminated ground water. The potential use of surface water as drinking water also poses a risk to human health.

The selected remedy uses a soil treatment system which will remove the contamination from the soil and reduce the leaching of the contamination from the soil into the ground water. The potential for direct contact of the environmental receptors with the PCB-contaminated surface soil will be eliminated through the off-site removal of the PCB-contaminated soil to an EPA-approved disposal facility. The management of migration portion of the selected remedy, in combination with the source control, will return the ground water and surface waters to their beneficial use in approximately 20 years. A long-term monitoring program will ensure that the remedy remains protective of human health and the environment.

Moreover, the selected remedy will achieve potential human health risk levels that attain the 10^{-4} to 10^{-6} incremental cancer risk range and a level protective of noncarcinogenic endpoints, and will comply with ARARs and the "To Be Considered" criteria. At the time that the Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by exposure to ground water (e.g., ingestion of ground water from domestic water usage).

If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until protective levels are achieved and have not been exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

Considering all of the elements of the selected remedy, EPA has determined that the selected remedy is protective of human health and the environment.

B. The Selected Remedy Attains ARARs

This remedy will attain all applicable or relevant and appropriate federal and state requirements that apply to the Site. Environmental laws from which ARARs for the selected remedial action are derived, and the specific ARARs include:

Chemical-Specific

o Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)

- o Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels Goals (MCLGs) (40 CFR 141.50-141.51)(non-zero MCLGs)
- o Resource Conservation and Recovery Act (RCRA) - Ground Water Protection Standards (40 CFR 264.94)
- o Clean Water Act (CWA) - Ambient Water Quality Criteria (AWQCs) (40 CFR 131)
- o Rhode Island Water Quality Standards (Section 6) -- Rhode Island Water Quality regulations for Water Pollution Control (October 1988)
- o Rhode Island Water Quality Regulations (Sections 7, 8, 10, 17) -- Rhode Island Water Quality regulations for Water Pollution Control (October 1988)
- o Rhode Island Rules and Regulations for Ground Water Quality (regulation DEM-GW-01-92, July 1993)
- o Rules and Regulations for Public Drinking Water (R46-13-DWQ)

Location-Specific

- o Clean Water Act (CWA) (40 CFR 230; 40 CFR 320-330)
- o Fish and Wildlife Coordination Act (40 CFR 6.302(g))
- o Protection of Wetlands Executive Order No. 11990 (40 CFR Part 6)
- o Rhode Island Rules and Regulations for Ground Water Quality (Regulation DEM-GW-01-92, July 1993)
- o Rhode Island Freshwater Wetlands Act (RIGL 2-1-18-27; Title 2, ch 1 §§ 18-27)
- o Rhode Island Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act (August 1990)

Action-Specific

- o Clean Water Act (CWA) (40 CFR 122, 125)
- o Resource Conservation and Recovery Act (40 CFR 265, Subpart P)
- o Resource Conservation and Recovery Act (40 CFR 264, Subpart AA)

- Clean Air Act (CAA) (40 CFR 61.348)

- Clean Air Act (CAA) (40 CFR 61.63)

- Rhode Island Rules and Regulations for Ground Water Quality (Regulation DEM-GW-01-92, July 1993)

- Air Pollution Control Regulation No. 1: Visible Emissions (Section 1)

- Air Pollution Control Regulation No. 17: Odors (section 17)

- Air Pollution Control Regulation No. 5: Fugitive Dust (section 5)

- Air Pollution Control Regulation No. 22: Air Toxics (section 22)

- Air Pollution Control Regulation No. 15: Organic Solvent Emissions (section 15)

- Rhode Island Water Quality Standards (Section 6) -- Rhode Island Water Quality regulations for Water Pollution Control (October 1988)

- Rhode Island Water Quality Regulations (Sections 7, 8, 10, 17) -- Rhode Island Water Quality regulations for Water Pollution Control (October 1988)

- Rhode Island Underground Injection Control Program Rules and Regulations (June 1984)

- Rhode Island Hazardous Waste Rules and Regulations (Section 3.53)

- Rhode Island Hazardous Waste Rules and Regulations (Section 8)

- Rhode Island Hazardous Waste Rules and Regulations (Sections 9.18, 9.19)

- Rhode Island Hazardous Waste Rules and Regulations (Section 3.53)

- Toxic Substance Control Act (TSCA)(40 CFR 761)

<u>To Be Considered</u>

- Environmental Protection Agency (EPA) Risk Reference Doses (RfDs)

- o Environmental Protection Agency (EPA) Carcinogen Assessment Group (CAG) Potency Factors
- o Environmental Protection Agency (EPA) Health Advisories (HA) and Acceptable Daily Intakes (ADIs)
- o Environmental Protection Agency (EPA) Health Effects Assessments (HEAs)
- o Environmental Protection Agency (EPA) Ground Water Protection Strategy
- o Environmental Protection Agency (EPA) Interim Sediment Quality Criteria
- o Office of Solid Waste and Emergency Response (OSWER/EPA) Air Stripper Control Guidance (Directive 9355.0-28)
- o Environmental Protection Agency (EPA) Region 1 Memo from Louis Gitto to Merrill Hohman (July 12, 1989)
- o Toxic Substance Control Act (TSCA) PCB Spill Clean-up Policy (40 CFR Part 761, Subpart G)
- o Rhode Island Policy on Permitting Air Strippers

All listed ARARs can be found in Tables 8, 9, and 10 in Appendix B of this Record of Decision. These tables provide a brief synopsis of the ARARs and an explanation of the actions necessary to meet the ARARs. These tables also indicate whether the ARARs are applicable or relevant and appropriate to actions at the Site. In addition to ARARs, the tables describe standards that are To-Be-Considered (TBC) with respect to remedial actions. The more significant ARARs are also discussed below.

i. Chemical Specific

Federal and State Drinking Water Standards

The ground water aquifer under the Site is classified as Class IIB under the Federal Ground Water Protection Strategy and Class GA-NA by the State of Rhode Island, which is a source of potable water. While Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) promulgated under the Federal Safe Drinking Water Act are not applicable to ground water, they are relevant and appropriate to ground water cleanup or to the attainment of ground water cleanup levels because the ground water may be used as a drinking water source in the reasonably foreseeable future. In addition, the NCP requires that usable ground water be restored to their beneficial uses whenever practicable. See 40 CFR § 300.430(a)(iii)(F).

The ground water quality standards established in the Rhode Island Rules and Regulations for Ground Water Quality are relevant and appropriate when the established values are more stringent than federal MCLs and non-zero MCLGs.

The remedy will attain these ARARs as well as those identified in Appendix B, Table 8, and will comply with those regulations which have been identified as TBCs by meeting the ground water cleanup levels throughout the contaminated plume in approximately 20 years as a result of the implementation of the selected source control and management of migration remedy. Removal of contaminants from the soil and operation of the ground water extraction and treatment system will reduce levels of the contamination at the Site to the interim cleanup levels identified in this ROD.

Federal and State Surface Water Standards

Under the Clean Water Act (CWA), EPA has established water quality criteria found in 40 CFR 131 Subpart D, which are nonenforceable guidelines to be used by states to establish water quality standards. These water quality criteria are considered relevant and appropriate requirements for cleanup of the surface water at the Site.

The Rhode Island Water Quality Standards established under the Rhode Island Water Quality Regulations for Water Pollution Control, which define the water quality standards of a water body by designating the use or uses to be made of the water body and by setting criteria necessary to protect those uses, are applicable requirements. The Rhode Island Water Quality Regulations for Water Pollution Control, which also regulate the restoration, preservation, enhancement and protection of state waters, are applicable requirements for any surface water discharges at the Site.

ii. Location Specific

Areas immediately adjacent to the west and south of the Picillo Farm property are designated wetlands under the Rhode Island Department of Environmental Management Rules and Regulations governing the enforcement of the Fresh Water Wetlands Act. Portions of the Site lie within these wetlands under jurisdiction of the Rhode Island Fresh Water Wetlands Act. Activities associated with the selected remedy within the wetlands and adjacent areas are subject to the applicable requirements of the Rhode Island Fresh Water Wetlands Act and will be met.

iii. Action Specific

Federal and State air standards and regulations will guide remediation measures designed to limit contaminant emissions from the soil and ground water treatment systems. Under the Clean Air Act (CAA), requirements setting emission standards for benzene and vinyl chloride are relevant and appropriate for any air emissions caused by the soil and ground water treatment systems. Certain provisions of the Resource Conservation and Recovery Act (RCRA) are also relevant and appropriate for air emissions from the soil and ground water treatment systems. Certain provisions of the Rhode Island Air Pollution Control Regulations, which set emission limitations are applicable and will be met during excavation of PCB-contaminated surface soil and for air emissions from soil and ground water treatment systems at the Site.

Under the Clean Water Act (CWA), substantive permit requirements of the National Pollution Discharge Elimination System (NPDES) for point source discharges are applicable if treated water is discharged into the surface waters. As discussed above under Chemical Specific ARARs, the Rhode Island Water Quality Standards are applicable requirements and will be met through treatment and proper controls for any surface water discharges at the Site. If treated ground water will be reinjected into the aquifer, Rhode Island Underground Injection Control (UIC) and Rhode Island Rules and Regulations for Ground Water Quality will be applicable requirements. The reinjection system will be designed, constructed and operated in accordance with these regulations to prevent ground water contamination.

Storage and disposal of PCB-contaminated soil will comply with storage, treatment and disposal requirements of the Toxic Substance Control Act (TSCA) through proper engineering design and controls. These regulations are currently determined to be relevant and appropriate. However, if PCB concentration during the remedial design and action are determined to exceed 50 ppm, these regulations become applicable. The disposal of PCB-contaminated soils will provide a permanent and protective remedy that would satisfy the requirements of TSCA.

C. The Selected Remedial Action is Cost-Effective

In the Agency's judgment, the selected remedy is cost effective, i.e., the remedy affords overall effectiveness proportional to its costs. In selecting this remedy, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria -- long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness, in combination. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs. The costs of this remedial alternative are:

	Capital Costs	O&M Costs	Present Worth
SC-2	$2,700,000	$ 1,400,000	$ 4,100,000
MM-3*	$1,600,000	$10,000,000	$11,600,000
Total	$4,300,000	$11,400,000	$15,700,000

* Costs based on UV/oxidation option; costs for the alternate air stripping option are presented in Section VIII, Description of Alternatives)

With respect to the source control alternatives, the selected alternative, SC-2 is protective of human health and the environment. Additionally, SC-2, in comparison with the other source control alternatives, is the least expensive alternative with the greatest proportional over-all effectiveness. Alternatives SC-3 (excavation and thermal desorption) and SC-4 (off-site incineration) do not provide overall effectiveness and protectiveness proportional to their respective costs. Alternative SC-4 is the most expensive source control alternative with an estimated total cost of $101,200,000. Alternative SC-3 is the next most expensive with a cost of $23,900,000 which is almost six times higher than the cost of SC-2, the selected source control remedy.

Moreover, alternatives SC-3 and SC-4 would each present a much greater short-term risk than the selected alternative because of the required excavation of a large volume of soil. Although the in-situ treatment components of alternatives SC-3 and SC-4 create an initial reduction in contaminant concentrations, these alternatives are not considered cost-effective due to the low short-term effectiveness, the high implementation costs, and the adverse impacts from extensive soil excavation. Thus, of the three source control alternatives evaluated and considered protective, the selected source control remedy, SC-2, has the most cost-effective components.

In conjunction with the implementation of the selected source control remedy, two of the management of migration alternatives, alternative MM-2 and selected alternative MM-3, would attain ARARs and be protective of human health and the environment. Alternative MM-2 would cost $14,200,000 to implement. The selected alternative, MM-3, would cost approximately 20% less than MM-2 at a cost of $11,600,000. Both, MM-2 and MM-3 would achieve restoration in the source and concentrated regions of the plume in approximately 20 years. Alternative MM-2 differs in that it entails active treatment of the dilute region of the plume.

Through active treatment, alternative MM-2 would attain cleanup levels in the dilute portion of the plume in approximately 8 years. However, restoration would not be complete until cleanup levels are attained in the source and concentrated regions of the plume. The selected management of migration remedy, MM-3, provides for the natural attenuation of the dilute portion of the plume which would meet cleanup levels in the same approximately 20 years period that it would take to attain cleanup levels in the source and concentrated regions. This would be achieved through isolation and active treatment of the source and concentrated regions of the plume.

Although the active treatment of the dilute portion of the plume in alternative MM-2 achieves restoration of the dilute region in a shorter period of time than MM-3, MM-2 presents a greater short-term risk of impacting the environment. The active treatment of the dilute region would require the extraction of a larger amount of ground water. The active extraction of ground water from the dilute portion of the plume would be implemented in very close proximity to the Unnamed Swamp and thus, increase the possibility of adversely impacting wetland areas. In selecting the management of migration remedy, EPA weighted the twelve-year estimated time difference in the restoration of the dilute region of the plume and the time period for overall restoration of the aquifer and surface water against the cost and the short-term effectiveness of MM-2 and MM-3. Based on these considerations, EPA has determined that the selected management of migration remedy, MM-3, provides a greater overall effectiveness and protectiveness proportional to its costs than does alternative MM-2.

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

Except for the No-Action Alternative SC-1, all of the source control alternatives (SC-2, SC-3 and SC-4) would provide overall protection of human health and the environment and meet their corresponding ARARs. All three alternatives would offer good protection against the principal risks associated with potential ingestion of contaminated ground water in the foreseeable future resulting from the leaching of contaminants from the soils into the ground water.

Although alternative SC-4 would offer the most permanent protection on-site because all contaminated soils would be transported and disposed of off-site, it would pose potential short-term risks related to major on-site excavation and the transport of waste off-site. Implementation of this alternative would also be unreliable as a result of the following major considerations: The ability of the local roads to handle the large volume of traffic associated with the off-site transport of waste, and the uncertainty in securing an incineration facility which could handle the large volume of contaminated soils (approximately 94,000 cubic yards). In addition, the $101,200,000 cost to implement SC-4 would be the most expensive of all the alternatives.

Alternative SC-3 would also be very effective in reducing or eliminating long-term risks associated with exposure to soil leachate. However, even after an initial in-situ treatment, the short-term risks to nearby communities and workers associated with extensive excavation of contaminated soils create major uncertainties with implementing SC-3. Alternative SC-3 would also be the next most expensive alternative at a cost of $23,900,000.

In EPA's analysis, the selected remedy SC-2 would provide better overall protection through long-term effectiveness and permanence, and cost effectiveness than the other alternatives. At a cost of $4,100,000, SC-2 would be designed to treat the contaminants in the subsurface soils without the need for excavation, thereby avoiding the short-term risks associated with the other alternatives. To maximize the long-term effectiveness of SC-2, a pilot study would be performed during the design phase to optimize the operating parameters and minimize uncertainties in the implementation.

Two of the management of migration alternatives, MM-2 and MM-3, in conjunction with the implementation of any active SC alternative, would provide overall protection of human health and the environment and would attain all ARARs. Both alternatives utilize the same permanent solution, extraction and treatment of ground water, to reduce the contamination in the aquifer and surface water. Both alternatives would be equally implementable since they both employ similar technology. In addition, both alternatives MM-2 and MM-3 would provide essentially the same long-term effectiveness. However, the cost of implementing MM-3, $11,600,000, is less than the $14,200,000 cost to implement MM-2.

The difference between the alternatives would be the amount of contamination that is extracted and treated versus the amount of contamination that is allowed to naturally attenuate. Alternative MM-2 would provide greater reduction in toxicity, mobility or volume through treatment by extracting and treating water in the entire plume, while the selected remedy MM-3 would only extract and treat ground water in the source and concentrated portions of the plume, allowing the dilute region to naturally attenuate. By containing and treating contamination in the source and concentrated regions, ground water in the dilute region is expected to be remediated in approximately 20 years in the selected remedy, compared to the approximate 8 year period to treat the dilute region under alternative MM-2. However, the importance of this distinction is lessened because the entire restoration time for the source and concentrated regions of the plume would be 20 years for both MM-2 and MM-3.

Although the restoration time of 20 years for the entire plume is similar for both alternatives, alternative MM-2 is expected to have a greater short-term impact on the environment. The extraction and treatment of the dilute portion of the plume under MM-2 would create a greater risk of dewatering the wetland areas than under MM-3 because a larger amount of ground water in the immediate proximity to the wetlands would be extracted. Based on the above considerations, EPA has determined that the selected remedy MM-3 provides a greater overall effectiveness and protectiveness than MM-2.

E. The Selected Remedy Satisfies the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The principal elements of the selected remedy are in-situ treatment of soil by enhanced vapor extraction and extraction and treatment of ground water. These elements address the primary threat at the Site, which is the contamination of soil, ground water and surface water. The selected remedy satisfies the statutory preference for treatment as a principal element by: permanently reducing the volume of contaminants; reducing leaching of contaminants from the soil into the ground water; and reducing the amount of contaminants migrating into the dilute portion of the ground water plume and the surface water.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented a proposed plan (preferred alternative) for remediation of the Site on June 29, 1993. The source control portion of the preferred alternative included treatment of soils contaminated with VOCs and SVOCs by in-situ thermally enhanced soil vapor extraction and excavation and removal off-site of surface soil contaminated with PCBs. The management of migration portion of the preferred alternative included extraction and treatment of contaminated water to federal and state drinking water standards by UV/Oxidation and carbon adsorption or air stripping and carbon adsorption. No significant changes from the Proposed Plan have been made to the selected remedy as detailed in the Record of Decision.

XIII. STATE ROLE

The Rhode Island Department of Environmental Management has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The State of Rhode Island concurs with the selected remedy for the Picillo Farm Superfund Site. A copy of the declaration of concurrence is attached as Appendix C.

APPENDIX A

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

LIST OF FIGURES

APPENDIX A

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

LIST OF FIGURES (cont.)

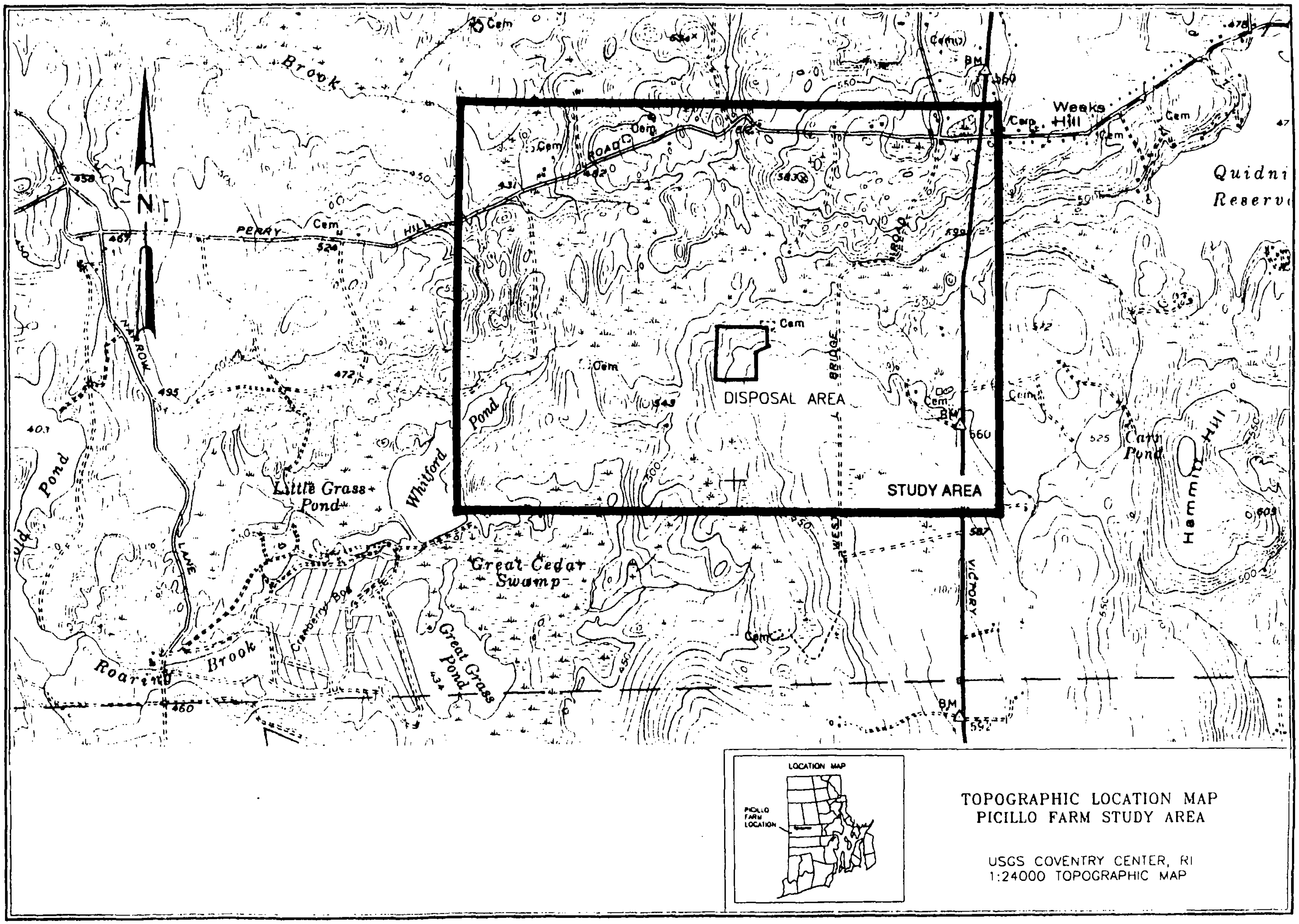

N
Brook
Weeks Hill
Quidni Reserv
PERRY HILL ROAD
NARROW LANE
Pond
Little Grass Pond
Whitford
Great Cedar Swamp
Cranberry Bog
Great Grass Pond
Roaring Brook
Cary Pond
Hammitt Hill
WEST BRIDGE ROAD
VICTORY
DISPOSAL AREA
STUDY AREA
Cem
BM
LOCATION MAP
PICILLO FARM LOCATION
TOPOGRAPHIC LOCATION MAP
PICILLO FARM STUDY AREA
USGS COVENTRY CENTER, RI
1:24000 TOPOGRAPHIC MAP

Fig. 1

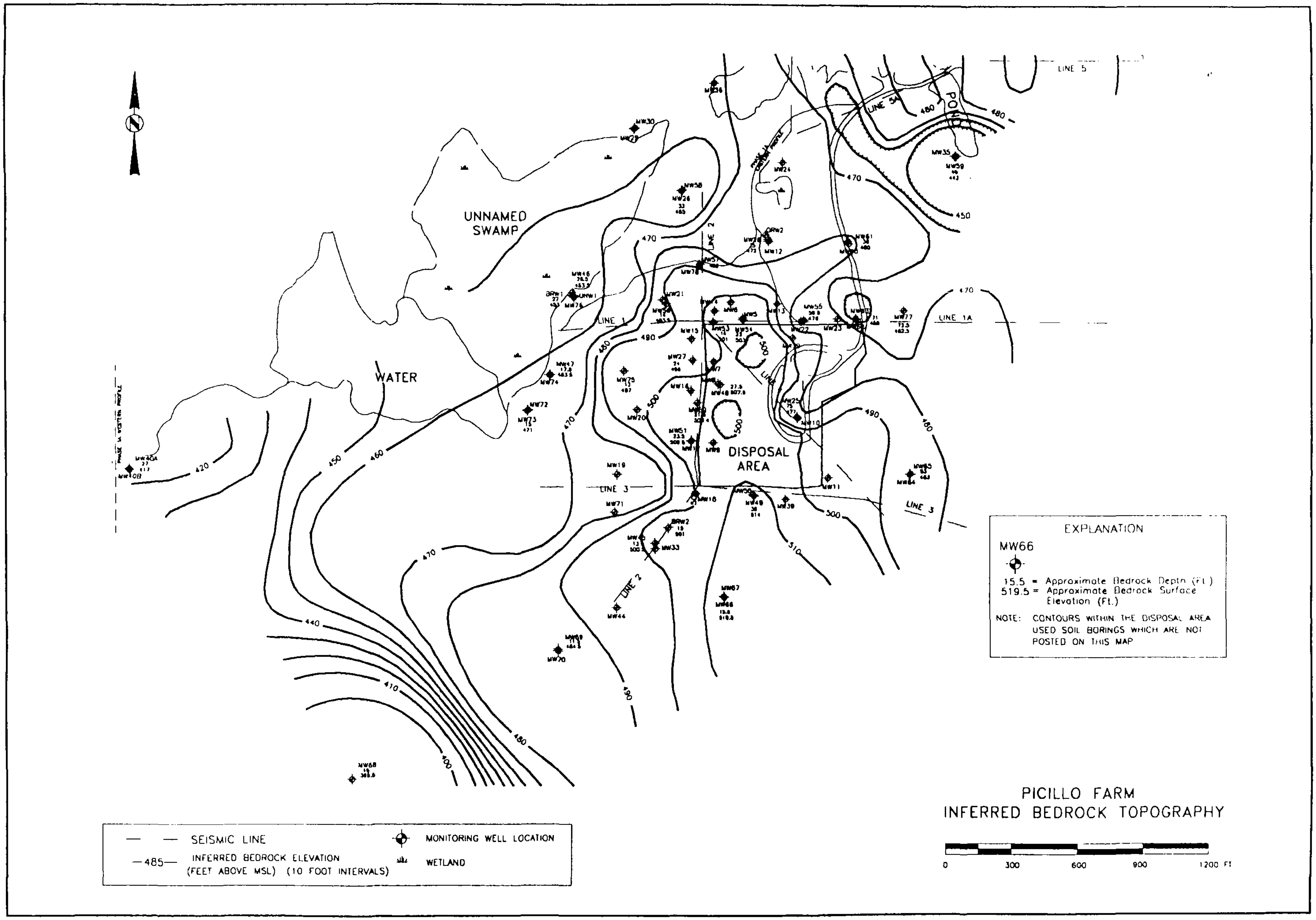
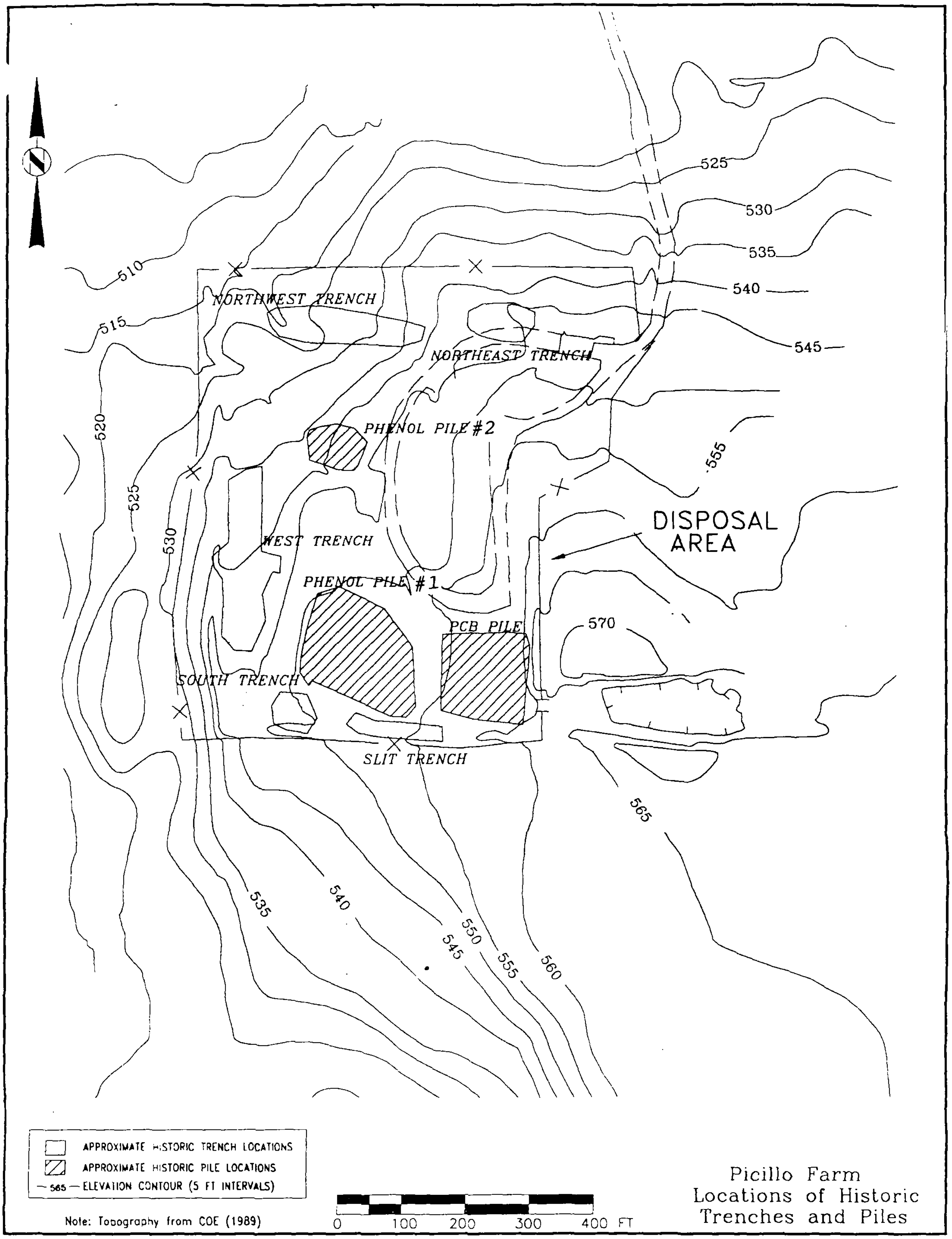

UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
LINE 1
LINE 1A
LINE 2
LINE 3
LINE 5
EXPLANATION
MW66
15.5 = Approximate Bedrock Depth (Ft.)
519.5 = Approximate Bedrock Surface Elevation (Ft.)
NOTE: CONTOURS WITHIN THE DISPOSAL AREA USED SOIL BORINGS WHICH ARE NOT POSTED ON THIS MAP
PICILLO FARM
INFERRED BEDROCK TOPOGRAPHY
0 300 600 900 1200 FT
SEISMIC LINE
485 INFERRED BEDROCK ELEVATION (FEET ABOVE MSL) (10 FOOT INTERVALS)
MONITORING WELL LOCATION
WETLAND

Fig. 2



NORTHWEST TRENCH
NORTHEAST TRENCH
PHENOL PILE #2
WEST TRENCH
PHENOL PILE #1
PCB PILE
SOUTH TRENCH
SLIT TRENCH
DISPOSAL AREA
510
515
520
525
530
535
540
545
550
555
560
565
570
APPROXIMATE HISTORIC TRENCH LOCATIONS
APPROXIMATE HISTORIC PILE LOCATIONS
565 — ELEVATION CONTOUR (5 FT INTERVALS)
Note: Topography from COE (1989)
0 100 200 300 400 FT
Picillo Farm
Locations of Historic
Trenches and Piles

Fig. 3

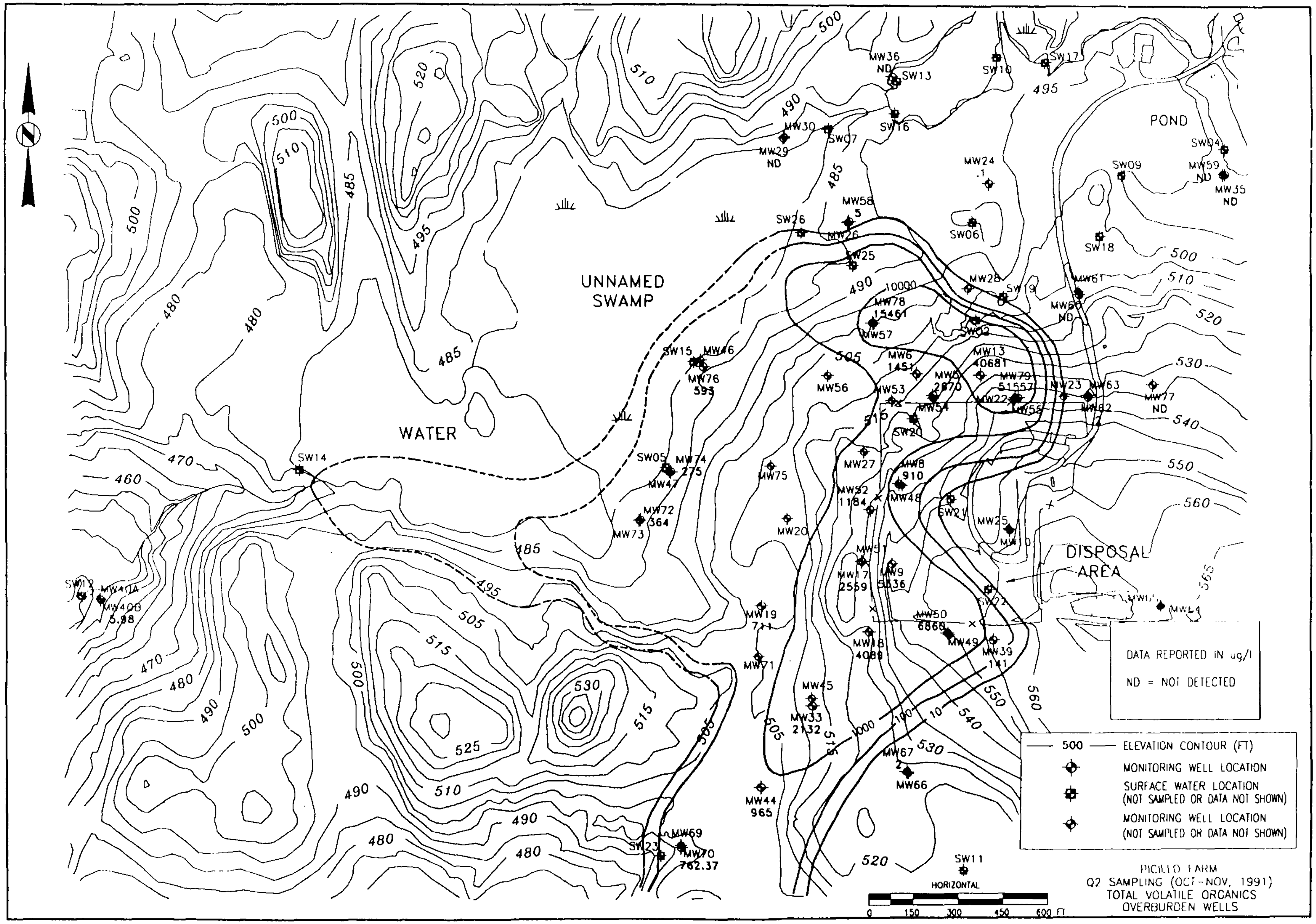

UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
DATA REPORTED IN ug/l
ND = NOT DETECTED
500 ELEVATION CONTOUR (FT)
MONITORING WELL LOCATION
SURFACE WATER LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
HORIZONTAL
0 150 300 450 600 FT.
PICILLO FARM
Q2 SAMPLING (OCT-NOV, 1991)
TOTAL VOLATILE ORGANICS
OVERBURDEN WELLS

Fig. 4

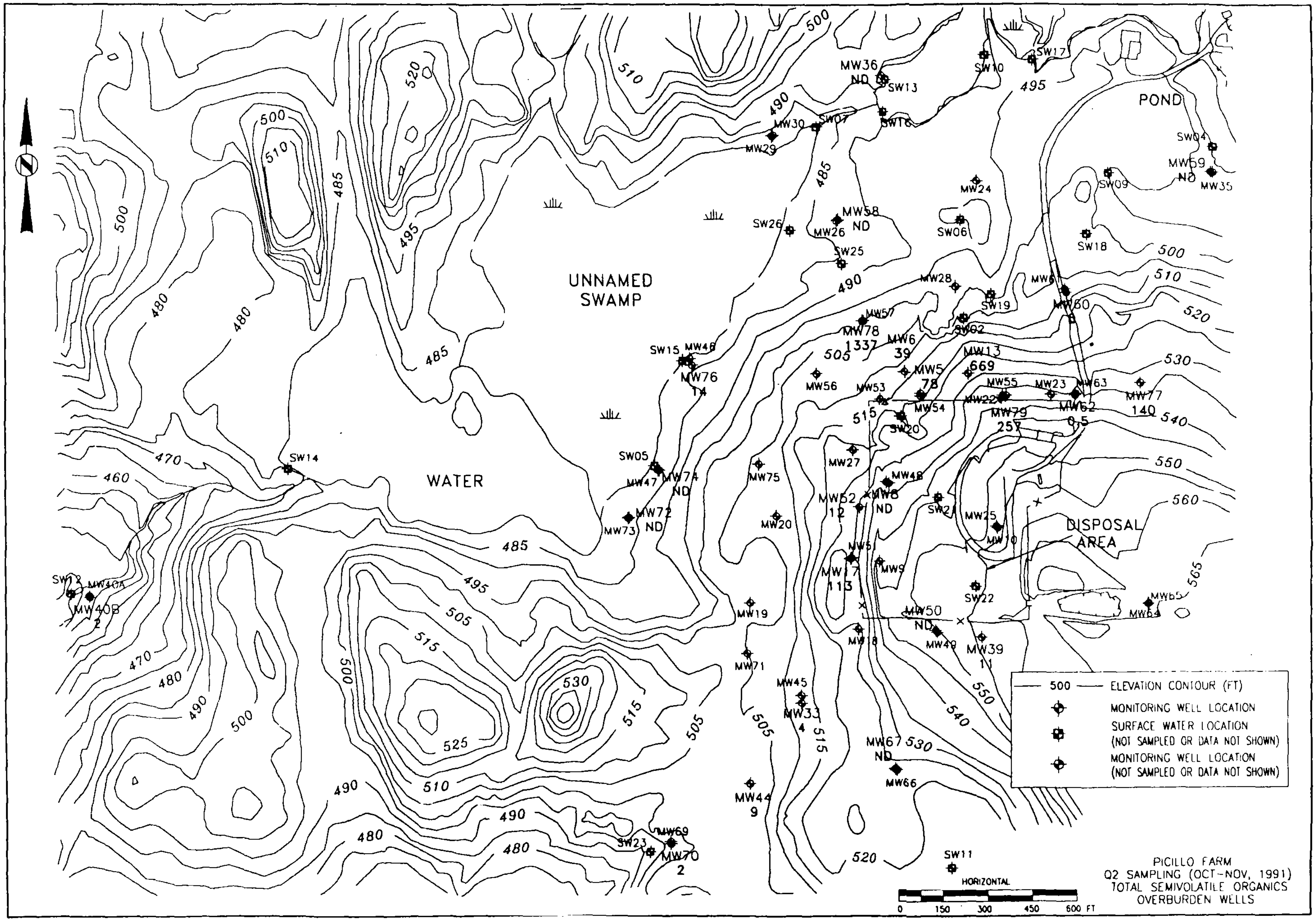

UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
500 ELEVATION CONTOUR (FT)
MONITORING WELL LOCATION
SURFACE WATER LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
HORIZONTAL
0 150 300 450 600 FT
PICILLO FARM
Q2 SAMPLING (OCT-NOV, 1991)
TOTAL SEMIVOLATILE ORGANICS
OVERBURDEN WELLS

Fig.

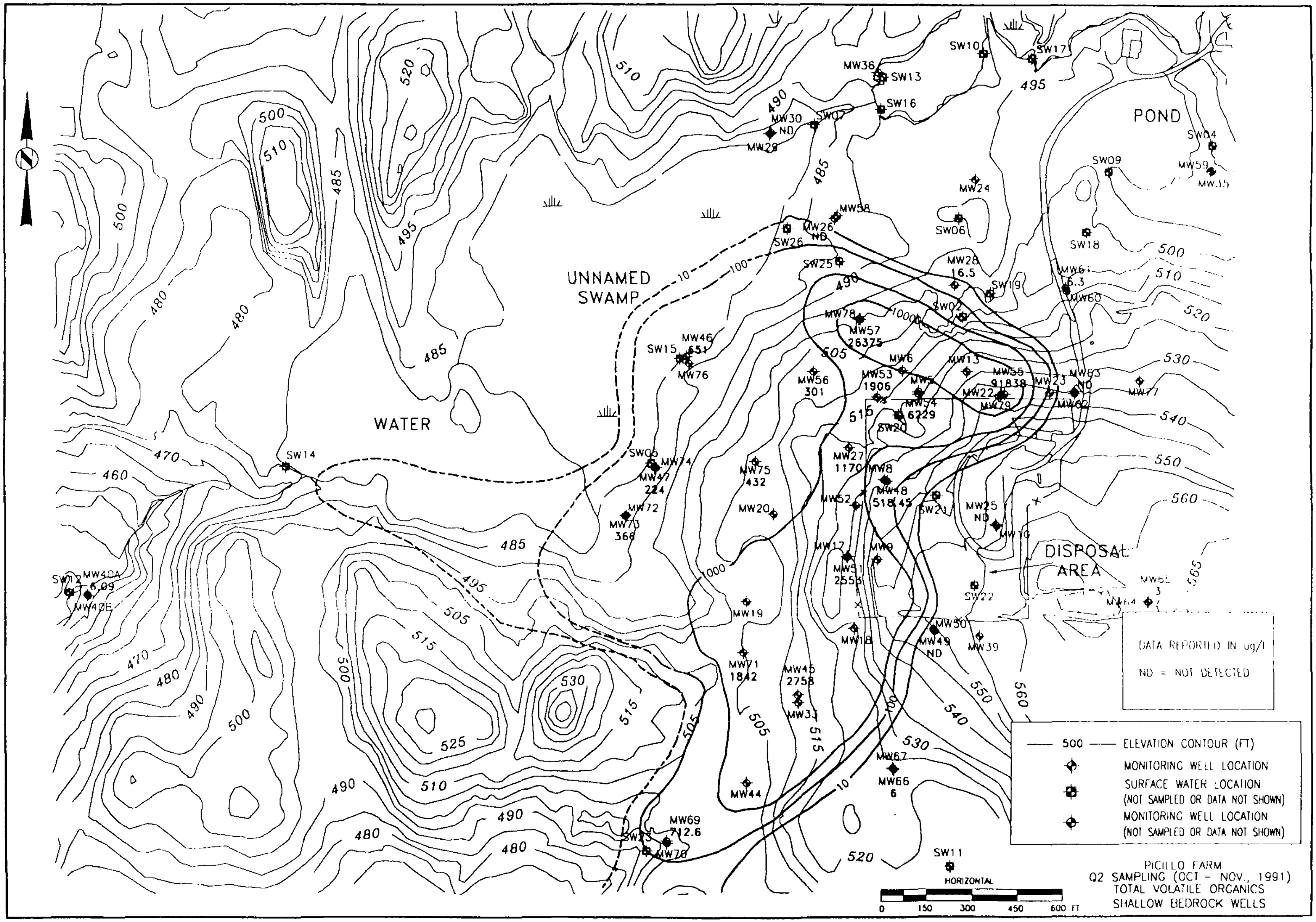

UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
DATA REPORTED IN ug/l
ND = NOT DETECTED
500 ELEVATION CONTOUR (FT)
MONITORING WELL LOCATION
SURFACE WATER LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
HORIZONTAL
0 150 300 450 600 FT
PICILLO FARM
Q2 SAMPLING (OCT - NOV., 1991)
TOTAL VOLATILE ORGANICS
SHALLOW BEDROCK WELLS
MW57
26375
MW55
91838
MW54
6229
MW48
51845
MW53
1906
MW27
1170
MW51
2555
MW45
2758
MW71
1842
MW69
712.6
MW46
651
MW75
432
MW73
366
MW56
301
MW47
224
MW28
16.5
MW61
6.3
MW40A
6.09
MW66
6
MW30
ND
MW26
ND
MW63
ND
MW25
ND
MW49
ND

Fig. 5

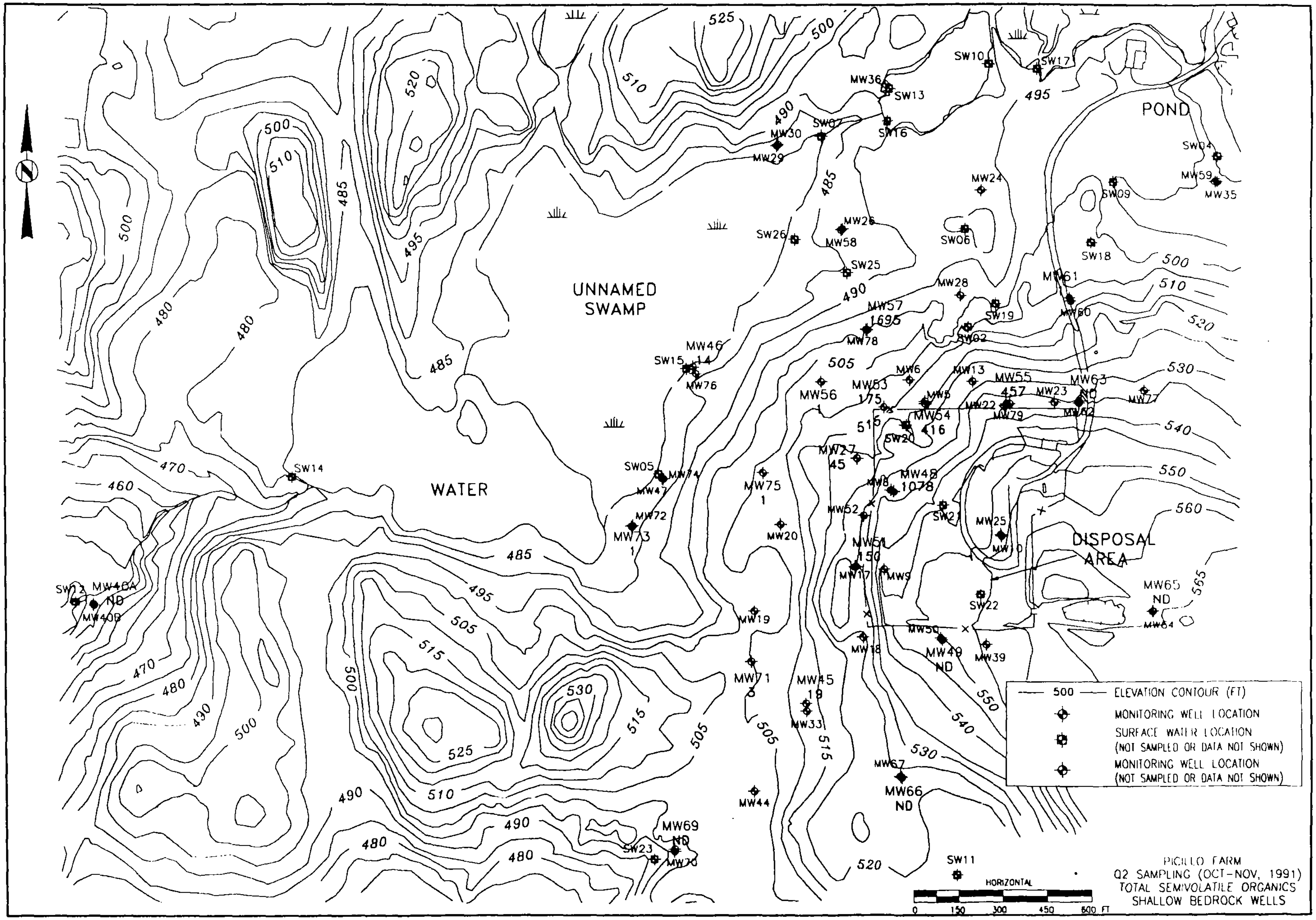
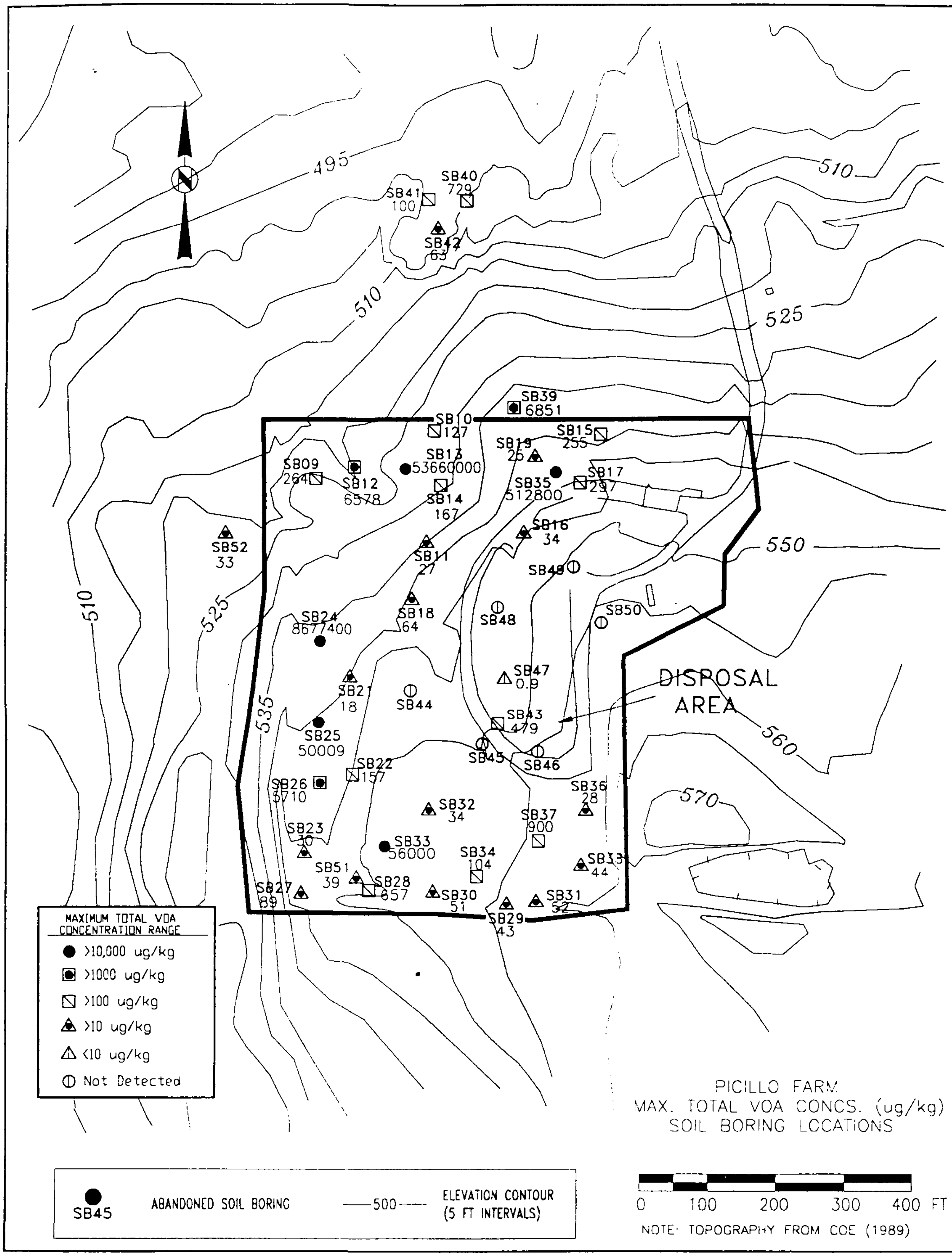
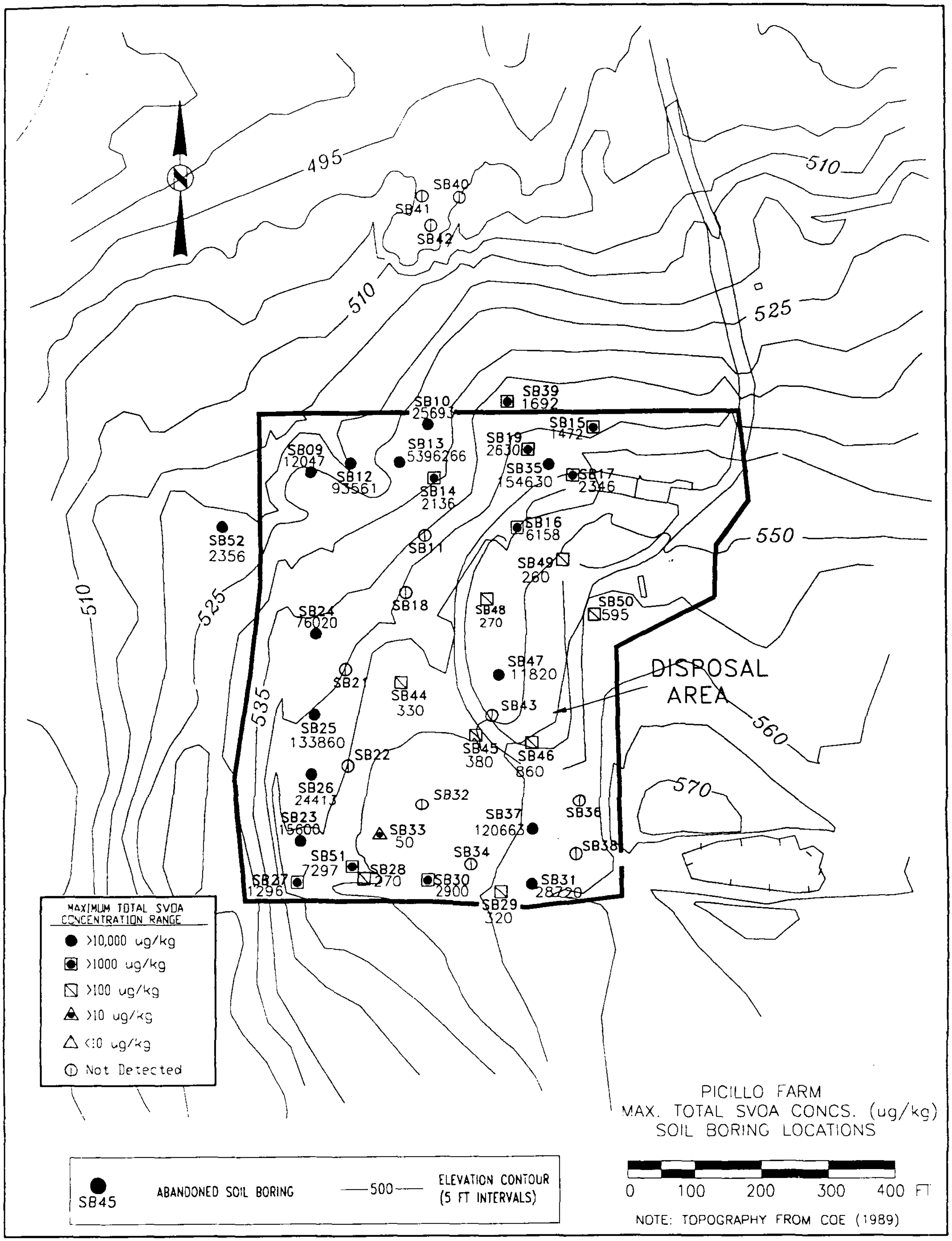

UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
500 ELEVATION CONTOUR (FT)
MONITORING WELL LOCATION
SURFACE WATER LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
HORIZONTAL
0 150 300 450 600 FT
PICILLO FARM
Q2 SAMPLING (OCT-NOV, 1991)
TOTAL SEMIVOLATILE ORGANICS
SHALLOW BEDROCK WELLS

Fig. 7



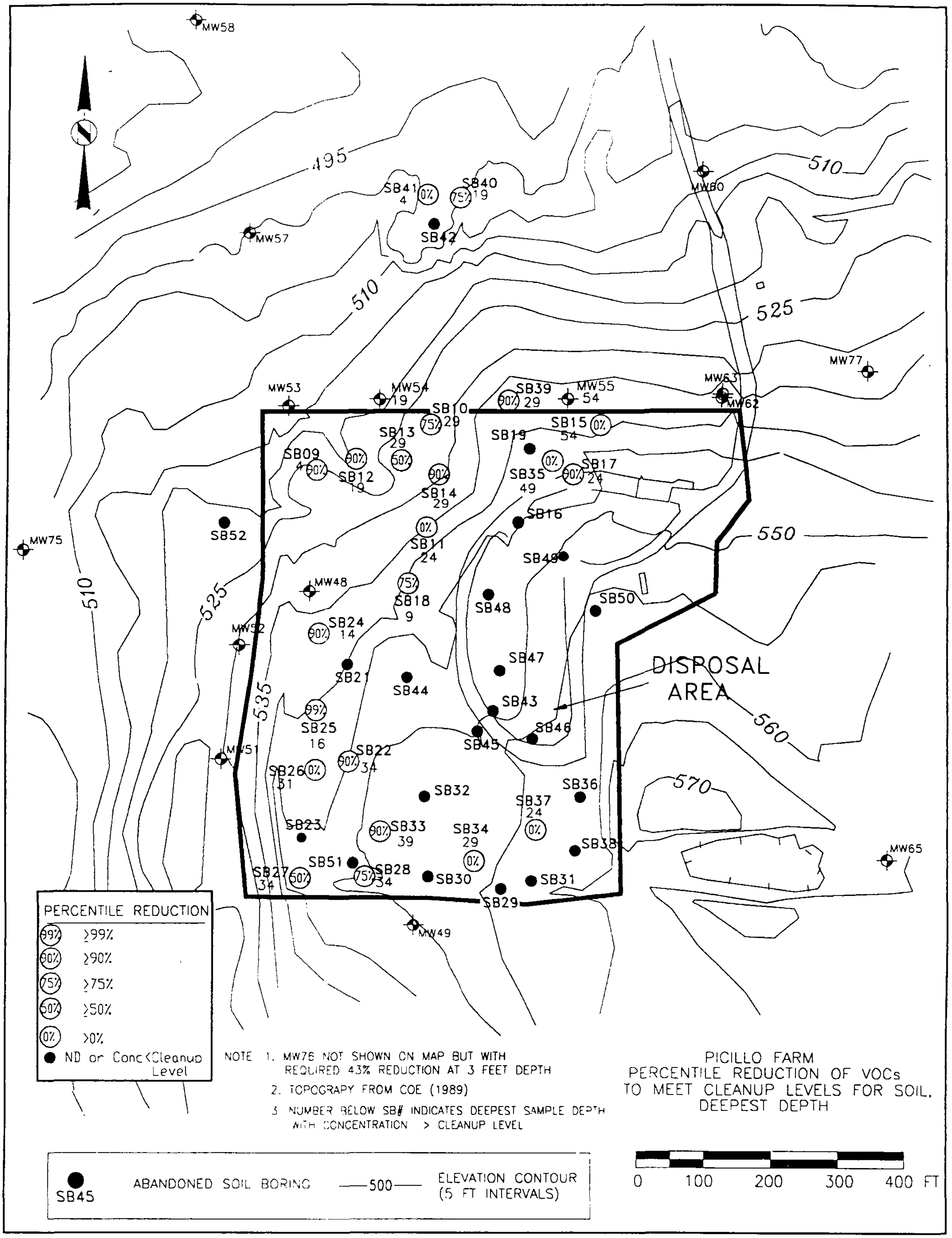
495
510
525
535
550
560
570
SB40
729
SB41
100
SB42
63
SB39
6851
SB10
127
SB15
255
SB19
25
SB13
53660000
SB09
264
SB12
6578
SB35
512800
SB17
297
SB14
167
SB16
34
SB52
33
SB11
27
SB49
SB18
64
SB48
SB50
SB24
8677400
SB47
0.9
DISPOSAL AREA
SB21
18
SB44
SB43
479
SB25
50009
SB45
SB46
SB22
157
SB26
5710
SB36
28
SB32
34
SB37
900
SB23
30
SB33
56000
SB34
104
SB33
44
SB51
39
SB28
657
SB27
89
SB30
51
SB29
43
SB31
32
MAXIMUM TOTAL VOA CONCENTRATION RANGE
>10,000 ug/kg
>1000 ug/kg
>100 ug/kg
>10 ug/kg
<10 ug/kg
Not Detected
PICILLO FARM
MAX. TOTAL VOA CONCS. (ug/kg)
SOIL BORING LOCATIONS
SB45
ABANDONED SOIL BORING
500
ELEVATION CONTOUR (5 FT INTERVALS)
0 100 200 300 400 FT
NOTE: TOPOGRAPHY FROM COE (1989)

Fig. 8



495
510
525
535
550
560
570
SB40
SB41
SB42
SB10
25693
SB39
1692
SB15
1472
SB19
2630
SB13
5396266
SB09
12047
SB12
93561
SB35
154630
SB17
2346
SB14
2136
SB16
6158
SB11
SB52
2356
SB49
260
SB24
76020
SB18
SB48
270
SB50
595
SB47
11820
DISPOSAL AREA
SB21
SB44
330
SB43
SB25
133860
SB22
SB45
380
SB46
860
SB26
24413
SB32
SB36
SB23
15600
SB33
50
SB37
120663
SB38
SB51
7297
SB34
SB28
270
SB27
1296
SB30
2900
SB31
28720
SB29
320
MAXIMUM TOTAL SVOA CONCENTRATION RANGE
>10,000 ug/kg
>1000 ug/kg
>100 ug/kg
>10 ug/kg
<10 ug/kg
Not Detected
PICILLO FARM
MAX. TOTAL SVOA CONCS. (ug/kg)
SOIL BORING LOCATIONS
SB45
ABANDONED SOIL BORING
500
ELEVATION CONTOUR (5 FT INTERVALS)
0 100 200 300 400 FT
NOTE: TOPOGRAPHY FROM COE (1989)

Fig. 9



PERCENTILE REDUCTION
≥99%
≥90%
≥75%
≥50%
>0%
ND or Conc<Cleanup Level
NOTE 1. MW76 NOT SHOWN ON MAP BUT WITH REQUIRED 43% REDUCTION AT 3 FEET DEPTH
2. TOPOGRAPHY FROM COE (1989)
3. NUMBER BELOW SB# INDICATES DEEPEST SAMPLE DEPTH WITH CONCENTRATION > CLEANUP LEVEL
PICILLO FARM
PERCENTILE REDUCTION OF VOCs
TO MEET CLEANUP LEVELS FOR SOIL,
DEEPEST DEPTH
SB45 ABANDONED SOIL BORING
—500— ELEVATION CONTOUR (5 FT INTERVALS)
0 100 200 300 400 FT
DISPOSAL AREA

Fig. 10

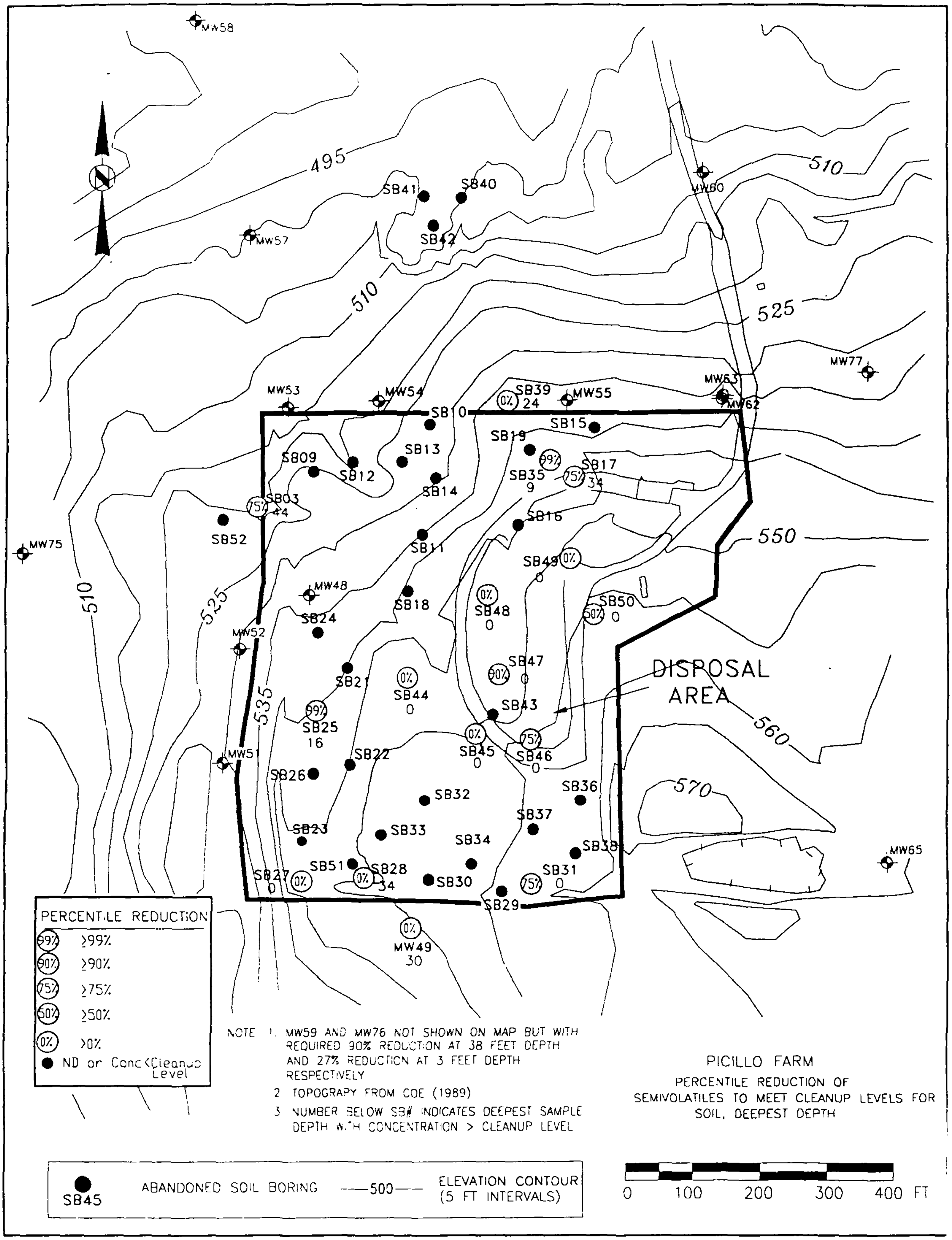
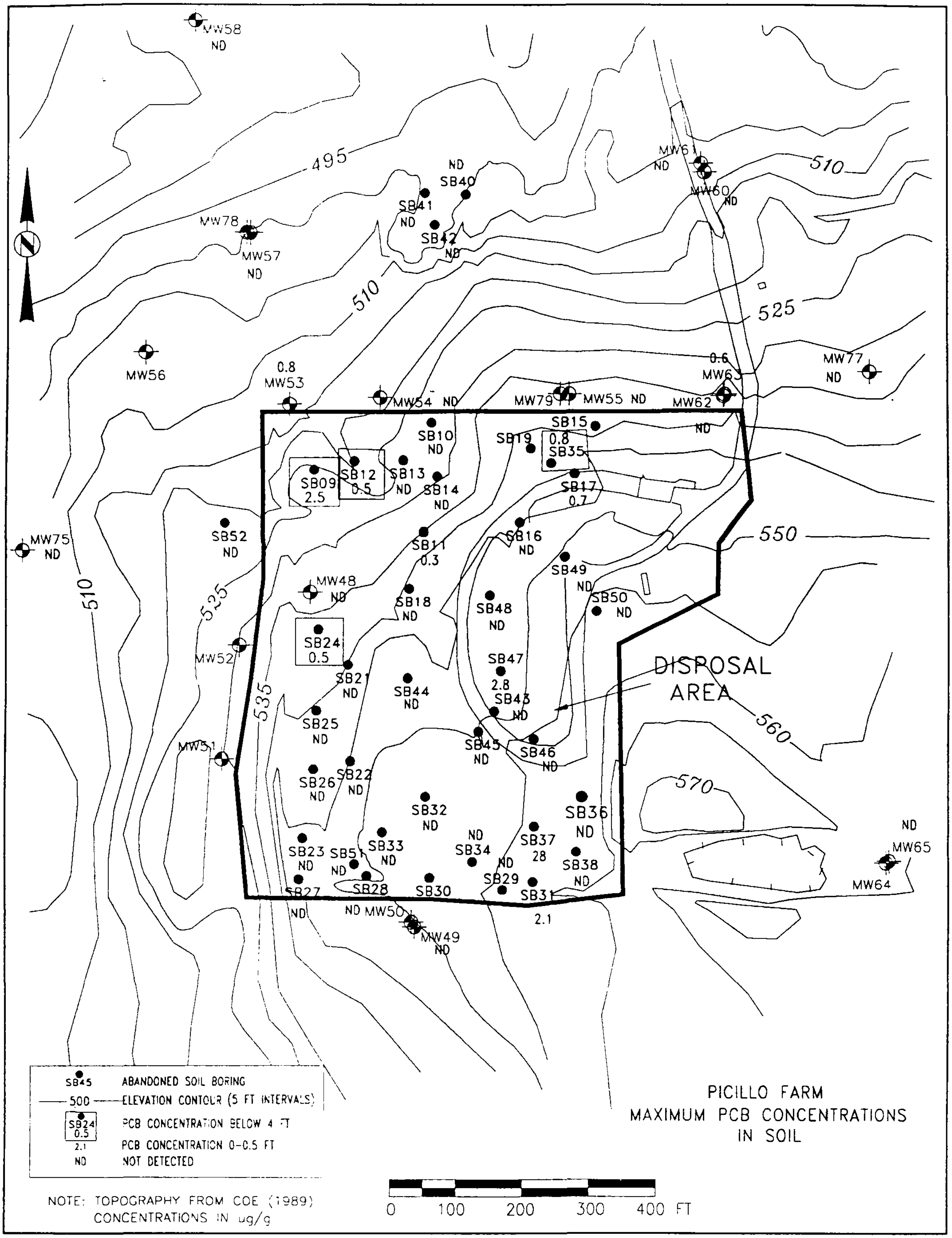

MW58
495
510
525
550
560
570
535
SB41
SB40
SB42
MW57
MW60
MW77
MW63
MW62
MW53
MW54
SB10
SB39
24
MW55
SB15
SB19
SB13
SB09
SB12
SB14
SB35
9
SB17
34
SB03
44
SB16
SB52
MW75
SB11
SB49
0
MW48
SB18
SB48
0
SB50
0
SB24
MW52
SB47
0
DISPOSAL
AREA
SB21
SB44
0
SB43
SB25
16
SB45
0
SB46
0
MW51
SB22
SB26
SB32
SB36
SB37
SB23
SB33
SB34
SB38
MW65
SB51
SB28
34
SB27
0
SB30
SB31
0
SB29
MW49
30
PERCENTILE REDUCTION
≥99%
≥90%
≥75%
≥50%
>0%
ND or Conc<Cleanup Level
NOTE 1. MW59 AND MW76 NOT SHOWN ON MAP BUT WITH REQUIRED 90% REDUCTION AT 38 FEET DEPTH AND 27% REDUCTION AT 3 FEET DEPTH RESPECTIVELY
2 TOPOGRAPHY FROM COE (1989)
3 NUMBER BELOW SB# INDICATES DEEPEST SAMPLE DEPTH WITH CONCENTRATION > CLEANUP LEVEL
PICILLO FARM
PERCENTILE REDUCTION OF SEMIVOLATILES TO MEET CLEANUP LEVELS FOR SOIL, DEEPEST DEPTH
SB45
ABANDONED SOIL BORING
—500—
ELEVATION CONTOUR (5 FT INTERVALS)
0
100
200
300
400 FT

Fig. 11



PICILLO FARM
MAXIMUM PCB CONCENTRATIONS
IN SOIL
DISPOSAL AREA
SB45 ABANDONED SOIL BORING
500 ELEVATION CONTOUR (5 FT INTERVALS)
SB24 0.5 PCB CONCENTRATION BELOW 4 FT
2.1 PCB CONCENTRATION 0-0.5 FT
ND NOT DETECTED
NOTE: TOPOGRAPHY FROM COE (1989)
CONCENTRATIONS IN ug/g
0 100 200 300 400 FT

Fig. 12

POST SOIL REMOVAL PCB CONCENTRATIONS (1988)

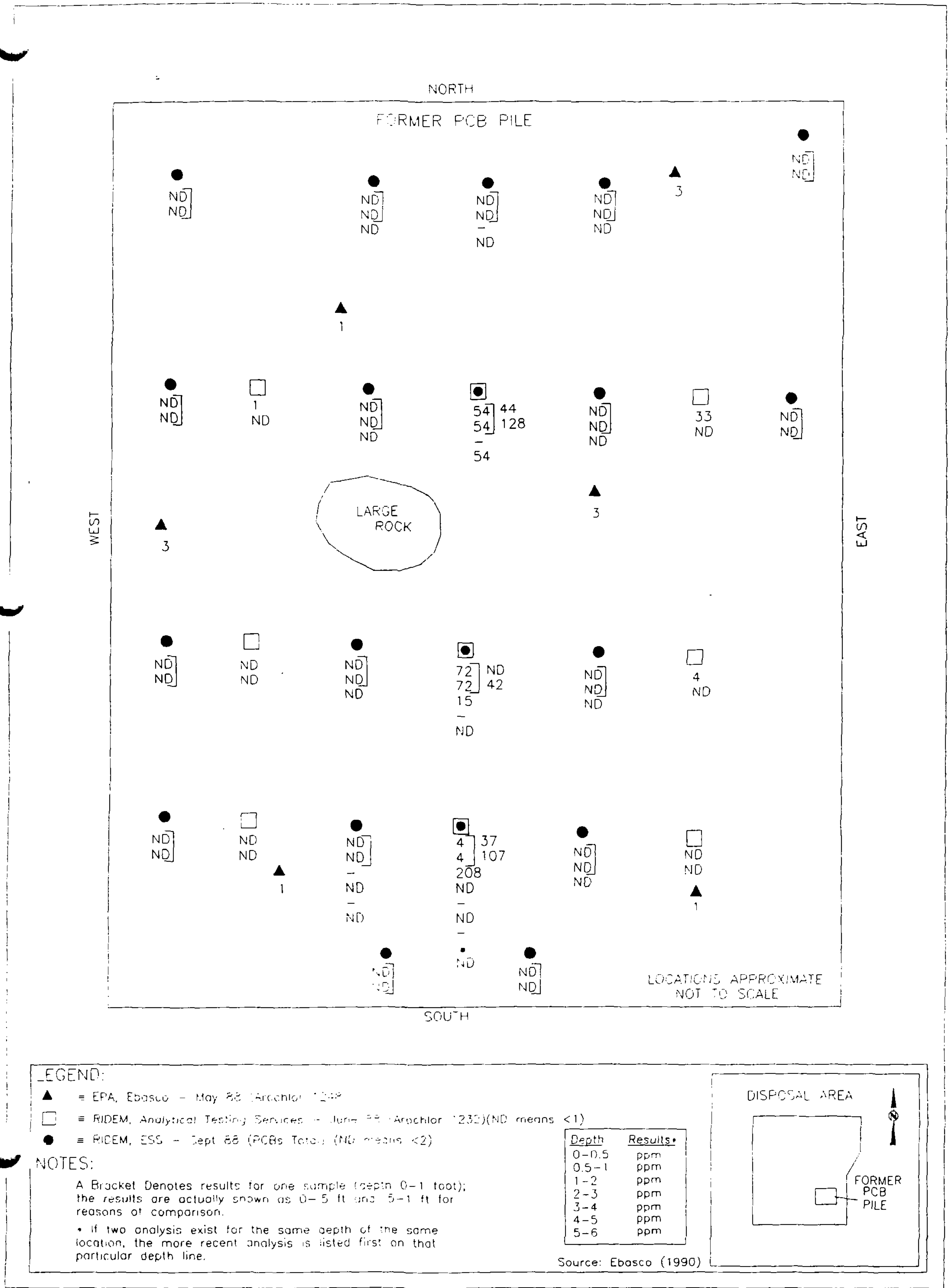
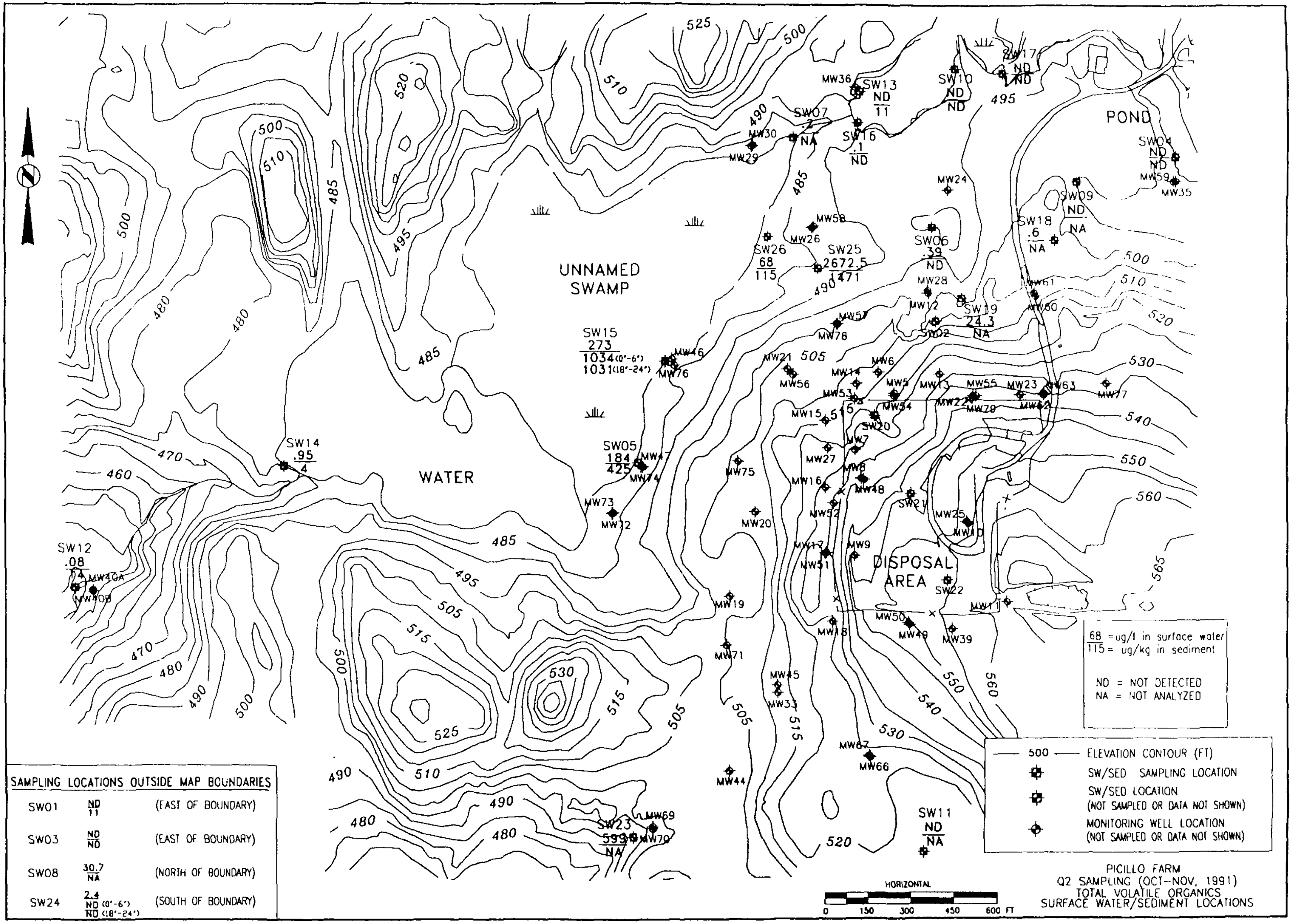
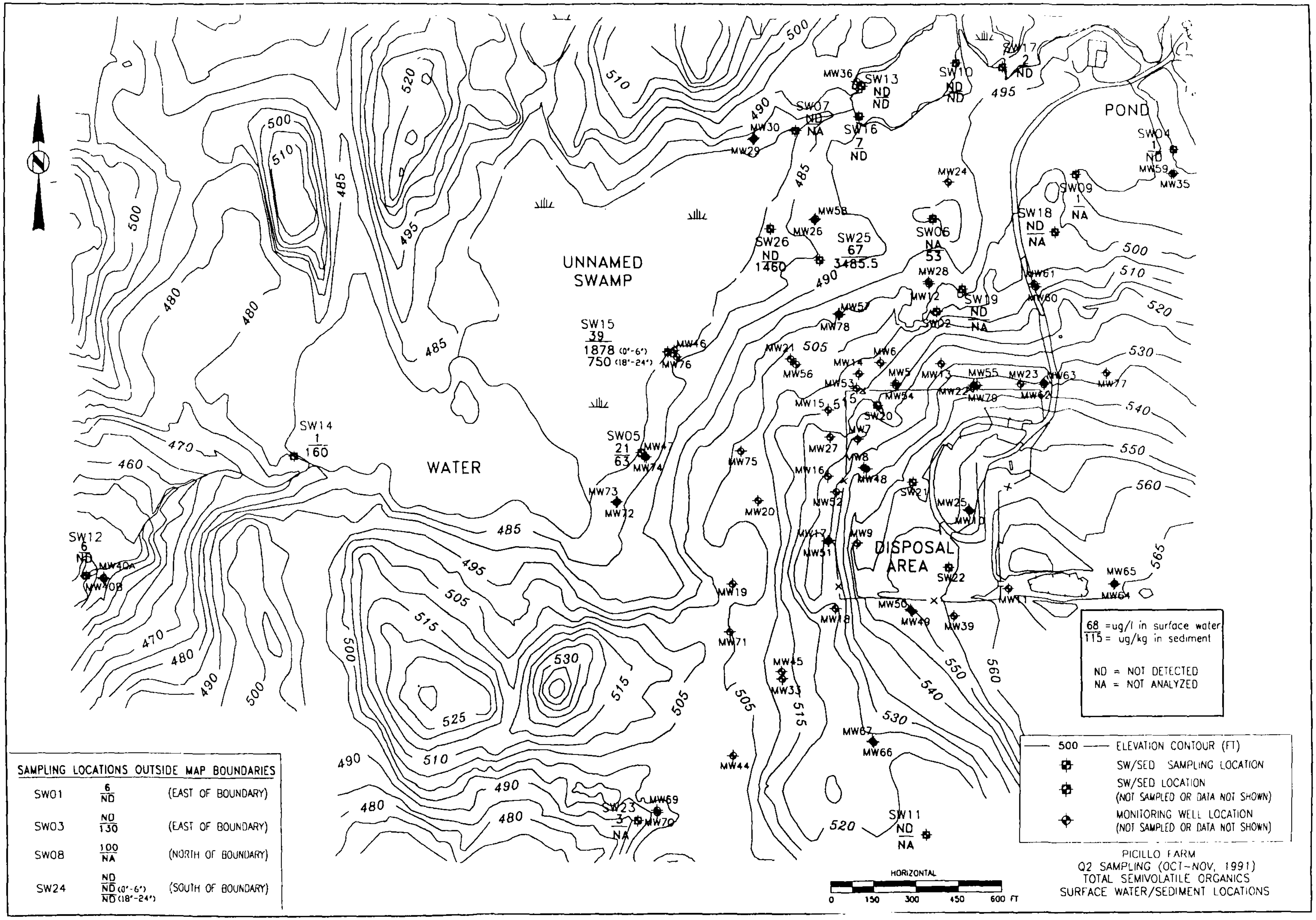


Fig. 13



UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
SW15 273 1034 (0'-6") 1031 (18'-24")
SW05 184 425
SW14 .95 4
SW12 .08 .14
SW13 ND 11
SW07 .7 NA
SW16 .1 ND
SW10 ND ND
SW17 ND ND
SW04 ND ND
SW09 ND NA
SW18 .6 NA
SW06 .39 ND
SW26 68 115
SW25 2672.5 1471
SW19 24.3 NA
SW23 599 NA
SW11 ND NA
68 = ug/l in surface water
115 = ug/kg in sediment
ND = NOT DETECTED
NA = NOT ANALYZED
500 ELEVATION CONTOUR (FT)
SW/SED SAMPLING LOCATION
SW/SED LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
SAMPLING LOCATIONS OUTSIDE MAP BOUNDARIES
SW01 ND 11 (EAST OF BOUNDARY)
SW03 ND ND (EAST OF BOUNDARY)
SW08 30.7 NA (NORTH OF BOUNDARY)
SW24 2.4 ND (0'-6") ND (18'-24") (SOUTH OF BOUNDARY)
HORIZONTAL
0 150 300 450 600 FT
PICILLO FARM
Q2 SAMPLING (OCT-NOV, 1991)
TOTAL VOLATILE ORGANICS
SURFACE WATER/SEDIMENT LOCATIONS

Fig.



UNNAMED SWAMP
WATER
POND
DISPOSAL AREA
SAMPLING LOCATIONS OUTSIDE MAP BOUNDARIES
SW01 6/ND (EAST OF BOUNDARY)
SW03 ND/130 (EAST OF BOUNDARY)
SW08 100/NA (NORTH OF BOUNDARY)
SW24 ND/ND (0"-6")/ND (18"-24") (SOUTH OF BOUNDARY)
68 = ug/l in surface water
115 = ug/kg in sediment
ND = NOT DETECTED
NA = NOT ANALYZED
500 ELEVATION CONTOUR (FT)
SW/SED SAMPLING LOCATION
SW/SED LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
MONITORING WELL LOCATION (NOT SAMPLED OR DATA NOT SHOWN)
HORIZONTAL
0 150 300 450 600 FT
PICILLO FARM
Q2 SAMPLING (OCT-NOV, 1991)
TOTAL SEMIVOLATILE ORGANICS
SURFACE WATER/SEDIMENT LOCATIONS

Fig. 15

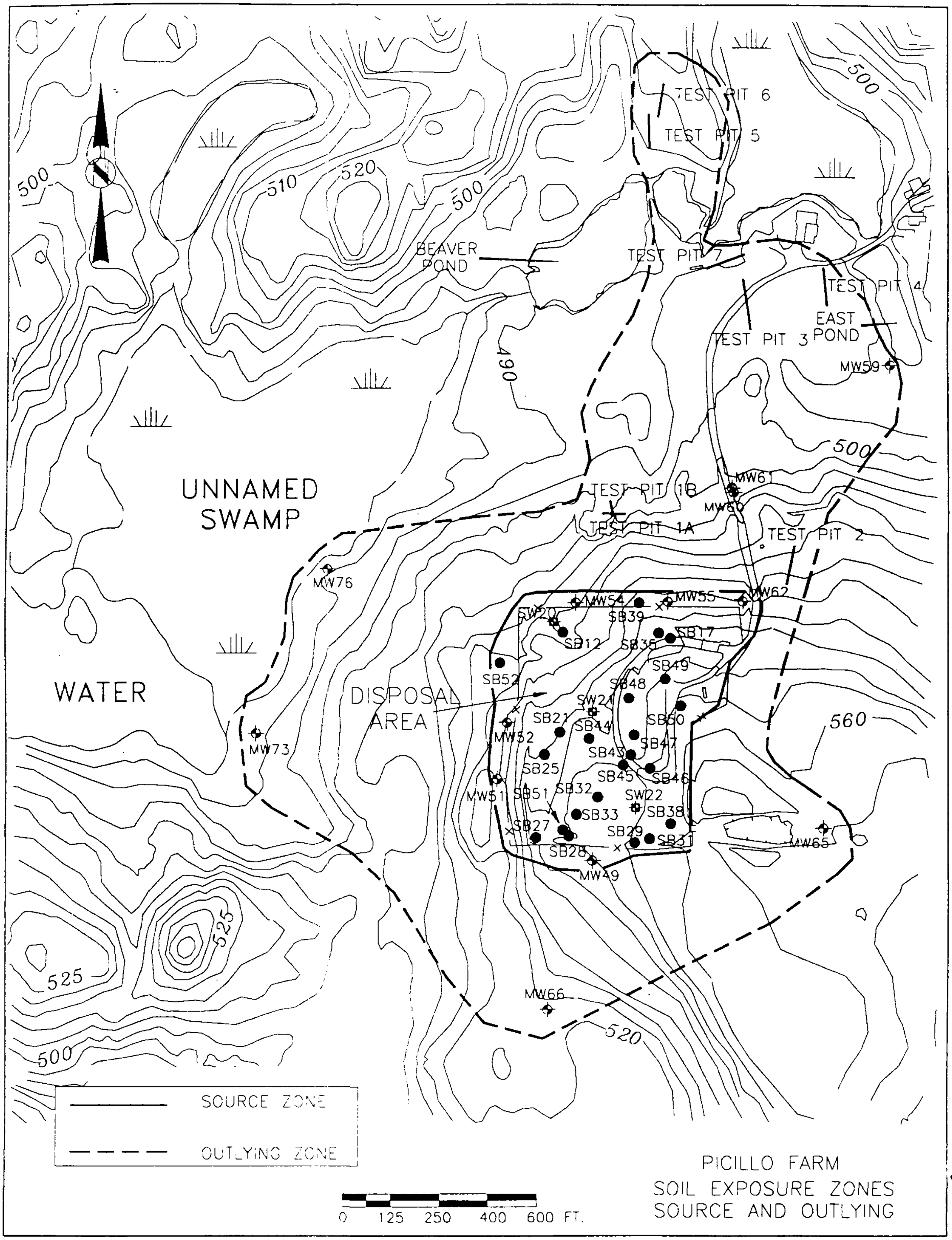
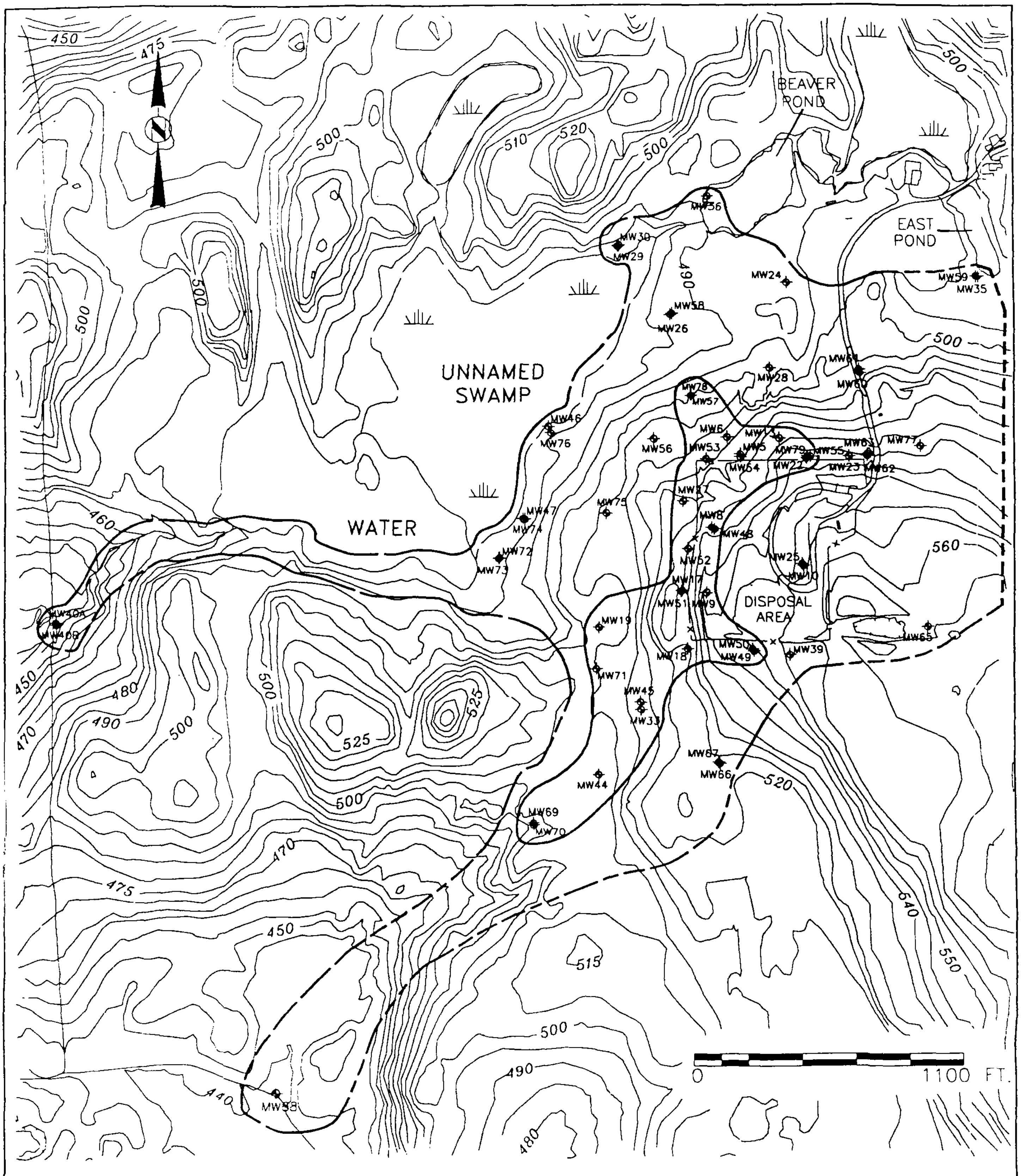

500
510
520
500
BEAVER POND
TEST PIT 6
TEST PIT 5
TEST PIT 7
TEST PIT 4
EAST POND
TEST PIT 3
MW59
490
500
UNNAMED SWAMP
TEST PIT 1B
MW61
MW60
TEST PIT 1A
TEST PIT 2
MW76
MW54
MW55
MW62
SW20
SB39
SB12
SB35
SB17
SB49
SB52
SB48
WATER
DISPOSAL AREA
SW21
SB21
SB44
SB50
560
MW73
MW52
SB47
SB25
SB43
SB45
SB46
MW51
SB51
SB32
SW22
SB33
SB38
SB27
SB29
SB31
SB28
MW65
MW49
525
525
MW66
520
500
SOURCE ZONE
OUTLYING ZONE
0 125 250 400 600 FT.
PICILLO FARM
SOIL EXPOSURE ZONES
SOURCE AND OUTLYING

Fig. 16



PICILLO FARM
GROUND WATER EXPOSURE ZONES
SOURCE AND DISTANT
OVERBURDEN AND SHALLOW BEDROCK AQUIFER

Fig. 17

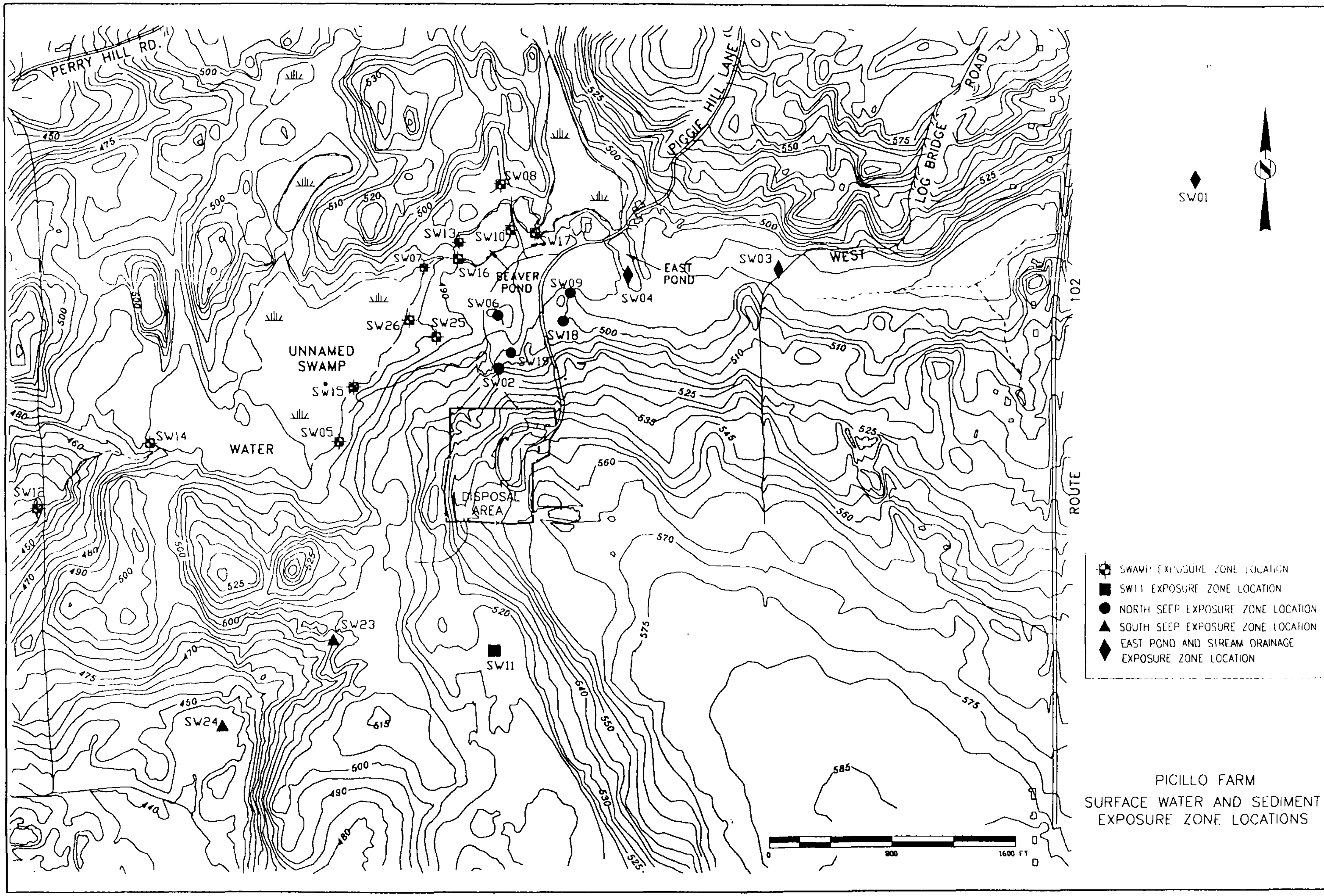

PERRY HILL RD.
PIGGIE HILL LANE
LOG BRIDGE ROAD
ROUTE 102
UNNAMED SWAMP
WATER
BEAVER POND
EAST POND
WEST
DISPOSAL AREA
SW01
SW02
SW03
SW04
SW05
SW06
SW07
SW08
SW09
SW10
SW11
SW12
SW13
SW14
SW15
SW16
SW17
SW18
SW19
SW23
SW24
SW25
SW26
SWAMP EXPOSURE ZONE LOCATION
SW11 EXPOSURE ZONE LOCATION
NORTH SEEP EXPOSURE ZONE LOCATION
SOUTH SEEP EXPOSURE ZONE LOCATION
EAST POND AND STREAM DRAINAGE EXPOSURE ZONE LOCATION
0
800
1600 FT
PICILLO FARM
SURFACE WATER AND SEDIMENT
EXPOSURE ZONE LOCATIONS

Fig. 18

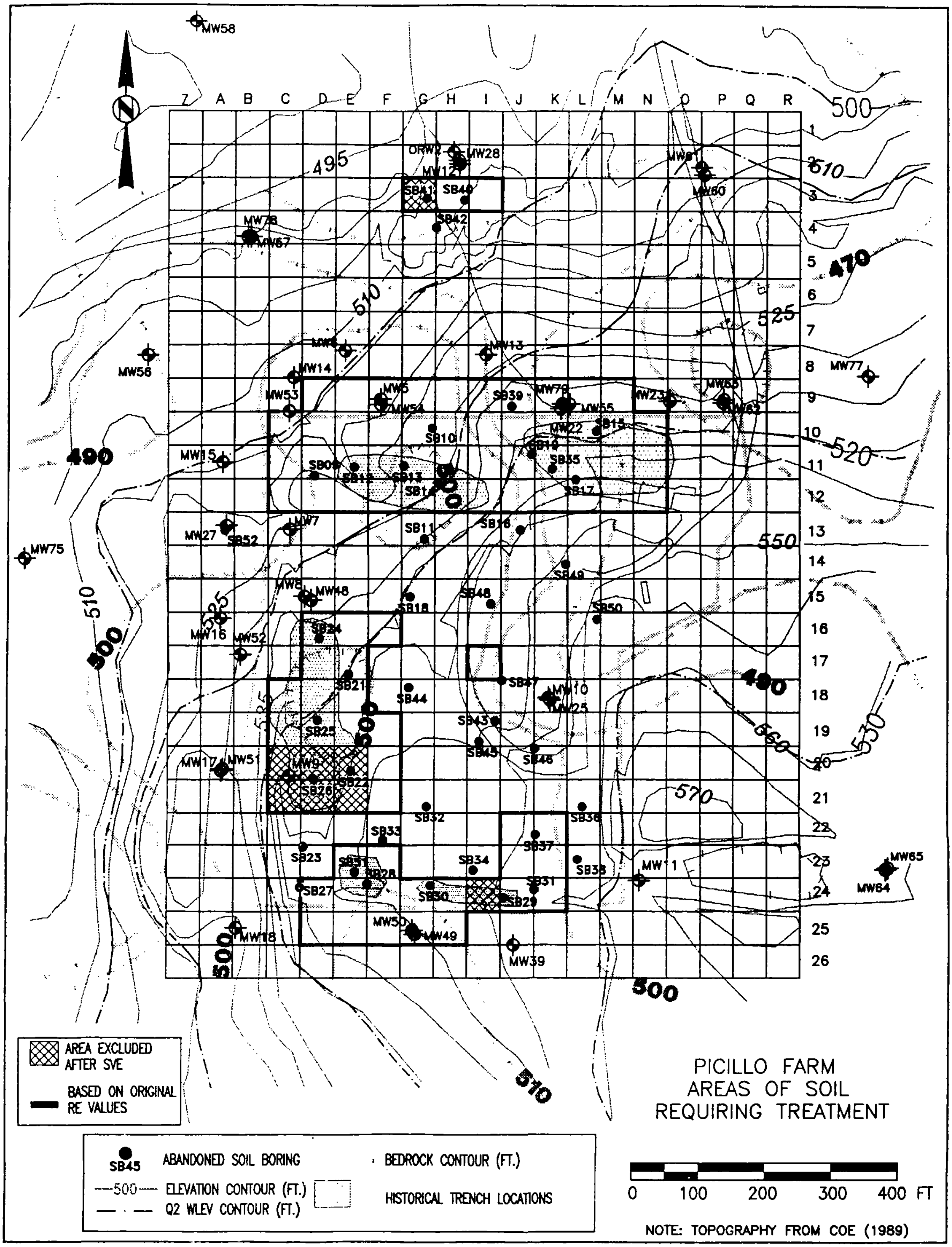
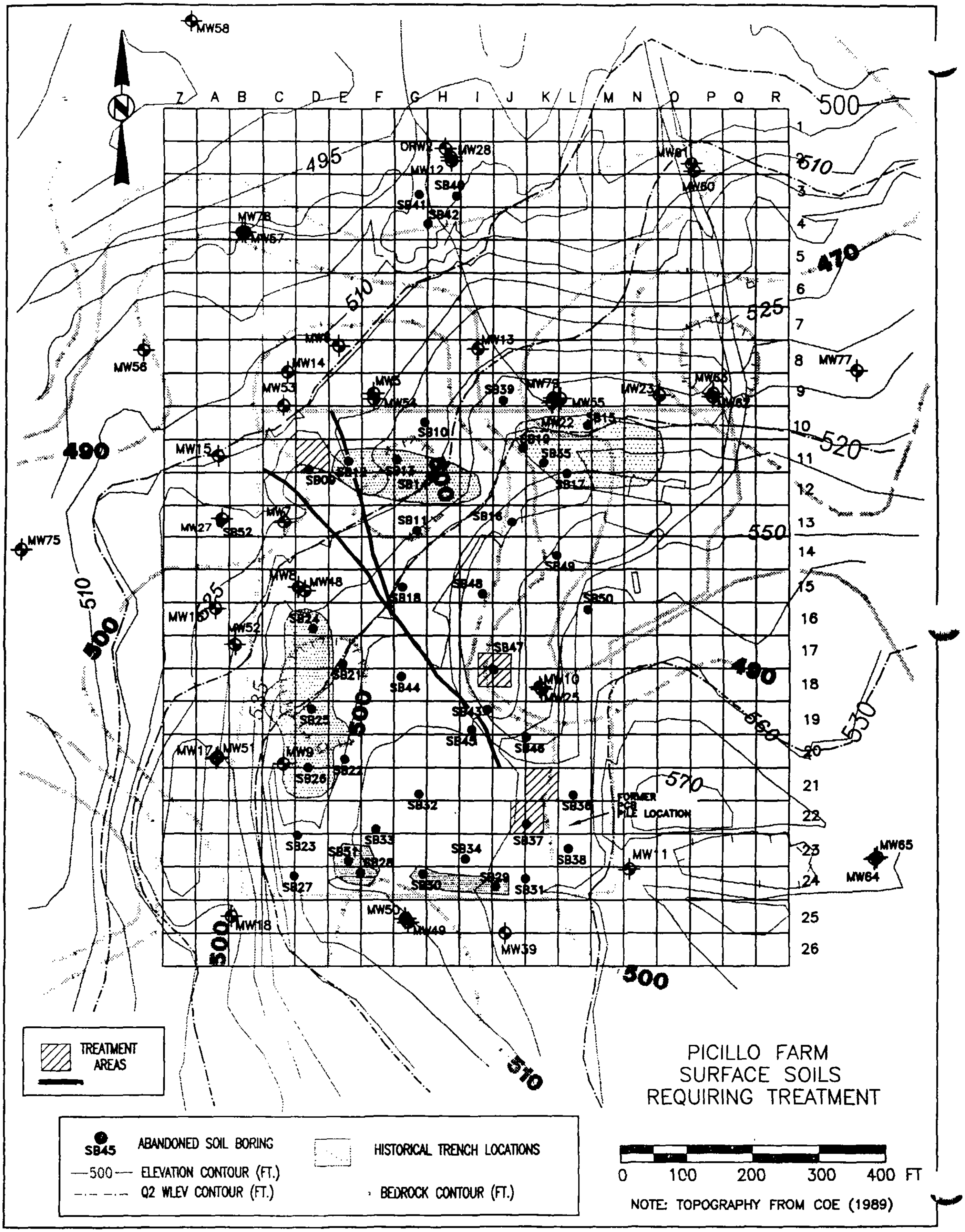

PICILLO FARM
AREAS OF SOIL
REQUIRING TREATMENT
AREA EXCLUDED AFTER SVE
BASED ON ORIGINAL RE VALUES
ABANDONED SOIL BORING
SB45
500 ELEVATION CONTOUR (FT.)
Q2 WLEV CONTOUR (FT.)
BEDROCK CONTOUR (FT.)
HISTORICAL TRENCH LOCATIONS
0 100 200 300 400 FT
NOTE: TOPOGRAPHY FROM COE (1989)
Z A B C D E F G H I J K L M N O P Q R
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Fig. 19



PICILLO FARM
SURFACE SOILS
REQUIRING TREATMENT
TREATMENT AREAS
SB45 ABANDONED SOIL BORING
HISTORICAL TRENCH LOCATIONS
—500— ELEVATION CONTOUR (FT.)
Q2 WLEV CONTOUR (FT.)
BEDROCK CONTOUR (FT.)
0 100 200 300 400 FT
NOTE: TOPOGRAPHY FROM COE (1989)
FORMER PCB PILE LOCATION

Fig. 20

Alternative MM-2 Extraction and Treatment Location Map

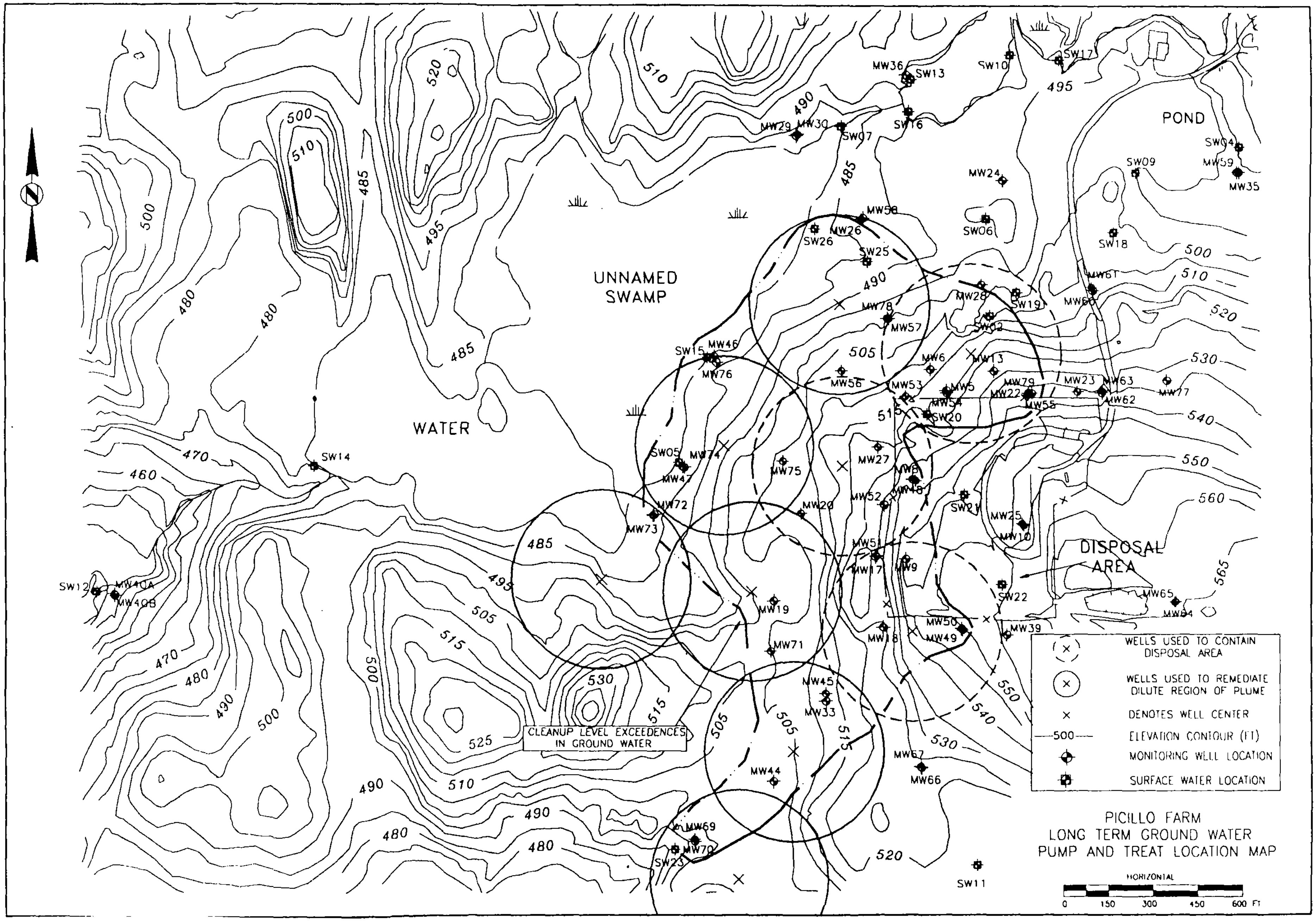
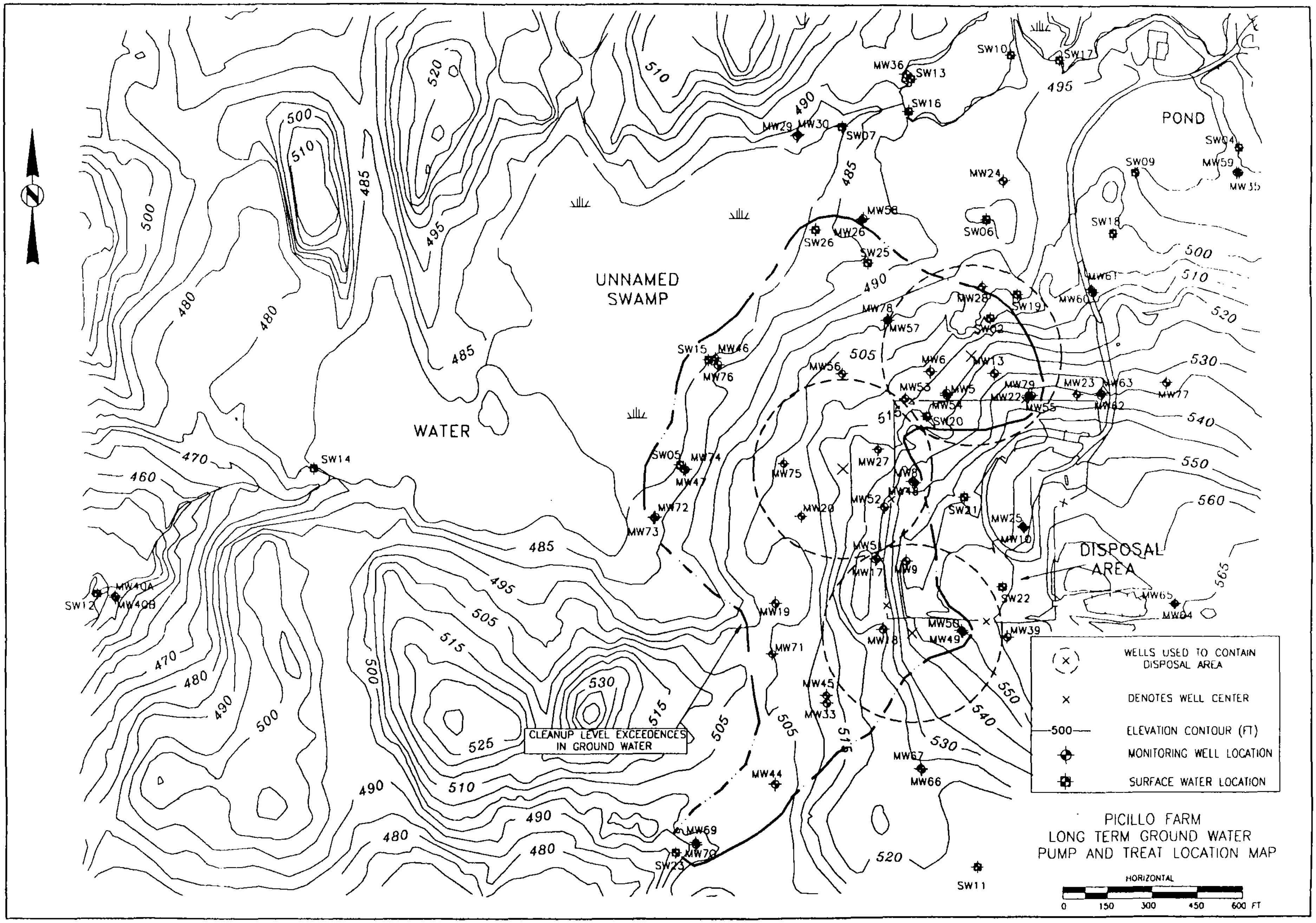
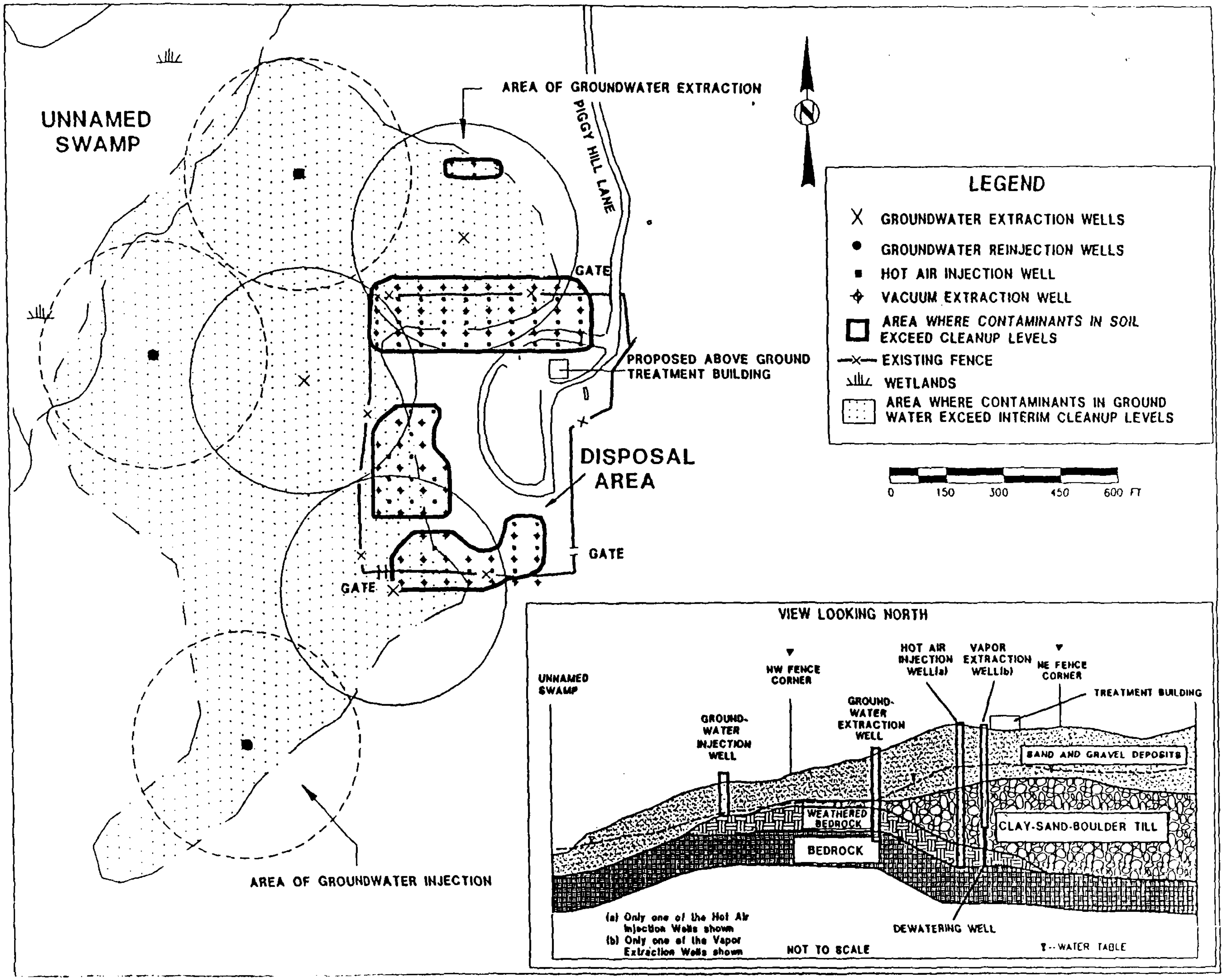


Fig. 21

Alternative MM-3 Extra on and Treatment Location Map



Selected Remedy (eptual Site Plan



APPENDIX B

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

LIST OF TABLES

TABLE 1

Picillo Farm Baseline Risk Assessment
Ground Water Source Zone
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Halogenated Organics									
Vinyl Chloride	1.76	1.10	6	MW-17	3/51	2	3	0	3
Trichlorofluoromethane	69.84	196.74	960	MW-13	16/26				
Dichlorofluoromethane	1.30	1.70	0.1	MW-70	1/2				
1,1,2-Trichloro-1,2,2-Trifluoroethan	106.12	219.41	980	MW-57	23/26				
Dichloromethane	651.86	2857.26	19000	MW-55	11/51	5	9	0	11
1,1-Dichloroethene	18.92	31.44	190	MW-55	35/51	7	26	7	26
1,1-Dichloroethane	107.65	292.17	1900	MW-57	38/51				
trans-1,2-Dichloroethene	2.81	4.37	23	MW-13	3/26	100	0	100	0
cis-1,2-Dichloroethene	170.47	527.82	2100	MW-57	18/26	70	3	70	3
1,2-Dichloroethene	21.86	39.68	160	MW-06	11/25	70	4	70	4
Chloroform	1846.27	6599.55	42000	MW-13	46/51				
1,2-Dichloroethane	228.90	419.48	2700	MW-13	46/51	5	46	0	46
1,1,1-Trichloroethane	1858.49	3447.75	18000	MW-13	48/51	200	42	200	42
Carbon Tetrachloride	12.18	69.68	500	MW-06	1/51	5	1	0	1
1,2-Dichloropropane	83.50	259.09	1400	MW-18	18/51	5	18	0	18
Trichloroethene	508.59	1555.25	9300	MW-13	46/51	5	46	0	46
1,1,2-Trichloroethane	6.32	15.03	95	MW-50	19/51	5	13	3	14
Tetrachloroethene	128.16	180.43	910	MW-13	43/51	5	43	0	43
1,1,1,2-Tetrachloroethane	0.09	0.02	0.1	MW-69	2/2				
Chlorobenzene	111.84	267.00	1300	MW-54	19/51				
Aromatics									
Benzene	131.94	349.01	2000	MW-13	30/51	5	27	0	30
Toluene	2294.49	6356.94	38000	MW-13	28/51	1000	11	1000	11
Ethylbenzene	272.73	573.28	2800	MW-09	29/51	700	8	700	8
Styrene	4.45	13.03	95	MW-13	2/51	100	0	100	0
Xylene	603.94	1351.71	6700	MW-09	29/51	10000	0	10000	0
Water Solubles									
Acetone	656.77	3898.86	27000	MW-55	6/49				
Tetrahydrofuran	276.46	797.75	3900	MW-55	20/25				
2-Butanone	219.79	1244.83	8500	MW-55	5/48				
4-Methyl-2-Pentanone	23.92	75.98	480	MW-13	7/49				
Other									
Carbon Disulfide	2.49	0.64	6	MW-19	1/51				

TABLE 1

Picillo Farm Baseline Risk Assessment
Ground Water Source Zone
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Polynuclear Aromatic Hydrocarbons									
Naphthalene	7.14	8.77	39	MW-57	17/35				
2-Methylnaphthalene	4.41	4.29	25	MW-48	8/34				
Dibenzofuran	3.12	2.40	8.5	MW-48	3/33				
Phenols									
Phenol	34.70	86.98	410	MW-13	9/25				
2-Chlorophenol	4.48	7.14	33	MW-78	6/24				
2-Methylphenol	26.52	45.44	160	MW-78	13/26				
4-Methylphenol	20.58	41.24	170	MW-57	11/26				
2-Nitrophenol	5.46	2.35	17	MW-13	1/26				
2,4-Dimethylphenol	9.88	18.67	71	MW-78	13/26				
2,4-Dichlorophenol	39.20	86.77	340	MW-57	7/25				
2,4,6-Trichlorophenol	3.79	2.17	10	MW-06	3/24				
Phthalates									
Dimethyl phthalate	3.91	1.44	8	MW-13	2/34				
Diethyl phthalate	8.81	21.16	120	MW-13	12/34				
Di-n-butyl phthalate	5.00	8.24	49.5	MW-48	4/33				
Butylbenzyl phthalate	5.26	12.62	75.5	MW-48	5/34	100	0	0	5
Bis (2-Ethylhexyl) phthalate	5.70	12.55	72	MW-48	5/33				
Di-n-octyl phthalate	6.06	6.09	40	MW-78	1/33				
Aromatics									
1,2-Dichlorobenzene	84.94	221.14	920	MW-57	18/35	600	2	600	2
Nitrobenzene	5.82	13.04	78	MW-09	2/33				
1,2,4-Trichlorobenzene	6.06	7.17	27.5	MW-48	12/34	70	0	70	0
Ethers									
Bis (2-Chloroethyl) Ether	10.00	27.49	160	MW-55	17/34				
Bis (2-Chloroethoxy) Methane	5.42	2.44	19	MW-45	1/33				
Other									
Benzyl Alcohol	4.00	1.41	6	MW-06	1/5				
Isophorone	25.71	46.02	190	MW-55	16/35				
Benzoic Acid	32.50	15.00	55	MW-13	1/4				
4-Chloroaniline	5.21	1.22	12	MW-55	1/33				

Picillo Farm Baseline Risk Assessment
Ground Water Source Zone
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Aluminum	26237.95	36482.45	159000	MW-06	30/31				
Antimony	8.28	2.26	17.9	MW-79	2/31	5	2	3	2
Arsenic	1.19	0.21	2.3	MW-79	1/31	50	0		
Barium	153.57	187.13	778	MW-19	25/31	2000	0	2000	0
Beryllium	4.80	6.47	32.3	MW-06	25/31	1	24	0	25
Cadmium	9.90	24.24	126	MW-06	15/31	5	9	5	9
Calcium	18229.03	11470.31	49400	MW-19	31/31				
Chromium	35.34	141.62	789	MW-06	12/31	100	2	100	2
Cobalt	14.12	18.71	88.6	MW-06	17/31				
Copper	81.68	322.18	1810	MW-06	20/31	1300	1	1300	1
Iron	39349.31	55208.11	269000	MW-06	30/31				
Lead	20.86	51.12	263	MW-06	13/31	15	8	0	13
Magnesium	4817.19	2779.82	12300	MW-17	31/31				
Manganese	5596.81	3899.13	14600	MW-17	31/31				
Mercury	0.12	0.05	0.3	MW-70	3/31	2	0	2	0
Nickel	26.22	68.04	381	MW-06	19/31	100	1	100	1
Potassium	7556.13	8687.04	49700	MW-06	31/31				
Sodium	21404.19	18160.37	82600	MW-05	31/31				
Vanadium	14.54	18.79	70.9	MW-44	19/31				
Zinc	288.01	623.87	3490	MW-06	26/31				

TABLE 1

TABLE 1

Picillo Farm Baseline Risk Assessment
Ground Water Source Zone
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Beta-BHC	0.02	0.01	0.032	MW-05	1/21				
Delta-BHC	0.02	0.01	0.023	MW-05	1/21				
Heptachlor	0.03	0.03	0.17	MW-48	6/24	0.4	0	0	6
Aldrin	0.03	0.05	0.25	MW-48	4/23				
Heptachlor Epoxide	0.02	0.03	0.14	MW-57	3/23	0.2	0	0	3
Endosulfane I	0.02	0.01	0.056	MW-06	2/22				
Dieldrin	0.04	0.02	0.061	MW-13	4/22				
Endrin	0.05	0.01	0.12	MW-55	1/22	2	0	2	0
Endosulfan II	0.03	0.02	0.03	MW-48	1/22				
4,4'-DDT	0.05	0.02	0.091	MW-55	3/22				
Endrin Aldehyde	0.02	0.01	0.039	MW-79	1/9				
Alpha Chlordane	0.08	0.11	0.05	MW-57	2/22	2	0	0	2
Gamma Chlordane	0.09	0.11	0.038	MW-05	1/21	2	0	0	1
Aroclor 1248	0.38	0.63	3.2	MW-48	1/22	0.5	1	0	1

Picillo Farm Baseline Risk Assessment
Ground Water Distant Zone
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Halogenated Organics									
Chloromethane	2.00	2.30	0.4	MW-61	1/60				
Vinyl Chloride	1.93	1.90	2	MW-28	2/60	2	0	0	2
Chloroethane	2.08	2.16	1	MW-24	1/60				
Trichlorofluoromethane	1.35	1.54	5	MW-75	7/30				
1,1,2-Trichloro-1,2,2-Trifluoroethan	3.77	9.58	44	MW-46	8/30				
Dichloromethane	2.01	1.12	7	MW-56	2/60	5	1	0	2
1,1-Dichloroethene	1.30	1.56	7	MW-76	15/60	7	0	7	0
1,1-Dichloroethane	8.08	20.01	110	MW-46	20/60				
trans-1,2-Dichloroethene	0.83	1.05	3	MW-28	3/30	100	0	100	0
cis-1,2-Dichloroethene	4.93	16.01	80	MW-46	10/30	70	1	70	1
1,2-Dichloroethene	4.45	11.97	66.5	MW-46	6/30	70	0	70	0
Chloroform	5.14	11.29	62	MW-47	14/60				
1,2-Dichloroethane	8.88	19.47	79	MW-73	13/60	5	11	0	13
1,1,1-Trichloroethane	38.19	74.31	345	MW-46	18/60	200	3	200	3
1,2-Dichloropropane	1.03	1.06	0.4	MW-40B	2/60	5	0	0	2
Trichloroethene	10.57	20.96	83	MW-46	20/60	5	12	0	20
1,1,2-Trichloroethane	1.21	0.96	1	MW-75	1/60	5	0	3	0
Tetrachloroethene	11.37	21.54	81	MW-46	20/60	5	14	0	20
Chlorobenzene	1.55	0.93	4	MW-46	2/60				
Aromatics									
Benzene	1.60	1.97	9.5	MW-46	6/60	5	3	0	6
Toluene	1.39	2.10	15	MW-68	5/60	1000	0	1000	0
Ethylbenzene	1.01	1.15	0.2	MW-28	2/60	700	0	700	0
Xylene	1.21	1.61	10	MW-46	3/60	10000	0	10000	0
Water Solubles									
Tetrahydrofuran	21.13	11.81	38	MW-75	7/8				
4-Methyl-2-Pentanone	3.63	1.69	4	MW-24	2/38				

Picillo Farm Baseline Risk Assessment
Ground Water Distant Zone
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Polynuclear Aromatic Hydrocarbons									
Naphthalene	4.05	1.70	2	MW-68	1/37				
Phenols									
Phenol	3.87	1.93	2	MW-61	2/34				
2,4-Dichlorophenol	4.12	1.51	3	MW-76	1/34				
Phthalates									
Di-n-butyl phthalate	5.14	0.82	10	MW-39	1/37				
Bis (2-Ethylhexyl) phthalate	7.27	22.52	140	MW-77	6/37				
Aromatics									
1,2-Dichlorobenzene	4.73	2.28	14	MW-46	3/37	600	0	600	0
Ethers									
Bis (2-Chloroethyl) Ether	3.80	2.01	1	MW-75	1/37				

TABLE 1

Picillo Farm Baseline Risk Assessment
Ground Water Distant Zone
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG
Aluminum	14823.95	24479.61	89200	MW-76	25/37				
Arsenic	1.13	0.38	2.5	MW-39	4/37	50	0		
Barium	105.81	178.44	739	MW-23	18/37	2000	0	2000	0
Beryllium	2.80	3.78	16	MW-76	20/37	1	19	0	20
Cadmium	2.05	0.33	4	MW-56	1/37	5	0	5	0
Calcium	7966.22	6520.63	29900	MW-23	37/37				
Chromium	9.78	20.30	102	MW-36	8/37	100	1	100	1
Cobalt	8.19	10.58	45.3	MW-36	11/37				
Copper	15.61	25.05	87	MW-30	16/37	1300	0	1300	0
Iron	29774.01	58671.68	301000	MW-76	34/37				
Lead	34.61	83.70	410	MW-39	24/37	15	10	0	24
Magnesium	2263.91	2296.79	10100	MW-76	37/37				
Manganese	1104.52	1777.31	9680	MW-76	34/37				
Mercury	0.13	0.11	0.62	MW-73	4/37	2	0	2	0
Nickel	5.86	10.20	61.2	MW-30	7/37	100	0	100	0
Potassium	5787.89	7762.10	30600	MW-65	37/37				
Sodium	6183.51	3386.80	17000	MW-65	37/37				
Vanadium	14.79	32.18	172	MW-36	13/37				
Zinc	145.57	237.22	1040	MW-76	26/37				

Picillo Farm Baseline Risk Assessment
Soil Source Surface Samples 0-2 ft
Volatile Organics Data Summary

TABLE 1

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogenated Organics						
Chloroform	2.84	0.88	5	SB-28	0-0.5	1/22
1,1,1-Trichloroethane	3.18	1.76	10	SB-31	0-0.5	2/22
1,2-Dichloropropane	2.80	1.97	11	SB-28	0-0.5	2/22
Tetrachloroethene	1.44	1.47	0.9	SB-47	0-0.5	1/22
Aromatics						
Toluene	2.57	1.77	9	SB-27	0-2	3/22
Ethylbenzene	3.07	0.97	6	SB-27	0-2	1/22
Xylene	4.89	5.75	30	SB-27	0-2	1/22
Water Solubles						
Acetone	2.64	1.22	4	SB-29	0-0.5	1/22

Picillo Farm Baseline Risk Assessment
Soil Source Surface Samples 0 - 2 ft
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Phenols						
Phenol	47.02	24.34	140	SB-27	0-2	3/22
Phthalates						
Diethyl phthalate	35.82	10.81	73	SB-31	0-0.5	2/22
Butylbenzyl phthalate	83.27	164.84	820	SB-47	0-0.5	2/22
Bis (2-Ethylhexyl) phthalate	742.05	2022.37	9700	SB-47	0-0.5	12/22
Di-n-octyl phthalate	224.09	242.86	1300	SB-47	0-0.5	2/22
Other						
Isophorone	15.36	13.34	74	SB-28	0-0.5	2/22

Picillo Farm Baseline Risk Assessment
Soil Source Surface Samples 0-2 ft
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	6604.25	2783.92	12300	MW-52	0-0.5	20/20
Arsenic	0.91	0.77	3	SB-47	0-0.5	13/20
Barium	18.54	14.12	74	SB-47	0-0.5	19/20
Beryllium	0.21	0.15	0.58	SB-47	0-0.5	8/20
Cadmium	0.46	0.94	4.4	SB-47	0-0.5	4/20
Calcium	426.58	221.40	835	SB-47	0-0.5	14/20
Chromium	6.61	8.56	36.8	SW-22	0-2	17/20
Cobalt	0.80	0.69	2.4	SW-20	0-2	10/20
Copper	31.78	85.13	287	SB-47	0-0.5	4/20
Iron	8914.50	3445.26	17700	SB-47	0-0.5	20/20
Lead	8.01	7.80	36.4	SB-47	0-0.5	19/20
Magnesium	439.05	273.86	1150	SB-47	0-0.5	15/20
Manganese	95.40	33.11	169	SB-52	0-0.5	20/20
Mercury	0.08	0.09	0.41	SW-22	0-2	3/20
Nickel	5.29	10.40	47.7	SB-33	0-0.5	3/20
Potassium	360.28	421.56	1150	SB-47	0-0.5	9/20
Selenium	0.36	0.64	3	SB-28	0-0.5	6/20
Sodium	69.99	56.07	212	SB-46	0-0.5	8/20
Thallium	0.15	0.03	0.28	SB-38	0-0.5	1/20
Vanadium	5.79	3.31	11	SB-45	0-0.5	14/20
Zinc	28.32	18.21	82.5	SB-47	0-0.5	17/20

TABLE 1

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Source Surface Samples 0-2 ft
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Heptachlor Epoxide	1.20	0.43	2.75	SB-29	0-0.5	1/22
Alpha Chlordane	22.43	23.91	84	SB-47	0-0.5	1/22
Gamma Chlordane	14.27	13.47	47	SB-31	0-0.5	1/22
Aroclor 1248	462.20	1576.29	7000	SW-22	0-2	5/22
Aroclor 1254	142.95	438.26	2100	SB-31	0-0.5	1/22

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Source Sub-surface Samples 2-30 ft
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogenated Organics						
1,1-Dichloroethene	1.63	0.61	3	SB-33	4-5.5	1/38
1,1-Dichloroethane	4.53	0.88	9	MW-49	10-11.5	1/38
Chloroform	1.26	3.28	20	SB-39	24-26	3/38
1,2-Dichloroethane	5.17	1.83	14	MW-54	19-20.5	2/38
1,1,1-Trichloroethane	1.84	1.21	8	SB-39	24-26	3/38
Trichloroethene	1.67	6.45	40	SB-12	14-16	3/38
Tetrachloroethene	2895.67	17844.20	110000	SB-35	9-11	4/38
Chlorobenzene	128.39	778.32	4800	SB-35	9-11	2/38
Aromatics						
Benzene	2.32	1.25	9	SB-39	24-26	2/38
Toluene	1764.50	10374.85	64000	SB-35	9-11	9/38
Ethylbenzene	1913.34	11347.45	70000	SB-35	9-11	7/38
Styrene	1950.34	12003.89	74000	SB-35	9-11	4/38
Xylene	5374.68	30799.06	190000	SB-35	9-11	7/38
Water Solubles						
Acetone	14.24	55.95	350	SB-43	9-10.5	2/38
2-Butanone	7.76	17.03	110	SB-43	9-10.5	1/38
4-Methyl-2-Pentanone	5.36	10.62	69	SB-39	24-26	2/38
2-Hexanone	5.37	2.27	19	SB-43	9-10.5	1/38

Picillo Farm Baseline Risk Assessment
Soil Source Sub-surface Samples 2 - 30 ft
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Polynuclear Aromatic Hydrocarbons						
Naphthalene	56.08	190.63	1200	SB-35	9-11	2/38
2-Methylnaphthalene	31.03	93.16	590	SB-35	9-11	2/38
Pyrene	13.34	2.11	26	SB-31	19-20.5	1/38
Phenols						
Phenol	199.21	185.34	1300	SB-25	14-15	2/38
Phthalates						
Diethyl phthalate	49.09	154.15	940	SB-35	9-11	9/38
Di-n-butyl phthalate	25.66	4.06	50	SB-33	19-20.5	1/38
Butylbenzyl phthalate	1160.66	6137.65	38000	SB-35	9-11	1/38
Bis (2-Ethylhexyl) phthalate	6006.84	23564.70	130000	SB-25	14-15	4/38
Di-n-octyl phthalate	1857.21	11353.00	70000	SB-35	9-11	3/38
Aromatics						
1,2-Dichlorobenzene	368.55	1254.78	7900	SB-35	9-11	1/38
1,2,4-Trichlorobenzene	104.21	129.74	860	SB-25	14-15	2/38
Other						
Isophorone	62.74	272.79	1700	SB-25	14-15	2/38

Picillo Farm Baseline Risk Assessment
Soil Source Sub-surface Samples 2-30 ft
Inorganics Data Summary

TABLE 1

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	4294.55	1698.71	8900	SB-51	4-6	33/33
Arsenic	0.23	0.08	0.55	SB-25	14-15	3/33
Barium	16.68	9.16	33.7	SB-39	19-21	28/33
Beryllium	0.21	0.21	0.88	SB-51	4-6	10/33
Cadmium	0.60	0.34	2	SB-17	24-25.5	4/33
Calcium	439.50	353.69	1550	SB-35	9-11	20/33
Chromium	3.45	5.54	32.1	SB-17	24-25.5	25/33
Cobalt	0.48	0.34	2	SB-39	19-21	6/33
Copper	21.73	21.08	76.6	SB-17	24-25.5	21/33
Iron	7325.15	2445.46	12500	SB-39	19-21	33/33
Lead	2.07	3.18	17	SB-35	9-11	15/33
Magnesium	355.36	332.99	1400	SB-39	19-21	18/33
Manganese	128.42	47.45	237	MW-62	24-26	33/33
Nickel	2.25	0.84	6.5	SB-17	24-25.5	2/33
Potassium	872.20	592.73	2200	SB-51	4-6	22/33
Selenium	0.13	0.03	0.24	SB-21	29-30	2/33
Sodium	83.79	54.98	255	SB-21	29-30	5/33
Thallium	0.13	0.04	0.31	SB-25	24-26	3/33
Vanadium	1.58	2.18	8.6	MW-62	24-26	9/33
Zinc	33.49	21.52	67.8	SB-27	9-11	25/33

Picillo Farm Baseline Risk Assessment
Soil Outlying Surface Samples 0-2 ft
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aromatics						
Toluene	3.75	1.77	5	MW-66	0-1.5	1/2

Picillo Farm Baseline Risk Assessment
Soil Source Sub-surface Samples 2-30 ft
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Gamma-BHC (Lindane)	10.09	54.06	330	SB-25	16-18	1/37
Endrin	7.97	34.19	210	SB-25	16-18	1/37
Gamma Chlordane	1.21	1.00	5.71	SB-35	9-11	1/36

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Outlying Surface Samples 0 - 2 ft
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Polynuclear Aromatic Hydrocarbons						
Phenanthrene	15.00	7.07	20	MW-66	0-1.5	1/2
Fluoranthene	18.00	8.49	24	MW-66	0-1.5	1/2
Pyrene	19.50	9.19	26	MW-66	0-1.5	1/2

Picillo Farm Baseline Risk Assessment
Soil Outlying Surface Samples 0-2 ft
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	10730.00	2927.42	12800	MW-73	0-1.5	2/2
Arsenic	2.10	0.28	2.3	MW-73	0-1.5	2/2
Barium	20.20	0.14	20.3	MW-66	0-1.5	2/2
Calcium	269.50	78.49	325	MW-66	0-1.5	2/2
Chromium	5.40	6.22	9.8	MW-73	0-1.5	1/2
Copper	5.05	0.07	5.1	MW-66	0-1.5	2/2
Iron	14800.00	707.11	15300	MW-66	0-1.5	2/2
Lead	16.05	8.27	21.9	MW-66	0-1.5	2/2
Magnesium	933.50	631.45	1380	MW-73	0-1.5	2/2
Manganese	93.65	16.05	105	MW-66	0-1.5	2/2
Potassium	408.50	245.37	582	MW-66	0-1.5	2/2
Selenium	0.65	0.18	0.77	MW-66	0-1.5	2/2
Thallium	0.27	0.13	0.36	MW-66	0-1.5	1/2
Vanadium	14.10	4.38	17.2	MW-73	0-1.5	2/2
Zinc	32.25	5.59	36.2	MW-66	0-1.5	2/2

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Outlying Sub-surface Samples 2-30 ft
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogenated Organics						
1,2-Dichloroethene	1.17	0.69	2	TR-01A(0-20')	9-10	1/39
Trichloroethene	4.01	0.79	8	MW-76	3-6	1/39
Tetrachloroethene	5.17	2.37	19	MW-76	3-6	1/39
Aromatics						
Toluene	0.76	0.83	2	TR-06(60-80')	8-9	3/39
Water Solubles						
Acetone	5.21	1.28	13	MW-76	3-6	1/39

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Outlying Sub-surface Samples 2 - 30 ft
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Polynuclear Aromatic Hydrocarbons						
Phenanthrene	153.85	24.02	300	TR-03(80-100')	6-7	1/39
Fluoranthene	22.05	3.44	43	TR-03(80-100')	6-7	1/39
Chrysene	18.97	2.96	37	TR-03(80-100')	6-7	1/39
Phthalates						
Butylbenzyl phthalate	29.23	4.56	57	TR-01(20-30')	5-6	1/39
Bis (2-Ethylhexyl) phthalate	170.13	135.10	980	MW-59	5-6.5	2/39

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Outlying Sub-surface Samples 2-30 ft
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	4416.15	2020.88	9480	TR-04(40-60')	7-8	39/39
Antimony	3.79	3.94	15.5	TR-04(40-60')	7-8	6/39
Arsenic	0.42	0.25	1.1	TR-04(20-40')	7-8	19/39
Barium	22.76	16.56	64.6	MW-76	3-6	34/39
Beryllium	0.50	0.40	1.7	TR-04(40-60')	7-8	23/39
Cadmium	0.29	0.04	0.56	MW-61	5-6.5	1/39
Calcium	477.58	325.45	1090	MW-61	5-6.5	23/39
Chromium	2.72	4.73	26.1	TR-05(0-20')	8-10	28/39
Cobalt	1.25	1.74	6.2	MW-76	3-6	12/39
Copper	3.27	5.08	26.3	MW-61	5-6.5	16/39
Iron	10380.77	6148.85	29400	TR-04(40-60')	7-8	39/39
Lead	5.15	11.79	76.3	TR-07(0-20')	7-8	34/39
Magnesium	579.73	291.32	1340	TR-07(40-60')	6-7	38/39
Manganese	379.38	635.94	3030	TR-04(0-20')	7-8	38/39
Mercury	0.06	0.04	0.28	TR-05(60-80')	6-8	1/39
Nickel	2.16	5.53	33.1	TR-05(0-20')	8-10	11/39
Potassium	1095.01	768.30	3080	TR-04(40-60')	7-8	35/39
Selenium	0.63	0.74	3.2	TR-02(0-20')	12-13	13/39
Sodium	37.71	23.21	125	MW-76	3-6	4/38
Thallium	0.26	0.48	2.3	TR-07(0-20')	7-8	5/21
Vanadium	4.49	2.41	10.1	TR-07(40-60')	6-7	30/39
Zinc	31.70	34.17	157	TR-04(40-60')	7-8	24/39

TABLE 1

Picillo Farm Baseline Risk Assessment
Soil Outlying Sub-surface Samples 2-30 ft
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Alpha-BHC	0.05	0.01	0.1	TR-01A(0-20')	9-10	1/39
Gamma-BHC (Lindane)	0.04	0.01	0.07	TR-02(40-60')	13-14	1/39
Heptachlor	0.06	0.01	0.12	TR-05(20-40')	6-8	1/39
Endrin	0.12	0.02	0.23	TR-02(0-20')	12-13	1/39
4,4'-DDE	0.10	0.03	0.22	TR-03(40-60')	6-7	3/39
4,4'-DDT	0.21	0.06	0.54	TR-01B(25-50')	5-6	2/39
Methoxychlor	0.33	0.14	1.1	TR-05(80-100')	10-12	2/39
Aroclor 1254	3.44	0.54	6.7	TR-05(80-100')	10-12	1/39

TABLE 1

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment Swamp
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogentated Organics						
Chloroethane	18.48	70.24	325	SW-25		2/21
1,1-Dichloroethane	51.61	129.55	610	SW-15	0-6	8/22
1,2-Dichloroethene	101.95	381.25	1800	SW-15	0-6	7/22
Chloroform	1.64	0.45	3	SW-25		2/21
1,2-Dichloroethane	4.33	7.21	26	SW-05		5/21
1,1,1-Trichloroethane	137.36	432.12	1900	SW-15	0-6	7/21
Trichloroethene	62.64	177.61	780	SW-15	0-6	6/21
Tetrachloroethene	158.93	385.91	1400	SW-15	0-6	7/21
Chlorobenzene	21.81	61.38	260	SW-15	0-6	4/21
Aromatics						
Benzene	5.88	16.53	76.5	SW-25		3/21
Toluene	164.95	436.52	2000	SW-15	0-6	8/22
Ethylbenzene	16.17	47.04	210	SW-25		3/21
Xylene	57.98	150.22	620	SW-15	0-6	4/21
Water Solubles						
Acetone	70.24	209.66	970	SW-15	18-24	7/21
2-Butanone	10.28	17.84	69	SW-25		6/20
Other						
Carbon Disulfide	1.88	1.44	8	SW-13		2/21

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment Swamp
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Polynuclear Aromatic Hydrocarbons						
Naphthalene	104.76	21.82	200	SW-25		1/21
2-Methylnaphthalene	57.62	12.00	110	SW-25		1/21
Phenanthrene	102.14	21.28	195	SW-25		1/21
Fluoranthene	206.43	133.27	680	SW-25		2/21
Pyrene	192.38	125.48	740	SW-07		1/21
Chrysene	130.95	27.28	250	SW-07		1/21
Phenols						
Phenol	73.41	52.83	260	SW-26		3/22
2-Methylphenol	186.67	99.29	620	SW-25		1/21
4-Methylphenol	132.62	336.28	1200	SW-15	0-6	3/21
2,4-Dimethylphenol	41.38	8.62	79	SW-25		1/21
2,4-Dichlorophenol	49.48	17.81	115	SW-25		2/21
Phthalates						
Butylbenzyl phthalate	174.10	41.68	356	SW-25		1/21
Bis (2-Ethylhexyl) phthalate	190.25	346.22	1240	SW-25		9/22
Aromatics						
1,2-Dichlorobenzene	178.81	174.23	650	SW-25		4/21
1,2,4-Trichlorobenzene	174.29	42.55	360	SW-25		1/21
Ethers						
Bis (2-Chloroethoxy) Methane	125.71	26.19	240	SW-25		1/21
Other						
Benzoic Acid	501.82	138.70	920	SW-15	0-6	1/11

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment Swamp
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	6225.00	3335.78	12100	SW-13		21/21
Arsenic	0.90	1.03	4.1	SW-10		9/20
Barium	18.86	12.66	50.6	SW-08		21/21
Beryllium	0.61	0.64	2.4	SW-10		11/21
Calcium	1061.55	1035.76	5100	SW-26		21/21
Chromium	10.79	23.79	86.8	SW-10		12/21
Cobalt	0.85	0.86	3.2	SW-10		6/20
Copper	3.58	4.81	24	SW-25		1/20
Iron	10373.10	14956.88	60600	SW-10		21/21
Lead	14.79	10.87	37.8	SW-14		19/21
Magnesium	409.17	206.83	899	SW-17		21/21
Manganese	191.94	195.81	641	SW-25		21/21
Mercury	0.12	0.25	1.1	SW-26		[illegible]
Potassium	261.90	251.54	933	SW-16		11/21
Selenium	0.59	0.40	2.3	SW-08		1/20
Sodium	113.20	63.40	310	SW-16		4/20
Vanadium	26.22	59.62	241	SW-10		21/21
Zinc	30.15	20.54	69.6	SW-16		16/20

Picillo Farm Baseline Risk Assessment
Sediment Swamp
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Dieldrin	0.12	0.04	0.22	SW-10		2/15
4,4'-DDE	0.14	0.03	0.26	SW-12		1/15
Endosulfan II	0.20	0.05	0.37	SW-12		1/15
Endosulfan Sulfate	0.10	0.09	0.42	SW-17		2/15
Alpha Chlordane	0.06	0.05	0.23	SW-12		2/15
Gamma Chlordane	0.05	0.01	0.093	SW-17		1/15

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment North Seep
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogenated Organics						
Chloroethane	9.00	9.80	29	SW-02	-	1/6
1,1-Dichloroethane	32.42	67.50	170	SW-02	-	2/6
1,2-Dichloroethene	51.58	107.43	270	SW-02	-	2/6
1,2-Dichloroethane	5.17	5.40	16	SW-02	-	1/6
1,1,1-Trichloroethane	3.50	1.58	6	SW-02	-	2/6
Trichloroethene	9.42	13.68	37	SW-19	-	2/6
Tetrachloroethene	22.25	37.19	96	SW-02	-	2/6
Chlorobenzene	3.17	1.40	6	SW-02	-	1/6
Aromatics						
Benzene	3.42	1.80	7	SW-02	-	1/6
Toluene	18.83	38.80	98	SW-02	-	1/6
Ethylbenzene	8.67	13.92	37	SW-02	-	1/6
Xylene	25.83	55.94	140	SW-02	-	1/6
Water Solubles						
Acetone	13.50	20.82	56	SW-19	-	1/6

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment North Seep
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Polynuclear Aromatic Hydrocarbons						
Fluoranthene	30.92	10.82	53	SW-06	-	1/6
Phenols						
Phenol	234.17	169.42	580	SW-09	-	1/6
2-Chlorophenol	186.67	65.32	320	SW-09	-	1/6
Aromatics						
1,2,4-Trichlorobenzene	116.67	40.82	200	SW-02	-	1/6

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment North Seep
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	12488.00	6694.45	19200	SW-19	-	5/5
Arsenic	1.06	0.61	1.8	SW-06	-	4/5
Barium	41.55	21.95	70.3	SW-19	-	5/5
Beryllium	0.68	0.49	1.5	SW-09	-	2/5
Calcium	1584.50	1343.39	3900	SW-19	-	5/5
Chromium	6.80	5.30	12.4	SW-06	-	4/5
Cobalt	4.18	4.32	11.8	SW-19	-	5/5
Copper	6.90	6.36	16.4	SW-06	-	2/5
Iron	11558.00	6525.01	20300	SW-19	-	5/5
Lead	30.72	29.33	78.7	SW-19	-	4/5
Magnesium	818.70	531.14	1510	SW-06	-	5/5
Manganese	511.50	886.09	2000	SW-19	-	5/5
Nickel	1.92	0.72	3.2	SW-06	-	1/5
Potassium	671.00	480.51	1480	SW-19	-	2/5
Selenium	0.66	0.36	1.3	SW-19	-	1/5
Sodium	358.20	133.49	597	SW-19	-	1/5
Vanadium	15.38	10.33	26.1	SW-19	-	5/5
Zinc	58.44	36.02	101	SW-19	-	4/5

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment North Seep
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Delta-BHC	0.06	0.02	0.11	SW-06	-	1/6
Dieldrin	0.09	0.03	0.16	SW-06	-	1/6
4,4'-DDE	0.76	0.27	1.3	SW-06	-	1/6
Endrin	0.19	0.07	0.32	SW-06	-	1/6
4,4'-DDT	0.31	0.11	0.53	SW-06	-	1/6
Endrin Aldehyde	0.18	0.00	0.18	SW-06	-	1/1

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment South Seep
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Halogenated Organics						
1,1-Dichloroethane	3.40	1.47	6	SW-24	0-6	1/5
Chloroform	1.50	0.56	2.5	SW-23		1/5
1,1,1-Trichloroethane	13.20	21.17	51	SW-23		1/5
Trichloroethene	1.80	0.67	3	SW-23		1/5
Tetrachloroethene	4.20	2.25	8	SW-23		1/5
Water Solubles						
Acetone	6.80	4.38	14	SW-23		2/5

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment South Seep
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Phthalates						
Bis (2-Ethylhexyl) phthalate	37.20	13.86	62	SW-23		1/5

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment South Seep
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	11721.00	6950.68	18800	SW-24	18-24	5/5
Barium	29.81	18.87	59.4	SW-24	18-24	5/5
Beryllium	2.54	2.07	5.3	SW-24	0-6	3/5
Cadmium	0.48	0.19	0.76	SW-23		1/4
Calcium	627.00	214.83	886	SW-24	0-6	5/5
Chromium	6.40	6.24	11.9	SW-24	0-6	2/4
Cobalt	2.03	0.97	3.3	SW-24	18-24	3/4
Copper	4.53	4.05	10.6	SW-24	0-6	1/4
Iron	7463.00	2230.20	9770	SW-24	18-24	5/5
Lead	18.92	24.67	57.3	SW-24	0-6	3/5
Magnesium	873.40	592.34	1920	SW-24	18-24	5/5
Manganese	98.00	47.22	175.5	SW-23		5/5
Nickel	2.81	1.13	4.5	SW-24	18-24	1/4
Potassium	889.20	229.23	1100	SW-24	0-6	5/5
Selenium	1.58	2.15	4.8	SW-24	0-6	1/4
Sodium	210.50	93.57	295	SW-23		3/4
Vanadium	8.82	4.56	14.6	SW-24	0-6	4/5
Zinc	42.29	24.92	70.6	SW-24	18-24	4/5

Picillo Farm Baseline Risk Assessment
Sediment South Seep
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Gamma-BHC (Lindane)	0.55	1.04	2.4	SW-24	0-6	2/5
Aldrin	0.11	0.04	0.18	SW-24	0-6	1/5
Dieldrin	0.35	0.13	0.58	SW-24	0-6	1/5
4,4'-DDE	1.52	3.01	6.9	SW-24	0-6	2/5
Endrin	0.25	0.09	0.42	SW-24	18-24	1/5
4,4'-DDT	0.73	1.27	3	SW-24	0-6	2/5
Methoxychlor	15.20	6.94	27	SW-24	18-24	1/5
Alpha Chlordane	0.19	0.18	0.51	SW-24	0-6	2/5
Gamma Chlordane	0.08	0.08	0.22	SW-24	0-6	2/5

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment East Pond
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aromatics						
Toluene	6.17	5.45	17	SW-01	-	1/6
Water Solubles						
2-Butanone	8.17	5.38	18	SW-01	-	2/6

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment East Pond
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Phenols						
2-Methylphenol	78.00	29.07	130	SW-03	-	1/5

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment East Pond
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	6705.00	3779.72	12900	SW-04	-	6/6
Arsenic	1.34	0.77	2.5	SW-04	-	3/5
Barium	22.45	9.49	36.1	SW-03	-	6/6
Beryllium	0.94	0.70	2.1	SW-01	-	2/5
Calcium	1253.83	854.67	2370	SW-03	-	6/6
Chromium	10.98	10.40	22.4	SW-04	-	4/5
Cobalt	3.31	2.61	7.8	SW-04	-	4/5
Copper	3.48	2.41	8.4	SW-03	-	1/6
Iron	12933.33	11681.56	29500	SW-04	-	6/6
Lead	12.48	5.03	19.8	SW-01	-	6/6
Magnesium	605.00	298.27	968	SW-03	-	6/6
Manganese	96.78	80.47	249	SW-04	-	6/6
Potassium	213.50	284.28	669	SW-03	-	3/6
Selenium	0.68	0.40	1.4	SW-01	-	1/5
Sodium	107.20	45.90	166	SW-03	-	2/5
Vanadium	19.70	20.01	51.5	SW-04	-	6/6
Zinc	42.60	14.86	59	SW-03	-	6/6

Picillo Farm Baseline Risk Assessment
Sediment East Pond
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
4,4'-DDE	0.11	0.04	0.19	SW-03	-	1/6
Endrin	0.15	0.05	0.25	SW-03	-	1/6
Endosulfan II	0.06	0.02	0.1	SW-04	-	1/6
Alpha chlordane	0.12	0.14	0.41	SW-03	-	2/6

Picillo Farm Baseline Risk Assessment
Sediment SW-11
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aromatics						
Toluene	53.00	0.00	53	SW-11	-	1/1
Water Solubles						
2-Butanone	190.00	0.00	190	SW-11	-	1/1

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment SW-11
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/Kg)	Standard Deviation (ug/Kg)	Maximum Detected (ug/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Phthalates						
Di-n-butyl phthalate	1200.00	0.00	1200	SW-11	-	1/1

TABLE 1

TABLE 1

Picillo Farm Baseline Risk Assessment
Sediment SW-11
Inorganics Data Summary

Analyte	Arithmetic Average (mg/Kg)	Standard Deviation (mg/Kg)	Maximum Detected (mg/Kg)	Location of Maximum	Depth of Maximum	Number of Detects/ Samples
Aluminum	8440.00	0.00	8440	SW-11	-	1/1
Arsenic	3.70	0.00	3.7	SW-11	-	1/1
Barium	71.20	0.00	71.2	SW-11	-	1/1
Beryllium	4.80	0.00	4.8	SW-11	-	1/1
Calcium	3300.00	0.00	3300	SW-11	-	1/1
Copper	17.50	0.00	17.5	SW-11	-	1/1
Iron	1750.00	0.00	1750	SW-11	-	1/1
Lead	33.80	0.00	33.8	SW-11	-	1/1
Magnesium	592.00	0.00	592	SW-11	-	1/1
Manganese	38.90	0.00	38.9	SW-11	-	1/1
Nickel	8.50	0.00	8.5	SW-11	-	1/1
Sodium	343.00	0.00	343	SW-11	-	1/1
Vanadium	10.10	0.00	10.1	SW-11	-	1/1
Zinc	68.10	0.00	68.1	SW-11	-	1/1

Picillo Farm Baseline Risk Assessment
Surface Water Swamp
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Halogenated Organics										
Vinyl Chloride	5.00	10.20	46.5	SW-25	1/21	2	1	0	1	0.2
Chloroethane	10.82	27.52	130	SW-25	5/22					
Trichlorofluoromethane	2.42	2.96	6	SW-25	2/12					
1,1,2-Trichloro-1,2,2-Trifluoroethane	7.67	18.69	67	SW-25	2/12					
Dichloromethane	1.85	1.06	4.5	SW-25	1/22	5	0	0	1	0.47
1,1-Dichloroethene	3.14	5.11	25	SW-25	1/22	7	1	7	1	0.0057
1,1-Dichloroethane	41.10	157.93	745	SW-25	7/22					
trans-1,2-Dichloroethene	1.13	0.93	2	SW-25	1/12	100	0	100	0	
cis-1,2-Dichloroethene	76.33	240.75	840	SW-25	4/12	70	1	70	1	
1,2-Dichloroethene	10.70	22.48	74	SW-15	2/10	70	1	70	1	
Chloroform	2.25	2.59	13	SW-25	1/22					0.57
1,2-Dichloroethane	5.91	18.12	86.5	SW-25	4/22	5	2	0	4	0.038
1,1,1-Trichloroethane	20.07	75.36	355	SW-25	5/22	200	1	200	1	
1,2-Dichloropropane	1.66	1.04	0.3	SW-14	1/22	5	0	0	1	
Trichloroethene	2.48	4.91	24	SW-25	5/22	5	1	0	5	0.27
Tetrachloroethene	3.59	9.19	44.5	SW-25	3/22	5	1	0	3	0.08
Chlorobenzene	3.00	6.11	30	SW-25	2/22					680
1,4-Dichlorobenzene	0.34	0.22	0.1	SW-16	1/8	75	0	75	0	400
Aromatics										
Benzene	4.73	14.50	69.5	SW-25	3/22	5	1	0	3	0.12
Toluene	21.07	43.41	165	SW-15	9/22	1000	0	1000	0	6,800
Ethylbenzene	3.65	9.18	44.5	SW-25	2/22	700	0	700	0	3,100
Xylene	3.56	8.53	41.5	SW-25	3/22	10000	0	10000	0	
4-Isopropyltoluene	0.36	0.19	0.2	SW-07	1/8					
Water Solubles										
Tetrahydrofuran	28.38	33.93	78.5	SW-25	2/4					
2-Butanone	6.00	3.74	19	SW-10	1/14					

- Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
- Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water Swamp
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Isaind Ambient Water Quality Standards * (ug/L)
Polynuclear Aromatic Hydrocarbons										
Naphthalene	4.32	1.49	2	SW-25	1/22					
Acenaphthylene	4.27	1.40	3	SW-08	1/22					
Benzo(a)pyrene	4.68	0.84	6	SW-17	1/22	0.2	1	0	1	0.00028
Phenols										
Phenol	5.43	5.61	29	SW-08	3/21					21,000
2-Chlorophenol	4.60	0.96	4.5	SW-25	1/22					
2-Methylphenol	4.18	1.72	4.5	SW-25	2/22					
4-Methylphenol	9.07	14.53	68	SW-08	4/22					
2,4-Dimethylphenol	4.55	1.06	4	SW-25	1/22					
2,4-Dichlorophenol	5.25	1.17	10.5	SW-25	1/22					93
Phthalates										
Dimethyl phthalate	4.32	1.49	2	SW-25	1/22					313,000
Bis (2-Ethylhexyl) phthalate	4.20	1.91	7	SW-16	5/22					0.18
Aromatics										
1,2-Dichlorobenzene	5.59	5.81	31	SW-25	3/22	600	0	600	0	2,700
1,2,4-Trichlorobenzene	4.43	1.27	3	SW-25	1/22	70	0	70	0	
Other										
Isophorone	4.32	1.49	2	SW-25	1/22					0.84
Benzoic Acid	23.20	5.69	7	SW-15	1/10					

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* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

Picillo Farm Baseline Risk Assessment
Surface Water Swamp
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Aluminum	5999.50	11125.46	53700	SW-26	19/22					
Arsenic	1.60	0.89	4	SW-26	5/22	50	0			0.0018
Barium	79.23	120.56	502	SW-08	15/22	2000	0	2000	0	
Beryllium	0.94	1.15	5.8	SW-26	5/22	1	5	0	5	
Cadmium	2.04	0.43	3.9	SW-05	1/21	5	0	5	0	
Calcium	8589.09	7645.69	27600	SW-08	22/22					
Chromium	4.12	9.80	47.9	SW-26	3/22	100	0	100	0	
Cobalt	3.26	6.69	32.6	SW-26	3/22					
Copper	14.74	31.63	140	SW-26	8/22	1300	0	1300	0	
Iron	36473.14	77211.65	306500	SW-25	22/22					
Lead	62.09	100.01	372	SW-08	14/22	15	11	0	14	
Magnesium	1936.45	1584.29	5920	SW-26	22/22					
Manganese	2106.75	3126.95	10000	SW-26	22/22					
Mercury	0.12	0.08	0.44	SW-26	2/22	2	0	2	0	0.14
Nickel	5.96	7.22	31.8	SW-26	6/22	100	0	100	0	610
Potassium	2380.45	1477.29	6530	SW-26	18/22					
Sodium	5329.32	2626.47	15300	SW-25	22/22					
Vanadium	17.51	20.44	90	SW-26	7/22					
Zinc	135.50	153.72	569	SW-15	15/21					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.

* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water Swamp
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Isalnd Ambient Water Quality Standards (ug/L)
Methoxychlor	0.25	0.06	0.43	SW-13	1/13	40	0	40	0	
Aroclor 1248	0.21	0.06	0.24	SW-26	1/13	0.5	0	0	1	0.0000044
Aroclor 1260	0.35	0.19	0.2	SW-15	1/13	0.5	0	0	1	0.0000044

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water North Seep
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Halogenated Organics										
Chloroethane	7.22	9.85	27	SW-02	2/9					
Trichlorofluoromethane	0.06	0.03	0.1	SW-06	1/4					
1,1-Dichloroethene	4.39	9.28	29	SW-02	2/9	7	1	7	1	0.0057
1,1-Dichloroethane	94.83	264.54	800	SW-02	4/9					
trans-1,2-Dichloroethene	1.13	1.25	3	SW-19	1/4	100	0	100	0	
1,2-Dichloroethene	160.60	335.39	760	SW-02	3/5	70	1	70	1	
Chloroform	1.89	1.54	5	SW-19	1/9					0.57
1,2-Dichloroethane	11.67	31.27	95	SW-02	2/9	5	1	0	2	0.038
1,1,1-Trichloroethane	116.00	331.65	1000	SW-02	3/9	200	1	200	1	
Carbon Tetrachloride	1.28	1.16	0.4	SW-19	1/9	5	0	0	1	0.025
Trichloroethene	67.94	184.85	560	SW-02	4/9	5	3	0	4	0.27
Tetrachloroethene	18.56	49.33	150	SW-02	3/9	5	2	0	3	0.08
Chlorobenzene	2.44	3.00	10	SW-02	1/9					680
Aromatics										
Benzene	13.41	36.24	110	SW-02	2/9	5	1	0	2	0.12
Toluene	69.11	202.84	610	SW-02	1/9	1000	0	1000	0	6800
Ethylbenzene	9.44	23.85	73	SW-02	1/9	700	0	700	0	3100
Xylene	16.69	46.18	140	SW-02	1/9	10000	0	10000	0	
1,3,5-Trimethylbenzene	0.05	0.02	0.08	SW-06	1/4					
tert-Butylbenzene	0.11	0.20	0.4	SW-18	2/4					
1,2,4-Trimethylbenzene	0.13	0.05	0.2	SW-06	1/4					
4-Isopropyltoluene	0.23	0.19	0.2	SW-18	1/4					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

Picillo Farm Baseline Risk Assessment
Surface Water North Seep
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Phenols										
Phenol	4.50	1.41	1	SW-09	1/8					21,000
Phthalates										
Dimethyl phthalate	5.33	1.00	8	SW-02	1/9					313,000
Diethyl phthalate	5.11	1.27	8	SW-02	2/9					23,000
Bis (2-Ethylhexyl) phthalate	5.11	0.78	7	SW-18-DUP	2/9					0.18
Aromatics										
1,2-Dichlorobenzene	4.67	1.00	2	SW-02	1/9	600	0	600	0	2,700
1,2,4-Trichlorobenzene	5.11	0.33	6	SW-02	1/9	70	0	70	0	
Ethers										
Bis (2-Chloroethyl) Ether	5.22	0.67	7	SW-02	1/9					0.0031
Other										
Isophorone	5.78	2.33	12	SW-02	1/9					0.84
Benzoic Acid	21.20	8.50	6	SW-19	1/5					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water North Seep
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Aluminum	8867.56	12386.17	38000	SW-19	10/11					
Arsenic	1.84	1.02	3.6	SW-19	5/11	50	0			0.0018
Barium	73.58	71.19	207	SW-19	7/11	2000	0	2000	0	
Beryllium	2.93	1.30	6.4	SW-19	1/11	1	1	0	1	
Cadmium	2.22	0.67	4	SW-19	1/11	5	0	5	0	
Calcium	8502.22	5694.05	16700	SW-19	11/11					
Chromium	6.09	3.27	14.8	SW-19	1/11	100	0	100	0	
Cobalt	11.07	4.45	20	SW-19	2/11					
Copper	9.36	9.21	31.7	SW-19	6/11	1300	0	1300	0	
Iron	14632.61	14281.24	44600	SW-19	11/11					
Lead	43.21	52.00	136	SW-19	8/11	15	6	0	8	
Magnesium	1874.56	1216.58	4080	SW-19	11/11					
Manganese	2125.78	3940.78	12100	SW-19	10/11					
Mercury	0.12	0.07	0.3	SW-06	1/11	2	0	2	0	0.14
Nickel	5.52	2.12	9.6	SW-19	2/11	100	0	100	0	610
Potassium	1871.47	1139.09	3430	SW-18	10/11					
Selenium	1.33	0.40	2.4	SW-19	1/11	50	0	50	0	
Sodium	5107.22	2236.51	10300	SW-02	11/11					
Vanadium	16.88	20.64	66	SW-19	6/11					
Zinc	110.07	131.05	368	SW-19	8/11					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water North Seep
Pesticide/PCB Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Isalnd Ambient Water Quality Standards * (ug/L)
Heptachlor	0.04	0.05	0.16	SW-18	1/7	0.4	0	0	1	0.000021
Dieldrin	0.07	0.05	0.18	SW-18	1/7					0.000014

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water South Seep
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Isalnd Ambient Water Quality Standards (ug/L)
Halogenated Organics										
1,1,2-Trichloro-1,2,2-Trifluoroethan	3.00	1.41	4	SW-23	1/2					
1,1-Dichloroethene	4.25	3.28	7	SW-23	2/4	7	0	7	0	0.0057
1,1-Dichloroethane	1.50	0.91	2	SW-23	1/4					
Chloroform	19.38	21.38	44	SW-23	2/4					0.57
1,2-Dichloroethane	6.13	8.63	19	SW-23	1/4	5	1	0	1	0.038
1,1,1-Trichloroethane	216.23	248.06	460	SW-23	3/4	200	2	200	2	
1,2-Dichloropropane	9.38	11.11	25	SW-23	2/4	5	2	0	2	
Trichloroethene	9.63	9.47	19	SW-23	2/4	5	2	0	2	0.27
1,1,2-Trichloroethane	2.63	1.84	5	SW-23	1/4	5	0	3	1	0.006
Tetrachloroethene	7.75	7.26	14	SW-23	2/4	5	2	0	2	0.08

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water South Seep
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Islnd Ambient Water Quality Standards * (ug/L)
Phthalates										
Bis (2-Ethylhexyl) phthalate	4.50	1.00	3	SW-23	1/4					0.18

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water South Seep
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Aluminum	1057.50	1338.96	2940	SW-23	2/4					
Barium	16.88	6.75	27	SW-24	1/4	2000	0	2000	0	
Beryllium	0.90	0.42	1.4	SW-23	2/4	1	2	0	2	
Calcium	4065.00	1397.77	5370	SW-23	4/4					
Cobalt	5.00	2.00	8	SW-23	1/4					
Iron	197.50	210.26	496	SW-23	2/4					
Magnesium	1020.00	266.16	1260	SW-23	4/4					
Manganese	537.75	476.82	1065	SW-23	4/4					
Potassium	720.00	503.24	1430	SW-23	2/4					
Sodium	2852.50	450.66	3430	SW-23	4/4					
Zinc	9.25	3.70	14.8	SW-24	1/4					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

Picillo Farm Baseline Risk Assessment
Surface Water East Pond
Volatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding *MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Halogenated Organics										
Dichloromethane	2.70	3.62	9	SW-03	1/5	5	1	0	1	0.47

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water East Pond
Semivolatile Organics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Phenols										
Phenol	3.58	2.20	1	SW-04	1/6					21,000
Phthalates										
Bis (2-Ethylhexyl) phthalate	4.83	0.98	6	SW-01	1/6					0.18

* Rhode Island ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

Picillo Farm Baseline Risk Assessment
Surface Water East Pond
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Isalnd Ambient Water Quality Standards * (ug/L)
Aluminum	402.83	604.00	1610	SW-04	2/6					
Calcium	2186.67	380.30	2680	SW-01	6/6					
Copper	5.43	1.90	9.3	SW-03	1/6	1300	0	1300	0	
Iron	741.00	852.80	2380	SW-04	5/6					
Lead	1.81	0.73	2.6	SW-03	3/6	15	0	0	3	
Magnesium	506.83	149.31	735	SW-01	6/6					
Manganese	20.85	15.21	41	SW-01	4/6					
Mercury	0.12	0.06	0.24	SW-01	1/6	2	0	2	0	0.14
Potassium	652.67	215.73	878	SW-04	5/6					
Sodium	4863.33	3403.11	9930	SW-01	6/6					
Zinc	4.38	1.53	7.5	SW-04	1/6					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-5.

TABLE 1

Picillo Farm Baseline Risk Assessment
Surface Water SW-11
Inorganics Data Summary

Analyte	Arithmetic Average (ug/L)	Standard Deviation (ug/L)	Maximum Detected (ug/L)	Location of Maximum	Number of Detects/ Samples	MCL (ug/L)	Number of Samples Exceeding MCL	MCLG (ug/L)	Number of Samples Exceeding MCLG	Rhode Island Ambient Water Quality Standards * (ug/L)
Aluminum	646.50	190.21	781	SW-11	2/2					
Calcium	1380.00	183.85	1510	SW-11	2/2					
Iron	413.00	0.00	413	SW-11	2/2					
Lead	2.95	2.05	4.4	SW-11	1/2	15	0	0	1	
Magnesium	232.50	109.60	310	SW-11	1/2					
Manganese	14.05	2.76	16	SW-11	2/2					
Mercury	0.17	0.10	0.24	SW-11	1/2	2	0	2	0	0.14
Sodium	2615.00	487.90	2960	SW-11	2/2					

* Rhode Island Ambient Water Quality Standards are the Applicable or Relevant and Appropriate Requirement (ARAR) if stricter than the MCL, otherwise the MCL is the ARAR.
* Rhode Island Ambient Water Quality Standards are based on human health carcinogenic risks of 10E-6.

TABLE 2

Risk Summary
Picillo Farm Baseline Risk Assessment

	Ground Water		Soil		Sediment		Surface Water*		Total	
SOURCE ZONE	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum
NON-CARCINOGENIC										
Current	-	-	4E-03	2E-02	-	-	-	-	4E-03	2E-02
Future	4E+01	7E+02	4E-02	5E-01	-	-	-	-	4E+01	7E+02
CARCINOGENIC										
Current	-	-	3E-07	3E-06	-	-	-	-	3E-07	3E-06
Future	2E-03	2E-02	1E-06	2E-05	-	-	-	-	2E-03	2E-02
OUTLYING ZONE	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum
NON-CARCINOGENIC										
Current	-	-	5E-03	5E-03	2E-02	6E-02	8E-01	2E+00	8E-01	2E+00
Future	3E+00	2E+01	1E-01	5E-01	4E-02	1E-01	5E+00	3E+01	8E+00	5E+01
CARCINOGENIC										
Current	-	-	2E-07	2E-07	4E-06	5E-06	1E-02	1E-02	1E-02	1E-02
Future	4E-04	1E-03	2E-06	7E-06	6E-06	1E-05	2E-02	2E-02	2E-02	2E-02

" - " Indicates Not An Applicable Pathway

*The future risks include ingestion as drinking water and fish ingestion from the Swamp and East Pond, together with incidental ingestion while swimming in the Swamp and East Pond together with dermal contact with the Swamp, North Seep, South Seep, East Pond, and SW-11 area. The current risks include ingestion of fish from the Swamp and East Pond, and incidental ingestion while swimming in the Swamp and East Pond together with dermal contact with the Swamp, North Seep, South Seep, East Pond, and SW-11 area.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Drinking Water
Ground Water; Source Zone
Future Use; Residential

TABLE 3

Compounds	Health Effects	Uncertainty Factor	Exposure Factor (l/kg/day)	Average: Exposure Conc. (mg/l)	Average: Average Daily Dose (mg/kg/day)	Average: Reference Dose (mg/kg/day)	Average: Hazard Index	Maximum: Exposure Conc. (mg/l)	Maximum: Average Daily Dose (mg/kg/day)	Maximum: Reference Dose (mg/kg/day)	Maximum: Hazard Index
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver toxicity	100	9.1E-02	6.5E-01	6.0E-02	6.0E-02	1E+00	1.9E+01	1.7E+00	6.0E-02	3E+01
1,1-Dichloroethene	liver lesions	1,000	9.1E-02	1.9E-02	1.7E-03	9.0E-03	2E-01	1.9E-01	1.7E-02	9.0E-03	2E+00
1,1-Dichloroethane	none	1,000	9.1E-02	1.1E-01	9.8E-03	1.0E-01	1E-01	1.9E+00	1.7E-01	1.0E-01	2E+00
cis-1,2-Dichloroethene	hematological effects	3,000	9.1E-02	1.7E-01	1.6E-02	1.0E-02	2E+00	2.1E+00	1.9E-01	1.0E-02	2E+01
1,2-Dichloroethene	hematological effects	3,000	9.1E-02	2.2E-02	2.0E-03	1.0E-02	2E-01	1.6E-01	1.5E-02	1.0E-02	1E+00
Chloroform	fatty cyst formation in liver	1,000	9.1E-02	1.8E+00	1.7E-01	1.0E-02	2E+01	4.2E+01	3.8E+00	1.0E-02	4E+02
1,1,1-Trichloroethane	liver toxicity	1,000	9.1E-02	1.9E+00	1.7E-01	9.0E-02	2E+00	1.8E+01	1.6E+00	9.0E-02	2E+01
Carbon Tetrachloride	liver lesions	1,000	9.1E-02	1.2E-02	1.1E-03	7.0E-04	2E+00	5.0E-01	4.6E-02	7.0E-04	7E+01
1,1,2-Trichloroethane	serum clinical chemistry effects	1,000	9.1E-02	6.3E-03	5.8E-04	4.0E-03	1E-01	9.5E-02	8.7E-03	4.0E-03	2E+00
Tetrachloroethene	liver toxicity	1,000	9.1E-02	1.3E-01	1.2E-02	1.0E-02	1E+00	9.1E-01	8.3E-02	1.0E-02	8E+00
Chlorobenzene	liver and kidney toxicity	1,000	9.1E-02	1.1E-01	1.0E-02	2.0E-02	5E-01	1.3E+00	1.2E-01	2.0E-02	6E+00
						Sub-total	3E+01			Sub-total	6E+02
Aromatics											
Toluene	liver and kidney weight changes	1,000	9.1E-02	2.3E+00	2.1E-01	2.0E-01	1E+00	3.8E+01	3.5E+00	2.0E-01	2E+01
Ethylbenzene	liver and kidney toxicity	1,000	9.1E-02	2.7E-01	2.5E-02	1.0E-01	2E-01	2.8E+00	2.6E-01	1.0E-01	3E+00
						Sub-total	1E+00			Sub-total	2E+01
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	9.1E-02	6.6E-01	6.0E-02	1.0E-01	6E-01	2.7E+01	2.5E+00	1.0E-01	2E+01
2-Butanone	total toxicity	1,000	9.1E-02	2.2E-01	2.0E-02	5.0E-02	4E-01	8.5E+00	7.8E-01	5.0E-02	2E+01
						Sub-total	1E+00			Sub-total	4E+01
				Sub-total volatile organics			3E+01	Sub-total volatile organics			6E+02
Semi-Volatile Organics											
Polynuclear Aromatic Hydrocarbons											
Naphthalene	reduced body weight gain	10,000	9.1E-02	7.1E-03	6.5E-04	4.0E-03	2E-01	3.9E-02	3.6E-03	4.0E-03	9E-01
						Sub-total	2E-01			Sub-total	1E+00
Phenols											
2,4-Dichlorophenol	immunological effects	100	9.1E-02	3.9E-02	3.6E-03	3.0E-03	1E+00	3.4E-01	3.1E-02	3.0E-03	1E+01
						Sub-total	1E+00			Sub-total	1E+01
Aromatics											
1,2-Dichlorobenzene	liver and kidney	1,000	9.1E-02	8.5E-02	7.8E-03	9.0E-02	9E-02	9.2E-01	8.4E-02	9.0E-02	9E-01
Nitrobenzene	hematological, adrenal, liver, and kidney lesions	10,000	9.1E-02	5.8E-03	5.3E-04	5.0E-04	1E+00	7.8E-02	7.1E-03	5.0E-04	1E+01
						Sub-total	1E+00			Sub-total	2E+01
				Sub-total semi-volatile organics			3E+00	Sub-total semi-volatile organics			3E+01
Metals											
Antimony	reduced lifespan; altered blood chemistry	1,000	9.1E-02	8.3E-03	7.6E-04	4.0E-04	2E+00	1.8E-02	1.6E-03	4.0E-04	4E+00
Barium	increased blood pressure	3	9.1E-02	1.5E-01	1.4E-02	7.0E-02	2E-01	7.8E-01	7.1E-02	7.0E-02	1E+00
Cadmium	renal damage	10	9.1E-02	9.9E-03	9.0E-04	5.0E-04	2E+00	1.3E-01	1.2E-02	5.0E-04	2E+01
Chromium	none	500	9.1E-02	3.5E-02	3.2E-03	5.0E-03	6E-01	7.9E-01	7.2E-02	5.0E-03	1E+01
Copper	gastrointestinal	NA	9.1E-02	8.2E-02	7.5E-03	3.7E-02	2E-01	1.8E+00	1.7E-01	3.7E-02	4E+00
Manganese	central nervous system effects	1	9.1E-02	5.6E+00	5.1E-01	1.0E-01	5E+00	1.5E+01	1.3E+00	1.0E-01	1E+01
Mercury	renal effects	1,000	9.1E-02	1.2E-04	1.1E-05	3.0E-04	4E-02	3.0E-04	2.7E-05	3.0E-04	9E-02
Nickel	reduced body and organ weight	300	9.1E-02	2.6E-02	2.4E-03	2.0E-02	1E-01	3.8E-01	3.5E-02	2.0E-02	2E+00
Vanadium	none	100	9.1E-02	1.5E-02	1.3E-03	7.0E-03	2E-01	7.1E-02	6.5E-03	7.0E-03	9E-01
Zinc	anemia	10	9.1E-02	2.9E-01	2.6E-02	2.0E-01	1E-01	3.5E+00	3.2E-01	2.0E-01	2E+00
				Sub-total metals			1E+01	Sub-total metals			7E+01
PCBs and Pesticides											
Heptachlor Epoxide	liver weight increases	1,000	9.1E-02	2.3E-05	2.1E-06	1.3E-05	2E-01	1.4E-04	1.3E-05	1.3E-05	1E+00
				Sub-total pcbs and pesticides			6E-01	Sub-total pcbs and pesticides			2E+00
				Estimated hazard index			4E+01	Estimated hazard index			7E+02
				Estimated liver* hazard index			3E+01	Estimated liver hazard index			6E+02
				Estimated kidney* hazard index			4E+00	Estimated kidney hazard index			7E+01
				Estimated CNS* hazard index			6E+00	Estimated CNS hazard index			1E+01
				Estimated other** hazard index			1E+01	Estimated other hazard index			1E+02

ND = Value or information not determined by sources referenced; refer to dose-response summary tableau for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

* - Hazard indicies for analytes identified as affecting the liver and kidney were included in both the liver and kidney risk estimations

** - "CNS" refers to central nervous system effects

*** - "Other" refers to the analytes not identified as affecting the liver, kidney, or central nervous system.

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Drinking Water
Ground Water; Source Zone
Future Use; Residential

Compounds	Cancer Type	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Vinyl Chloride	lung	A	1.5E-02	1.8E-03	2.6E-05	1.9E+00	5E-05	6.0E-03	8.9E-05	1.9E+00	2E-04
Dichloromethane	liver	B2	1.5E-02	6.5E-01	9.7E-03	7.5E-03	7E-05	1.9E+01	2.8E-01	7.5E-03	2E-03
1,1-Dichloroethene	adrenal	C	1.5E-02	1.9E-02	2.8E-04	6.0E-01	2E-04	1.9E-01	2.8E-03	6.0E-01	2E-03
Chloroform	kidney	B2	1.5E-02	1.8E+00	2.7E-02	6.1E-03	2E-04	4.2E+01	6.2E-01	6.1E-03	4E-03
1,2-Dichloroethane	circulatory system	B2	1.5E-02	2.3E-01	3.4E-03	9.1E-02	3E-04	2.7E+00	4.0E-02	9.1E-02	4E-03
Carbon Tetrachloride	liver	B2	1.5E-02	1.2E-02	1.8E-04	1.3E-01	2E-05	5.0E-01	7.4E-03	1.3E-01	1E-03
1,2-Dichloropropane	liver	B2	1.5E-02	8.4E-02	1.2E-03	6.8E-02	8E-05	1.4E+00	2.1E-02	6.8E-02	1E-03
Trichloroethene	liver	B2	1.5E-02	5.1E-01	7.6E-03	1.1E-02	8E-05	9.3E+00	1.4E-01	1.1E-02	2E-03
1,1,2-Trichloroethane	liver	C	1.5E-02	6.3E-03	9.4E-05	5.7E-02	5E-06	9.5E-02	1.4E-03	5.7E-02	8E-05
Tetrachloroethene	liver	B2	1.5E-02	1.3E-01	1.9E-03	5.1E-02	1E-04	9.1E-01	1.4E-02	5.1E-02	7E-04
1,1,1,2-Tetrachloroethane	liver	C	1.5E-02	8.5E-06	1.3E-06	2.6E-02	3E-08	1.0E-04	1.5E-06	2.6E-02	4E-08
						Sub-total	1E-03			Sub-total	2E-02
Aromatics											
Benzene	leukemia	A	1.5E-02	1.3E-01	2.0E-03	2.9E-02	6E-05	2.0E+00	3.0E-02	2.9E-02	9E-04
Styrene	lung and bronchi	B2	1.5E-02	4.5E-03	6.6E-05	3.0E-02	2E-06	9.5E-02	1.4E-03	3.0E-02	4E-05
						Sub-total	6E-05			Sub-total	9E-04
				Sub-total volatile organics			1E-03	Sub-total volatile organics			2E-02
Semi-Volatile Organics											
Phenols											
2,4,6-Trichlorophenol	liver	B2	1.5E-02	3.6E-03	5.6E-05	1.1E-02	6E-07	1.0E-02	1.5E-04	1.1E-02	2E-06
						Sub-total	6E-07			Sub-total	2E-06
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.5E-02	5.7E-03	8.5E-05	1.4E-02	1E-06	7.2E-02	1.1E-03	1.4E-02	1E-05
						Sub-total	1E-06			Sub-total	1E-05
Ethers											
Bis (2-Chloroethyl) Ether	liver	B2	1.5E-02	1.0E-02	1.5E-04	1.1E+00	2E-04	1.6E-01	2.4E-03	1.1E+00	3E-03
						Sub-total	2E-04			Sub-total	3E-03
Other											
Isophorone	kidney	C	1.5E-02	2.6E-02	3.8E-04	4.1E-03	2E-06	1.9E-01	2.8E-03	4.1E-03	1E-05
						Sub-total	2E-06			Sub-total	1E-05
				Sub-total semi-volatile organics			2E-04	Sub-total semi-volatile organics			3E-03
Metals											
Arsenic	skin	A	1.5E-02	1.2E-03	1.8E-05	1.8E+00	3E-05	2.3E-03	3.4E-05	1.8E+00	6E-05
Beryllium	total tumors	B2	1.5E-02	4.8E-03	7.1E-05	4.3E+00	3E-04	3.2E-02	4.8E-04	4.3E+00	2E-03
				Sub-total metals			*3E-04*	*Sub-total metals*			2E-03
PCBs and Pesticides											
Beta-BHC		C	1.5E-02	1.9E-05	2.9E-07	1.8E+00	5E-07	3.2E-05	4.8E-07	1.8E+00	9E-07
Heptachlor	liver	B2	1.5E-02	2.6E-05	3.9E-07	4.5E+00	2E-06	1.7E-04	2.5E-06	4.5E+00	1E-05
Aldrin	liver	B2	1.5E-02	2.9E-05	4.3E-07	1.2E+01	5E-06	2.5E-04	3.7E-06	1.2E+01	4E-05
Heptachlor Epoxide	liver	B2	1.5E-02	2.3E-05	3.4E-07	9.1E+00	3E-06	1.4E-04	2.1E-06	9.1E+00	2E-05
Dieldrin	liver	B2	1.5E-02	3.7E-05	5.5E-07	1.6E+01	9E-06	6.1E-05	9.1E-07	1.6E+01	1E-05
4,4'-DDT	liver	B2	1.5E-02	5.1E-05	7.7E-07	3.4E-01	3E-07	9.1E-05	1.4E-06	3.4E-01	5E-07
Gamma Chlordane	liver	B2	1.5E-02	8.6E-05	1.3E-06	1.3E+00	2E-06	3.8E-05	5.7E-07	1.3E+00	7E-07
Aroclor 1248	liver	B2	1.5E-02	3.8E-04	5.7E-06	7.7E+00	4E-05	3.2E-03	4.8E-05	7.7E+00	4E-04
				Sub-total pcbs and pesticides			7E-05	Sub-total pcbs and pesticides			5E-04
				Estimated incremental cancer risk			2E-03	Estimated incremental cancer risk			2E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Drinking Water
Ground Water; Distant Zone
Future Use; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	9.1E-02	1.3E-03	1.2E-04	9.0E-03	1E-02	7.0E-03	6.4E-04	9.0E-03	7E-02
1,1-Dichloroethane	none	1,000	9.1E-02	8.1E-03	7.4E-04	1.0E-01	7E-03	1.1E-01	1.0E-02	1.0E-01	1E-01
cis-1,2-Dichloroethene	hematological effects	3,000	9.1E-02	4.9E-03	4.5E-04	1.0E-02	5E-02	8.0E-02	7.3E-03	1.0E-02	7E-01
1,2-Dichloroethene	hematological effects	3,000	9.1E-02	4.5E-03	4.1E-04	1.0E-02	4E-02	8.7E-02	8.1E-03	1.0E-02	8E-01
Chloroform	fatty cyst formation in liver	1,000	9.1E-02	5.1E-03	4.7E-04	1.0E-02	5E-02	6.2E-02	5.7E-03	1.0E-02	6E-01
1,1,1-Trichloroethane	liver toxicity	1,000	9.1E-02	3.8E-02	3.5E-03	9.0E-02	4E-02	3.5E-01	3.2E-02	9.0E-02	4E-01
Tetrachloroethene	liver toxicity	1,000	9.1E-02	1.1E-02	1.0E-03	1.0E-02	1E-01	8.1E-02	7.4E-03	1.0E-02	7E-01
						Sub-total	**3E-01**			**Sub-total**	**3E+00**
				Sub-total volatile organics			**3E-01**	**Sub-total volatile organics**			**3E+00**
Semi-Volatile Organics											
Phenols											
2,4-Dichlorophenol	immunological effects	100	9.1E-02	4.1E-03	3.8E-04	3.0E-03	1E-01	3.0E-03	2.7E-04	3.0E-03	9E-02
						Sub-total	**1E-01**			**Sub-total**	**9E-02**
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight		9.1E-02	7.3E-03	6.6E-04	2.0E-02	3E-02	1.4E-01	1.3E-02	2.0E-02	6E-01
						Sub-total	**4E-02**			**Sub-total**	**6E-01**
				Sub-total semi-volatile organics			**3E-01**	**Sub-total semi-volatile organics**			**8E-01**
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	9.1E-02	1.1E-03	1.0E-04	3.0E-04	3E-01	2.5E-03	2.3E-04	3.0E-04	8E-01
Barium	increased blood pressure	3	9.1E-02	1.1E-01	9.7E-03	7.0E-02	1E-01	7.4E-01	6.7E-02	7.0E-02	1E+00
Beryllium	none	100	9.1E-02	2.8E-03	2.6E-04	5.0E-03	5E-02	1.6E-02	1.5E-03	5.0E-03	3E-01
Cadmium	renal damage	10	9.1E-02	2.1E-03	1.9E-04	5.0E-04	4E-01	4.0E-03	3.7E-04	5.0E-04	7E-01
Chromium	none	500	9.1E-02	9.8E-03	8.9E-04	5.0E-03	2E-01	1.0E-01	9.3E-03	5.0E-03	2E+00
Copper	gastrointestinal	NA	9.1E-02	1.6E-02	1.4E-03	3.7E-02	4E-02	8.7E-02	7.9E-03	3.7E-02	2E-01
Manganese	central nervous system effects	1	9.1E-02	1.2E+00	1.1E-01	1.0E-01	1E+00	9.7E+00	8.8E-01	1.0E-01	9E+00
Mercury	renal effects	1,000	9.1E-02	1.3E-04	1.2E-05	3.0E-04	4E-02	6.2E-04	5.7E-05	3.0E-04	2E-01
Nickel	reduced body and organ weight	300	9.1E-02	5.9E-03	5.4E-04	2.0E-02	3E-02	6.1E-02	5.6E-03	2.0E-02	3E-01
Vanadium	none	100	9.1E-02	1.5E-02	1.4E-03	7.0E-03	2E-01	1.7E-01	1.6E-02	7.0E-03	2E+00
Zinc	anemia	10	9.1E-02	1.5E-01	1.3E-02	2.0E-01	7E-02	1.0E+00	9.5E-02	2.0E-01	5E-01
				Sub-total metals			**3E+00**	**Sub-total metals**			**2E+01**
				Estimated hazard index			**3E+00**	**Estimated hazard index**			**2E+01**
				Estimated liver* hazard index			**3E-01**	**Estimated liver hazard index**			**2E+00**
				Estimated kidney* hazard index			**1E-02**	**Estimated kidney hazard index**			**4E-02**
				Estimated CNS* hazard index			**1E+00**	**Estimated CNS hazard index**			**9E+00**
				Estimated other hazard index**			**2E+00**	**Estimated other hazard index**			**1E+01**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

* - Hazard indices for analytes identified as affecting the liver and kidney were included in both the liver and kidney risk estimations

* *- "CNS" refers to central nervous system effects

*** - "Other" refers to the analytes not identified as affecting the liver, kidney, or central nervous system.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Drinking Water
Ground Water; Distant Zone
Future Use; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	9.1E-02	1.3E-03	1.2E-04	9.0E-03	1E-02	7.0E-03	6.4E-04	9.0E-03	7E-02
1,1-Dichloroethane	none	1,000	9.1E-02	8.1E-03	7.4E-04	1.0E-01	7E-03	1.1E-01	1.0E-02	1.0E-01	1E-01
cis-1,2-Dichloroethene	hematological effects	3,000	9.1E-02	4.9E-03	4.5E-04	1.0E-02	5E-02	8.0E-02	7.3E-03	1.0E-02	7E-01
1,2-Dichloroethene	hematological effects	3,000	9.1E-02	4.5E-03	4.1E-04	1.0E-02	4E-02	6.7E-02	6.1E-03	1.0E-02	6E-01
Chloroform	fatty cyst formation in liver	1,000	9.1E-02	5.1E-03	4.7E-04	1.0E-02	5E-02	6.2E-02	5.7E-03	1.0E-02	6E-01
1,1,1-Trichloroethane	liver toxicity	1,000	9.1E-02	3.8E-02	3.5E-03	9.0E-02	4E-02	3.5E-01	3.2E-02	9.0E-02	4E-01
Tetrachloroethene	liver toxicity	1,000	9.1E-02	1.1E-02	1.0E-03	1.0E-02	1E-01	8.1E-02	7.4E-03	1.0E-02	7E-01
						Sub-total	3E-01			**Sub-total**	3E+00
				Sub-total volatile organics			3E-01	**Sub-total volatile organics**			3E+00
Semi-Volatile Organics											
Phenols											
2,4-Dichlorophenol	immunological effects	100	9.1E-02	4.1E-03	3.8E-04	3.0E-03	1E-01	3.0E-03	2.7E-04	3.0E-03	9E-02
						Sub-total	1E-01			**Sub-total**	9E-02
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight		9.1E-02	7.3E-03	6.6E-04	2.0E-02	3E-02	1.4E-01	1.3E-02	2.0E-02	6E-01
						Sub-total	4E-02			**Sub-total**	6E-01
				Sub-total semi-volatile organics			3E-01	**Sub-total semi-volatile organics**			8E-01
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	9.1E-02	1.1E-03	1.0E-04	3.0E-04	3E-01	2.5E-03	2.3E-04	3.0E-04	8E-01
Barium	increased blood pressure	3	9.1E-02	1.1E-01	9.7E-03	7.0E-02	1E-01	7.4E-01	6.7E-02	7.0E-02	1E+00
Beryllium	none	100	9.1E-02	2.8E-03	2.6E-04	5.0E-03	5E-02	1.6E-02	1.5E-03	5.0E-03	3E-01
Cadmium	renal damage	10	9.1E-02	2.1E-03	1.9E-04	5.0E-04	4E-01	4.0E-03	3.7E-04	5.0E-04	7E-01
Chromium	none	500	9.1E-02	9.8E-03	8.9E-04	5.0E-03	2E-01	1.0E-01	9.3E-03	5.0E-03	2E+00
Copper	gastrointestinal	NA	9.1E-02	1.6E-02	1.4E-03	3.7E-02	4E-02	8.7E-02	7.9E-03	3.7E-02	2E-01
Manganese	central nervous system effects	1	9.1E-02	1.2E+00	1.1E-01	1.0E-01	1E+00	9.7E+00	8.8E-01	1.0E-01	9E+00
Mercury	renal effects	1,000	9.1E-02	1.3E-04	1.2E-05	3.0E-04	4E-02	6.2E-04	5.7E-05	3.0E-04	2E-01
Nickel	reduced body and organ weight	300	9.1E-02	5.9E-03	5.4E-04	2.0E-02	3E-02	6.1E-02	5.6E-03	2.0E-02	3E-01
Vanadium	none	100	9.1E-02	1.5E-02	1.4E-03	7.0E-03	2E-01	1.7E-01	1.6E-02	7.0E-03	2E+00
Zinc	anemia	10	9.1E-02	1.5E-01	1.3E-02	2.0E-01	7E-02	1.0E+00	9.5E-02	2.0E-01	5E-01
				Sub-total metals			3E+00	**Sub-total metals**			2E+01
				Estimated hazard index			3E+00	**Estimated hazard index**			2E+01
				Estimated liver* hazard index			3E-01	**Estimated liver hazard index**			2E+00
				Estimated kidney* hazard index			1E-02	**Estimated kidney hazard index**			4E-02
				Estimated CNS* hazard index			1E+00	**Estimated CNS hazard index**			9E+00
				Estimated other hazard index**			2E+00	**Estimated other hazard index**			1E+01

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.
NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)
* - Hazard indices for analytes identified as affecting the liver and kidney were included in both the liver and kidney risk estimations
** - "CNS" refers to central nervous system effects
*** - "Other" refers to the analytes not identified as affecting the liver, kidney, or central nervous system.

3 OF 58

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Drinking Water
Ground Water; Distant Zone
Future Use; Residential

Compounds	Cancer Type	Weight of Evidence	Exposure Factor	Average				Maximum			
			l/kg/day	Exposure Conc. mg/l	Average Daily Dose mg/kg/day	Cancer Potency Factor mg/kg/day-1	Incremental Cancer Risk	Exposure Conc. mg/l	Average Daily Dose mg/kg/day	Cancer Potency Factor mg/kg/day-1	Incremental Cancer Risk
Volatile Organic Compounds											
Halogenated Organics											
Chloromethane	kidney	C	1.5E-02	2.0E-03	3.0E-05	1.3E-02	4E-07	4.0E-04	5.9E-06	1.3E-02	8E-08
Vinyl Chloride	lung	A	1.5E-02	1.9E-03	2.9E-05	1.9E+00	5E-05	2.0E-03	3.0E-05	1.9E+00	6E-05
Dichloromethane	liver	B2	1.5E-02	2.0E-03	3.0E-05	7.5E-03	2E-07	7.0E-03	1.0E-04	7.5E-03	8E-07
1,1-Dichloroethene	adrenal	C	1.5E-02	1.3E-03	1.9E-05	6.0E-01	1E-05	7.0E-03	1.0E-04	6 0E-01	6E-05
Chloroform	kidney	B2	1.5E-02	5.1E-03	7.6E-05	6.1E-03	5E-07	6.2E-02	9.2E-04	6.1E-03	6E-06
1,2-Dichloroethane	circulatory system	B2	1.5E-02	8.9E-03	1.3E-04	9.1E-02	1E-05	7.9E-02	1.2E-03	9.1E-02	1E 04
1,2-Dichloropropane	liver	B2	1.5E-02	1.0E-03	1.5E-05	6 8E-02	1E-06	4.0E-04	5.9E-06	6 8E-02	4E-07
Trichloroethene	liver	B2	1.5E-02	1.1E-02	1.6E-04	1.1E-02	2E-06	8.3E-02	1.2E-03	1.1E-02	1E-05
1,1,2-Trichloroethane	liver	C	1.5E-02	1.2E-03	1.8E-05	5.7E-02	1E-06	1.0E-03	1.5E-05	5.7E-02	8E-07
Tetrachloroethene	liver	B2	1.5E-02	1.1E-02	1.7E-04	5.1E-02	9E-06	8.1E-02	1.2E-03	5.1E-02	6E-05
						Sub-total	9E-05			Sub-total	3E-04
Aromatics											
Benzene	leukemia	A	1.5E-02	1.6E-03	2.4E-05	2.9E-02	7E-07	9.6E-03	1.4E-04	2.9E-02	4E-06
						Sub-total	7E-07			Sub-total	4E-06
				Sub-total volatile organics			9E-05				3E-04
Semi-Volatile Organics											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.5E-02	7.3E-03	1.1E-04	1.4E-02	2E-06	1.4E-01	2.1E-03	1.4E-02	3E-05
						Sub-total	2E-06			Sub-total	3E-05
Ethers											
Bis (2-Chloroethyl) Ether	liver	B2	1.5E-02	3.8E-03	5.6E-05	1.1E+00	6E-05	1.0E-03	1.5E-05	1.1E+00	2E-05
						Sub-total	6E-05			Sub-total	2E-05
				Sub-total semi-volatile organics			6E-05	Sub-total semi-volatile organics			5E-05
Metals											
Arsenic	skin	A	1.5E-02	1.1E-03	1.7E-05	1.8E+00	3E-05	2.5E-03	3.7E-05	1.8E+00	7E-05
Beryllium	total tumors	B2	1.5E-02	2.8E-03	4.2E-05	4.3E+00	2E-04	1.6E-02	2.4E-04	4.3E+00	1E-03
				Sub-total metals			2E-04	Sub-total metals			1E-03
				Estimated incremental cancer risk			4E-04	Estimated incremental cancer risk			1E-03

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Source Soil: Surficial
Current Use; Trespasser

				Average				Maximum			
Compounds	Health Effects	Uncertainty Factor	Exposure Factor kg/kg/day	Exposure Conc. mg/kg	Average Daily Dose mg/kg/day	Reference Dose mg/kg/day	Hazard Index	Exposure Conc. mg/kg	Average Daily Dose mg/kg/day	Reference Dose mg/kg/day	Hazard Index
Semi-Volatile Organics											
Phthalates											
Butylbenzyl phthalate	increased liver weight	1,000	1.4E-06	8.3E-02	1.1E-07	2.0E-01	6E-07	8.2E-01	1.1E-06	2.0E-01	6E-06
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.4E-06	7.4E-01	1.0E-06	2.0E-02	5E-05	9.7E+00	1.3E-05	2.0E-02	7E-04
Di-n-octyl phthalate	increased liver and kidney weight; hematological	1,000	1.4E-06	2.2E-01	3.1E-07	2.0E-02	2E-05	1.3E+00	1.8E-06	2.0E-02	9E-05
						Sub-total	7E-05			**Sub-total**	8E-04
				Sub-total semi-volatile organics			7E-05	**Sub-total semi-volatile organics**			8E-04
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	9.1E-01	3.6E-07	3.0E-04	1E-03	3.0E+00	1.2E-06	3.0E-04	4E-03
Barium	increased blood pressure	3	3.9E-07	1.9E+01	7.3E-06	7.0E-02	1E-04	7.4E+01	2.9E-05	7.0E-02	4E-04
Beryllium	none	100	3.9E-07	2.1E-01	8.1E-08	5.0E-03	2E-05	5.8E-01	2.3E-07	5.0E-03	5E-05
Cadmium	renal damage	10	3.9E-07	4.6E-01	1.8E-07	5.0E-04	4E-04	4.4E+00	1.7E-06	5.0E-04	3E-03
Chromium	none	500	3.9E-07	6.6E+00	2.6E-06	5.0E-03	5E-04	3.7E+01	1.4E-05	5.0E-03	3E-03
Copper	gastrointestinal	NA	3.9E-07	3.2E+01	1.2E-05	3.7E-02	3E-04	2.9E+02	1.1E-04	3.7E-02	3E-03
Manganese	central nervous system effects	1	3.9E-07	9.5E+01	3.7E-05	1.0E-01	4E-04	1.7E+02	6.6E-05	1.0E-01	7E-04
Mercury	renal effects	1,000	3.9E-07	7.6E-02	3.0E-08	3.0E-04	1E-04	4.1E-01	1.6E-07	3.0E-04	5E-04
Nickel	reduced body and organ weight	300	3.9E-07	5.3E+00	2.1E-06	2.0E-02	1E-04	4.8E+01	1.9E-05	2.0E-02	9E-04
Vanadium	none	100	3.9E-07	5.8E+00	2.3E-06	7.0E-03	3E-04	1.1E+01	4.3E-06	7.0E-03	6E-04
Zinc	anemia	10	3.9E-07	2.8E+01	1.1E-05	2.0E-01	6E-05	8.3E+01	3.2E-05	2.0E-01	2E-04
				Sub-total Metals			3E-03	**Sub-total Metals**			2E-02
PCBs and Pesticides											
Heptachlor Epoxide	liver weight increases	1,000	2.2E-07	1.2E-03	2.6E-10	1.3E-05	2E-05	2.8E-03	5.9E-10	1.3E-05	5E-05
Gamma Chlordane	liver necrosis	1,000	2.2E-07	1.4E-02	3.1E-09	6.0E-05	5E-05	4.7E-02	1.0E-08	6.0E-05	2E-04
				Sub-total PCBs and pesticides			7E-05	**Sub-total PCBs and pesticides**			2E-04
				Estimated hazard index			4E-03	**Estimated hazard index**			2E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Source Soil: Sub-Surface
Future Use; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
Tetrachloroethene	liver toxicity	1,000	1.4E-05	2.9E+00	4.2E-05	1.0E-02	4E-03	1.1E+02	1.6E-03	1.0E-02	2E-01
Chlorobenzene	liver and kidney toxicity	1,000	1.4E-05	1.3E-01	1.8E-06	2.0E-02	9E-05	4.8E+00	6.9E-05	2.0E-02	3E-03
						Sub-total	4E-03			Sub-total	2E-01
Aromatics											
Toluene	liver and kidney weight changes	1,000	1.4E-05	1.8E+00	2.5E-05	2.0E-01	1E-04	6.4E+01	9.2E-04	2.0E-01	5E-03
Ethylbenzene	liver and kidney toxicity	1,000	1.4E-05	1.9E+00	2.8E-05	1.0E-01	3E-04	7.0E+01	1.0E-03	1.0E-01	1E-02
Styrene	blood and liver effects	1,000	1.4E-05	2.0E+00	2.8E-05	2.0E-01	1E-04	7.4E+01	1.1E-03	2.0E-01	5E-03
						Sub-total	6E-04			Sub-total	2E-02
				Sub-total volatile organics			5E-03	Sub-total volatile organics			2E-01
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Naphthalene	reduced body weight gain	10,000	6.9E-06	5.6E-02	3.9E-07	4.0E-03	1E-04	1.2E+00	8.3E-06	4.0E-03	2E-03
						Sub-total	1E-04			Sub-total	2E-03
Phthalates											
Butylbenzyl phthalate	increased liver weight	1,000	1.4E-05	1.2E+00	1.7E-05	2.0E-01	8E-05	3.8E+01	5.5E-04	2.0E-01	3E-03
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.4E-05	6.0E+00	8.6E-05	2.0E-02	4E-03	1.3E+02	1.9E-03	2.0E-02	9E-02
Di-n-octyl phthalate	increased liver and kidney weight; hematological	1,000	1.4E-05	1.9E+00	2.7E-05	2.0E-02	1E-03	7.0E+01	1.0E-03	2.0E-02	5E-02
						Sub-total	6E-03			Sub-total	1E-01
				Sub-total semi-volatile organics			6E-03	Sub-total semi-volatile organics			2E-01
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	6.1E-06	2.3E-01	1.4E-06	3.0E-04	5E-03	5.5E-01	3.3E-06	3.0E-04	1E-02
Barium	increased blood pressure	3	6.1E-06	1.7E+01	1.0E-04	7.0E-02	1E-03	3.4E+01	2.0E-04	7.0E-02	3E-03
Cadmium	renal damage	10	6.1E-06	6.0E-01	3.6E-06	5.0E-04	7E-03	2.0E+00	1.2E-05	5.0E-04	2E-02
Chromium	none	500	6.1E-06	3.5E+00	2.1E-05	5.0E-03	4E-03	3.2E+01	1.9E-04	5.0E-03	4E-02
Copper	gastrointestinal	NA	6.1E-06	2.2E+01	1.3E-04	3.7E-02	4E-03	7.7E+01	4.6E-04	3.7E-02	1E-02
Manganese	central nervous system effects	1	6.1E-06	1.3E+02	7.8E-04	1.0E-01	8E-03	2.4E+02	1.4E-03	1.0E-01	1E-02
Nickel	reduced body and organ weight	300	6.1E-06	2.2E+00	1.4E-05	2.0E-02	7E-04	6.5E+00	3.9E-05	2.0E-02	2E-03
Vanadium	none	100	6.1E-06	1.6E+00	9.6E-06	7.0E-03	1E-03	8.6E+00	5.2E-05	7.0E-03	7E-03
Zinc	anemia	10	6.1E-06	3.3E+01	2.0E-04	2.0E-01	1E-03	6.8E+01	4.1E-04	2.0E-01	2E-03
					Sub-total metals		3E-02		Sub-total metals		1E-01
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver and kidney toxicity	1,000	1.4E-05	1.0E-02	1.5E-07	3.0E-04	5E-04	3.3E-01	4.7E-06	3.0E-04	2E-02
Endrin	convulsions and liver lesions	100	2.7E-06	8.0E-03	2.1E-08	3.0E-04	7E-05	2.1E-01	5.6E-07	3.0E-04	2E-03
				Sub-total PCBs and Pesticides			6E-04	Sub-total PCBs and Pesticides			2E-02
				Estimated hazard index			4E-02	Estimated hazard index			5E-01

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Source Soil: Sub-Surface
Future Use; Residential

TABLE 3

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	adrenal	C	1.8E-06	1.6E-03	2.9E-09	6.0E-01	2E-09	3.0E-03	5.3E-09	6.0E-01	3E-09
Chloroform	kidney	B2	1.8E-06	1.3E-03	2.2E-09	6.1E-03	1E-11	2.0E-02	3.5E-08	6.1E-03	2E-10
1,2-Dichloroethane	circulatory system	B2	1.8E-06	5.2E-03	9.1E-09	9.1E-02	8E-10	1.4E-02	2.5E-08	9.1E-02	2E-09
Trichloroethene	liver	B2	1.8E-06	1.7E-03	2.9E-09	1.1E-02	3E-11	4.0E-02	7.0E-08	1.1E-02	8E-10
Tetrachloroethene	liver	B2	1.8E-06	2.9E+00	5.1E-06	5.1E-02	3E-07	1.1E+02	1.9E-04	5.1E-02	1E-05
						Sub-total	3E-07			Sub-total	1E-05
Aromatics											
Benzene	leukemia	A	1.8E-06	2.3E-03	4.1E-09	2.9E-02	1E-10	9.0E-03	1.6E-08	2.9E-02	5E-10
Styrene	lung and bronchi	B2	1.8E-06	2.0E+00	3.4E-06	3.0E-02	1E-07	7.4E+01	1.3E-04	3.0E-02	4E-06
						Sub-total	1E-07			Sub-total	4E-06
				Sub-total volatile organics			4E-07	Sub-total volatile organics			1E-05
Semi-volatile organics											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.8E-06	6.0E+00	1.1E-05	1.4E-02	1E-07	1.3E+02	2.3E-04	1.4E-02	3E-06
						Sub-total	1E-07			Sub-total	3E-06
Other											
Isophorone	kidney	C	1.8E-06	6.3E-02	1.1E-07	4.1E-03	5E-10	1.7E+00	3.0E-06	4.1E-03	1E-08
						Sub-total	5E-10			Sub-total	1E-08
				Sub-total semi-volatile organics			1E-07	Sub-total semi-volatile organics			3E-06
Metals											
Arsenic	skin	A	6.7E-07	2.3E-01	1.5E-07	1.8E+00	3E-07	5.5E-01	3.7E-07	1.8E+00	6E-07
Beryllium	total tumors	B2	6.7E-07	2.1E-01	1.4E-07	4.3E+00	6E-07	8.8E-01	5.9E-07	4.3E+00	3E-06
					Sub-total metals		9E-07		Sub-total metals		3E-06
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver	B2-C	1.8E-06	1.0E-02	1.8E-08	1.3E+00	2E-08	3.3E-01	5.8E-07	1.3E+00	8E-07
Gamma Chlordane	liver	B2	3.1E-07	1.2E-03	3.7E-10	1.3E+00	5E-10	5.7E-03	1.8E-09	1.3E+00	2E-09
				Sub-total PCBs and Pesticides			2E-08	Sub-total PCBs and Pesticides			8E-07
				Estimated incremental cancer risk			1E-06	Estimated incremental cancer risk			2E-05

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Soil: Outlying, Surface
Current Use; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Aromatics											
Toluene	liver and kidney weight changes	1,000	1.4E-06	3.6E-03	5.1E-09	2.0E-01	3E-08	5.0E-03	6.8E-09	2.0E-01	3E-08
						Sub-total	**3E-08**			**Sub-total**	**3E-08**
				Sub-total volatile organics			**3E-08**	**Sub-total volatile organics**			**3E-08**
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Phenanthrene	ND	10,000	4.9E-07	1.5E-02	7.3E-09	4.0E-03	2E-06	2.0E-02	9.8E-09	4.0E-03	2E-06
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	4.9E-07	1.8E-02	8.8E-09	4.0E-02	2E-07	2.4E-02	1.2E-08	4.0E-02	3E-07
Pyrene	kidney toxicity	3,000	4.9E-07	2.0E-02	9.5E-09	3.0E-02	3E-07	2.6E-02	1.3E-08	3.0E-02	4E-07
						Sub-total	**2E-06**			**Sub-total**	**3E-06**
				Sub-total semi-volatile organics			**2E-06**	**Sub-total semi-volatile organics**			**3E-06**
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	2.1E+00	8.2E-07	3.0E-04	3E-03	2.3E+00	9.0E-07	3.0E-04	3E-03
Barium	increased blood pressure	3	3.9E-07	2.0E+01	7.9E-06	7.0E-02	1E-04	2.0E+01	7.9E-06	7.0E-02	1E-04
Chromium	none	500	3.9E-07	5.4E+00	2.1E-06	5.0E-03	4E-04	9.8E+00	3.8E-06	5.0E-03	8E-04
Copper	gastrointestinal	NA	3.9E-07	5.1E+00	2.0E-06	3.7E-02	5E-05	5.1E+00	2.0E-06	3.7E-02	5E-05
Manganese	central nervous system effects	1	3.9E-07	9.4E+01	3.7E-05	1.0E-01	4E-04	1.1E+02	4.1E-05	1.0E-01	4E-04
Vanadium	none	100	3.9E-07	1.4E+01	5.5E-06	7.0E-03	8E-04	1.7E+01	6.7E-06	7.0E-03	1E-03
Zinc	anemia	10	3.9E-07	3.2E+01	1.3E-05	2.0E-01	6E-05	3.6E+01	1.4E-05	2.0E-01	7E-05
				Sub-total metal			**5E-03**	**Sub-total metal**			**5E-03**
				Estimated hazard index			**5E-03**	**Estimated hazard index**			**5E-03**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

9 of 58

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Soil: Outlying, Surface
Current Use; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Metals											
Arsenic	skin	A	5.6E-08	2.1E+00	1.2E-07	1.8E+00	2E-07	2.3E+00	1.3E-07	1.8E+00	2E-07
				Sub-total metal			2E-07	**Sub-total metal**			2E-07
				Estimated icremental cancer risk			2E-07	**Estimated incremental cancer risk**			2E-07

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

10 of 58

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Soil: Outlying, Sub-Surface
Future Use; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,2-Dichloroethene	hematological effects	3,000	1.4E-05	1.2E-03	1.7E-08	1.0E-02	2E-06	2.0E-03	2.9E-08	1.0E-02	3E-06
Tetrachloroethene	liver toxicity	1,000	1.4E-05	5.2E-03	7.4E-08	1.0E-02	7E-06	1.9E-02	2.7E-07	1.0E-02	3E-05
						Sub-total	**9E-06**			**Sub-total**	**3E-05**
Aromatics											
Toluene	liver and kidney weight changes	1,000	1.4E-05	7.6E-04	1.1E-08	2.0E-01	5E-08	2.0E-03	2.9E-08	2.0E-01	1E-07
						Sub-total	**5E-08**			**Sub-total**	**1E-07**
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	1.4E-05	5.2E-03	7.5E-08	1.0E-01	7E-07	1.3E-02	1.9E-07	1.0E-01	2E-06
						Sub-total	**7E-07**			**Sub-total**	**2E-06**
				Sub-total volatile organics			**1E-05**	**Sub-total volatile organics**			**3E-05**
Semi-Volatile											
Polynuclear Aromatic Hydrocarbons											
Phenanthrene	ND	10,000	6.9E-06	1.5E-01	1.1E-06	4.0E-03	3E-04	3.0E-01	2.1E-06	4.0E-03	5E-04
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	6.9E-06	2.2E-02	1.5E-07	4.0E-02	4E-06	4.3E-02	3.0E-07	4.0E-02	7E-06
						Sub-total	**3E-04**			**Sub-total**	**5E-04**
Phthalates											
Butylbenzyl phthalate	increased liver weight	1,000	1.4E-05	2.9E-02	4.2E-07	2.0E-01	2E-06	5.7E-02	8.2E-07	2.0E-01	4E-06
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.4E-05	1.7E-01	2.4E-06	2.0E-02	1E-04	9.8E-01	1.4E-05	2.0E-02	7E-04
						Sub-total	**1E-04**			**Sub-total**	**7E-04**
				Sub-total semi-volatile organics			**4E-04**	**Sub-total semi-volatile organics**			**1E-03**
Metals											
Antimony	reduced lifespan; altered blood chemistry	1,000	6.1E-06	3.8E+00	2.3E-05	4.0E-04	6E-02	1.6E+01	9.4E-05	4.0E-04	2E-01
Arsenic	keratosis, hyperpigmentation, possible vascular	3	6.1E-06	4.2E-01	2.5E-06	3.0E-04	8E-03	1.1E+00	6.7E-06	3.0E-04	2E-02
Barium	increased blood pressure	3	6.1E-06	2.3E+01	1.4E-04	7.0E-02	2E-03	6.5E+01	3.9E-04	7.0E-02	6E-03
Beryllium	none	100	6.1E-06	5.0E-01	3.0E-06	5.0E-03	6E-04	1.7E+00	1.0E-05	5.0E-03	2E-03
Cadmium	renal damage	10	6.1E-06	2.9E-01	1.7E-06	5.0E-04	3E-03	5.6E-01	3.4E-06	5.0E-04	7E-03
Chromium	none	500	6.1E-06	2.7E+00	1.7E-05	5.0E-03	3E-03	2.6E+01	1.6E-04	5.0E-03	3E-02
Copper	gastrointestinal	NA	6.1E-06	3.3E+00	2.0E-05	3.7E-02	5E-04	2.6E+01	1.6E-04	3.7E-02	4E-03
Manganese	central nervous system effects	1	6.1E-06	3.8E+02	2.3E-03	1.0E-01	2E-02	3.0E+03	1.8E-02	1.0E-01	2E-01
Mercury	renal effects	1,000	6.1E-06	5.6E-02	3.4E-07	3.0E-04	1E-03	2.8E-01	1.7E-06	3.0E-04	6E-03
Nickel	reduced body and organ weight	300	6.1E-06	2.2E+00	1.3E-05	2.0E-02	7E-04	3.3E+01	2.0E-04	2.0E-02	1E-02
Vanadium	none	100	6.1E-06	4.5E+00	2.7E-05	7.0E-03	4E-03	1.0E+01	6.1E-05	7.0E-03	9E-03
Zinc	anemia	10	6.1E-06	3.2E+01	1.9E-04	2.0E-01	1E-03	1.6E+02	9.5E-04	2.0E-01	5E-03
				Sub-total metal			**1E-01**	**Sub-total metal**			**5E-01**
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver and kidney toxicity	1,000	1.4E-05	3.6E-05	5.2E-10	3.0E-04	2E-06	7.0E-05	1.0E-09	3.0E-04	3E-06
Heptachlor	liver weight increases	300	2.7E-06	6.2E-05	1.6E-10	5.0E-04	3E-07	1.2E-04	3.2E-10	5.0E-04	6E-07
Endrin	convulsions and liver lesions	100	2.7E-06	1.2E-04	3.1E-10	3.0E-04	1E-06	2.3E-04	6.1E-10	3.0E-04	2E-06
4,4'-DDT	liver lesions	100	2.7E-06	2.1E-04	5.7E-10	5.0E-04	1E-06	5.4E-04	1.4E-09	5.0E-04	3E-06
Methoxychlor	developmental effects	1,000	2.7E-06	3.3E-04	8.7E-10	5.0E-03	2E-07	1.1E-03	2.9E-09	5.0E-03	6E-07
				Sub-total PCBs and Pesticides			**4E-06**	**Sub-total PCBs and Pesticides**			**9E-06**
				Estimated hazard index			**1E-01**	**Estimated hazard index**			**5E-01**

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NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Soils
Soil; Outlying, Sub-Surface
Future Use; Residential

TABLE 3

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor (kg/kg/day)	Average: Exposure Conc. (mg/kg)	Average: Average Daily Dose (mg/kg/day)	Average: Cancer Potency Factor (mg/kg/day -1)	Average: Incremental Cancer Risk	Maximum: Exposure Conc. (mg/kg)	Maximum: Average Daily Dose (mg/kg/day)	Maximum: Cancer Potency Factor (mg/kg/day -1)	Maximum: Incremental Cancer Risk
Volatile Organic Compounds											
Halogenated Organics											
Trichloroethene	liver	B2	1.8E-06	4.0E-03	7.1E-09	1.1E-02	8E-11	8.0E-03	1.4E-08	1.1E-02	2E-10
Tetrachloroethene	liver	B2	1.8E-06	5.2E-03	9.1E-09	5.1E-02	5E-10	1.9E-02	3.3E-08	5.1E-02	2E-09
						Sub-total	5E-10			Sub-total	2E-09
				Sub-total volatile organics			5E-10	Sub-total volatile organics			2E-09
Semi-Volatile											
Polynuclear Aromatic Hydrocarbons											
Chrysene	ND	B2	7.8E-07	1.9E-02	1.5E-08	7.3E+00	1E-07	3.7E-02	2.9E-08	7.3E+00	2E-07
						Sub-total	1E-07			Sub-total	2E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.8E-06	1.7E-01	3.0E-07	1.4E-02	4E-09	9.8E-01	1.7E-06	1.4E-02	2E-08
						Sub-total	4E-09			Sub-total	2E-08
				Sub-total semi-volatile organics			1E-07	Sub-total semi-volatile organics			2E-07
Metals											
Arsenic	skin	A	6.7E-07	4.2E-01	2.8E-07	1.8E+00	5E-07	1.1E+00	7.4E-07	1.8E+00	1E-06
Beryllium	total tumors	B2	6.7E-07	5.0E-01	3.3E-07	4.3E+00	1E-06	1.7E+00	1.1E-06	4.3E+00	5E-06
				Sub-total metal			2E-06	Sub-total metal			6E-06
PCBs and Pesticides											
Alpha-BHC	liver	B2	1.8E-06	5.1E-05	9.0E-11	6.3E+00	6E-10	1.0E-04	1.8E-10	6.3E+00	1E-09
Gamma-BHC (Lindane)	liver	B2-C	1.8E-06	3.6E-05	6.3E-11	1.3E+00	8E-11	7.0E-05	1.2E-10	1.3E+00	2E-10
Heptachlor	liver	B2	3.1E-07	6.2E-05	1.9E-11	4.5E+00	9E-11	1.2E-04	3.7E-11	4.5E+00	2E-10
4,4'-DDE	liver	B2	3.1E-07	9.8E-05	3.0E-11	3.4E-01	1E-11	2.2E-04	6.8E-11	3.4E-01	2E-11
4,4'-DDT	liver	B2	3.1E-07	2.1E-04	6.6E-11	3.4E-01	2E-11	5.4E-04	1.7E-10	3.4E-01	6E-11
Aroclor 1254	liver	B2	3.1E-07	3.4E-03	1.1E-09	7.7E+00	8E-09	6.7E-03	2.1E-09	7.7E+00	2E-08
				Sub-total PCBs and Pesticides			9E-09	Sub-total PCBs and Pesticides			2E-08
				Estimated incremental cancer risk			2E-06	Estimated incremental cancer risk			6E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; Swamp
Current Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogentated Organics											
1,2-Dichloroethene	hematological effects	3,000	1.4E-06	1.0E-01	1.4E-07	1.0E-02	1E-05	1.8E+00	2.5E-06	1.0E-02	2E-04
1,1,1-Trichloroethane	liver toxicity	1,000	1.4E-06	1.4E-01	1.9E-07	9.0E-02	2E-06	1.9E+00	2.6E-06	9.0E-02	3E-05
Tetrachloroethene	liver toxicity	1,000	1.4E-06	1.6E-01	2.2E-07	1.0E-02	2E-05	1.4E+00	1.9E-06	1.0E-02	2E-04
Chlorobenzene	liver and kidney toxicity	1,000	1.4E-06	2.2E-02	3.0E-08	2.0E-02	1E-06	2.6E-01	3.6E-07	2.0E-02	2E-05
						Sub-total	4E-05			Sub-total	5E-04
				Sub-total volatile organics			4E-05	Sub-total volatile organics			5E-04
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Naphthalene	reduced body weight gain	10,000	4.9E-07	1.0E-01	5.1E-08	4.0E-03	1E-05	2.0E-01	9.8E-08	4.0E-03	2E-05
2-Methylnaphthalene	ND		4.9E-07	5.8E-02	2.8E-08	ND		1.1E-01	5.4E-08	ND	
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	4.9E-07	2.1E-01	1.0E-07	4.0E-02	3E-06	6.8E-01	3.3E-07	4.0E-02	8E-06
Phenols											
Phenol	developmental effects	100	1.4E-06	7.3E-02	1.0E-07	6.0E-01	2E-07	2.6E-01	3.6E-07	6.0E-01	6E-07
4-Methylphenol	decreased body weight, neurotoxicity	1,000	1.4E-06	1.3E-01	1.8E-07	5.0E-02	4E-06	1.2E+00	1.6E-06	5.0E-02	3E-05
2,4-Dimethylphenol	clinical and hematological effects	3,000	1.4E-06	4.1E-02	5.7E-08	2.0E-02	3E-06	7.9E-02	1.1E-07	2.0E-02	5E-06
						Sub-total	3E-05			Sub-total	1E-04
Phthalates											
Butylbenzyl phthalate	increased liver weight	1,000	1.4E-06	1.7E-01	2.4E-07	2.0E-01	1E-06	3.6E-01	4.9E-07	2.0E-01	2E-06
						Sub-total	1E-05			Sub-total	9E-05
Aromatics											
1,2-Dichlorobenzene	liver and kidney	1,000	1.4E-06	1.8E-01	2.4E-07	9.0E-02	3E-06	6.5E-01	8.9E-07	9.0E-02	1E-05
						Sub-total	3E-05			Sub-total	6E-05
Metals											
Aluminum	ND		3.9E-07	6.2E+03	2.4E-03	ND		1.2E+04	4.7E-03	ND	
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	9.0E-01	3.5E-07	3.0E-04	1E-03	4.1E+00	1.6E-06	3.0E-04	5E-03
Beryllium	none	100	3.9E-07	6.1E-01	2.4E-07	5.0E-03	5E-05	2.4E+00	9.4E-07	5.0E-03	2E-04
Calcium	ND		3.9E-07	1.1E+03	4.2E-04	ND		5.1E+03	2.0E-03	ND	
Chromium	none	500	3.9E-07	1.1E+01	4.2E-06	5.0E-03	8E-04	8.7E+01	3.4E-05	5.0E-03	7E-03
Copper	gastrointestinal	NA	3.9E-07	3.6E+00	1.4E-06	3.7E-02	4E-05	2.4E+01	9.4E-06	3.7E-02	3E-04
Lead	central nervous system effects		1.2E-07	1.5E+01	1.7E-06	ND		3.8E+01	4.4E-06	ND	
Potassium	ND		3.9E-07	2.6E+02	1.0E-04	ND		9.3E+02	3.7E-04	ND	
Selenium	ND		3.9E-07	5.9E-01	2.3E-07	ND		2.3E+00	9.0E-07	ND	
					Sub-total metals		5E-03		Sub-total metals		3E-02
				Estimated hazard index			5E-03	Estimated hazard index			3E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; Swamp
Current Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogentated Organics											
Chloroform	kidney	B2	2.0E-07	1.6E-03	3.2E-10	6.1E-03	2E-12	3.0E-03	5.9E-10	6.1E-03	4E-12
1,2-Dichloroethane	circulatory system	B2	2.0E-07	4.3E-03	8.5E-10	9.1E-02	8E-11	2.6E-02	5.1E-09	9.1E-02	5E-10
Trichloroethene	liver	B2	2.0E-07	6.3E-02	1.2E-08	1.1E-02	1E-10	7.8E-01	1.5E-07	1.1E-02	2E-09
Tetrachloroethene	liver	B2	2.0E-07	1.6E-01	3.1E-08	5.1E-02	2E-09	1.4E+00	2.7E-07	5.1E-02	1E-08
						Sub-total	2E-09			Sub-total	2E-08
Aromatics											
Benzene	leukemia	A	2.0E-07	5.9E-03	1.2E-09	2.9E-02	3E-11	7.7E-02	1.5E-08	2.9E-02	4E-10
						Sub-total	3E-11			Sub-total	4E-10
				Sub-total volatile organics			2E-09	Sub-total volatile organics			2E-08
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Chrysene	ND	B2	7.0E-08	1.3E-01	9.2E-09	7.3E+00	7E-08	2.5E-01	1.7E-08	7.3E+00	1E-07
						Sub-total	7E-08			Sub-total	1E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	2.0E-07	1.9E-01	3.7E-08	1.4E-02	5E-10	1.2E+00	2.4E-07	1.4E-02	3E-09
						Sub-total	5E-10			Sub-total	3E-09
				Sub-total semi-volatile organics			7E-08	Sub-total semi-volatile organics			1E-07
Metals											
Arsenic	skin	A	5.6E-08	9.0E-01	5.0E-08	1.8E+00	9E-08	4.1E+00	2.3E-07	1.8E+00	4E-07
Beryllium	total tumors	B2	5.6E-08	6.1E-01	3.4E-08	4.3E+00	1E-07	2.4E+00	1.3E-07	4.3E+00	6E-07
					Sub-total metals		2E-07		Sub-total metals		1E-06
PCBs and Pesticides											
Dieldrin	liver	B2	2.0E-07	1.2E-04	2.3E-11	1.6E+01	4E-10	2.2E-04	4.3E-11	1.6E+01	7E-10
4,4'-DDE	liver	B2	3.1E-08	1.4E-04	4.3E-12	3.4E-01	1E-12	2.6E-04	8.0E-12	3.4E-01	3E-12
Gamma Chlordane	liver	B2	3.1E-08	5.0E-05	1.5E-12	1.3E+00	2E-12	9.3E-05	2.9E-12	1.3E+00	4E-12
				Sub-total PCBs and pesticides			4E-10	Sub-total PCBs and pesticides			7E-10
				Estimated incremental cancer risk			3E-07	Estimated incremental cancer risk			1E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

14 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; Swamp
Future Use; Wading; Trespasser

				Average				Maximum			
Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogentated Organics											
1,2-Dichloroethene	hematological effects	3,000	2.7E-06	1.0E-01	2.8E-07	1.0E-02	3E-05	1.8E+00	4.9E-06	1.0E-02	5E-04
1,1,1-Trichloroethane	liver toxicity	1,000	2.7E-06	1.4E-01	3.8E-07	9.0E-02	4E-06	1.9E+00	5 2E-06	9 0E-02	6E-05
Tetrachloroethene	liver toxicity	1,000	2.7E-06	1.6E-01	4.4E-07	1.0E-02	4E-05	1.4E+00	3 8E-06	1.0E-02	4E-04
Chlorobenzene	liver and kidney toxicity	1,000	2.7E-06	2.2E-02	6.0E-08	2.0E-02	3E-06	2.6E-01	7.1E-07	2.0E-02	4E-05
						Sub-total	8E-05			Sub-total	1E-03
				Sub-total volatile organics			9E-05	Sub-total volatile organics			1E-03
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Naphthalene	reduced body weight gain	10,000	9.8E-07	1.0E-01	1.0E-07	4.0E-03	3E-05	2.0E-01	2.0E-07	4.0E-03	5E-05
2-Methylnaphthalene	ND		9.8E-07	5.8E-02	5.6E-08	ND		1.1E-01	1.1E-07	ND	
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	9.8E-07	2.1E-01	2.0E-07	4.0E-02	5E-06	6.8E-01	6.7E-07	4.0E-02	2E-05
Phenols											
Phenol	developmental effects	100	2.7E-06	7.3E-02	2.0E-07	6.0E-01	3E-07	2.6E-01	7.1E-07	6.0E-01	1E-06
4-Methylphenol	decreased body weight, neurotoxicity	1,000	2.7E-06	1.3E-01	3.6E-07	5.0E-02	7E-06	1.2E+00	3.3E-06	5.0E-02	7E-05
2,4-Dimethylphenol	clinical and hematological effects	3,000	2.7E-06	4.1E-02	1.1E-07	2.0E-02	6E-06	7.9E-02	2.2E-07	2.0E-02	1E-05
						Sub-total	7E-05			Sub-total	2E-04
Phthalates											
Butylbenzyl phthalate	increased liver weight	1,000	2.7E-06	1.7E-01	4.8E-07	2.0E-01	2E-06	3.6E-01	9.8E-07	2.0E-01	5E-06
						Sub-total	3E-05			Sub-total	2E-04
Aromatics											
1,2-Dichlorobenzene	liver and kidney	1,000	2.7E-06	1.8E-01	4.9E-07	9.0E-02	5E-06	6.5E-01	1.8E-06	9.0E-02	2E-05
						Sub-total	5E-05			Sub-total	1E-04
Ethers											
Metals											
Aluminum	ND		7.8E-07	6.2E+03	4.9E-03	ND		1.2E+04	9.5E-03	ND	
Arsenic	keratosis, hyperpigmentation, possible vascular	3	7.8E-07	9.0E-01	7.0E-07	3.0E-04	2E-03	4.1E+00	3.2E-06	3.0E-04	1E-02
Beryllium	none	100	7.8E-07	6.1E-01	4.8E-07	5.0E-03	1E-04	2.4E+00	1.9E-06	5.0E-03	4E-04
Calcium	ND		7.8E-07	1.1E+03	8.3E-04	ND		5.1E+03	4.0E-03	ND	
Chromium	none	500	7.8E-07	1.1E+01	8.4E-06	5.0E-03	2E-03	8.7E+01	6 8E-05	5 0E-03	1E-02
Copper	gastrointestinal	NA	7.8E-07	3.6E+00	2.8E-06	3.7E-02	8E-05	2.4E+01	1.9E-05	3.7E-02	5E-04
Lead	central nervous system effects		2.3E-07	1.5E+01	3.5E-06	ND		3.8E+01	8.9E-06	ND	
Potassium	ND		7.8E-07	2.6E+02	2.1E-04	ND		9.3E+02	7.3E-04	ND	
Selenium	ND		7.8E-07	5.9E-01	4.6E-07	ND		2.3E+00	1.8E-06	ND	
					Sub-total metals		9E-03		Sub-total metals		6E-02
				Estimated hazard index			1E-02	Estimated hazard index			6E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

15 of 58

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; Swamp
Future Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Maximum Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogentated Organics											
Chloroform	kidney	B2	3.9E-07	1.6E-03	6.4E-10	6.1E-03	4E-12	3.0E-03	1.2E-09	6.1E-03	7E-12
1,2-Dichloroethane	circulatory system	B2	3.9E-07	4.3E-03	1.7E-09	9.1E-02	2E-10	2.6E-02	1.0E-08	9.1E-02	9E-10
Trichloroethene	liver	B2	3.9E-07	6.3E-02	2.5E-08	1.1E-02	3E-10	7.8E-01	3.1E-07	1.1E-02	3E-09
Tetrachloroethene	liver	B2	3.9E-07	1.6E-01	6.2E-08	5.1E-02	3E-09	1.4E+00	5.5E-07	5.1E-02	3E-08
						Sub-total	4E-09			Sub-total	3E-08
Aromatics											
Benzene	leukemia	A	3.9E-07	5.9E-03	2.3E-09	2.9E-02	7E-11	7.7E-02	3.0E-08	2.9E-02	9E-10
						Sub-total	7E-11			Sub-total	9E-10
				Sub-total volatile organics			4E-09	Sub-total volatile organics			3E-08
Semi-volatile organics											
Polynuclear Aromatic Hydrocarbons											
Chrysene	ND	B2	1.4E-07	1.3E-01	1.8E-08	7.3E+00	1E-07	2.5E-01	3.5E-08	7.3E+00	3E-07
						Sub-total	1E-07			Sub-total	3E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	3.9E-07	1.9E-01	7.4E-08	1.4E-02	1E-09	1.2E+00	4.9E-07	1.4E-02	7E-09
						Sub-total	1E-09			Sub-total	7E-09
				Sub-total semi-volatile organics			1E-07	Sub-total semi-volatile organics			3E-07
Metals											
Arsenic	skin	A	1.1E-07	9.0E-01	1.0E-07	1.8E+00	2E-07	4.1E+00	4.6E-07	1.8E+00	8E-07
Beryllium	total tumors	B2	1.1E-07	6.1E-01	6.9E-08	4.3E+00	3E-07	2.4E+00	2.7E-07	4.3E+00	1E-06
					Sub-total metals		5E-07		Sub-total metals		2E-06
PCBs and Pesticides											
Dieldrin	liver	B2	3.9E-07	1.2E-04	4.7E-11	1.6E+01	7E-10	2.2E-04	8.6E-11	1.6E+01	1E-09
4,4'-DDE	liver	B2	6.2E-08	1.4E-04	8.5E-12	3.4E-01	3E-12	2.6E-04	1.6E-11	3.4E-01	5E-12
Gamma Chlordane	liver	B2	6.2E-08	5.0E-05	3.1E-12	1.3E+00	4E-12	9.3E-05	5.7E-12	1.3E+00	7E-12
				Sub-total PCBs and pesticides			8E-10	Sub-total PCBs and pesticides			1E-09
				Estimated incremental cancer risk			6E-07	Estimated incremental cancer risk			2E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

16 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; North Seep
Current Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
Chloroethane	ND	300	1.4E-06	9.0E-03	1.2E-08	4.0E-01	3E-08	2.9E-02	4.0E-08	4.0E-01	1E-07
1,1-Dichloroethane	none	1,000	1.4E-06	3.2E-02	4.4E-08	1.0E-01	4E-07	1.7E-01	2.3E-07	1.0E-01	2E-06
1,2-Dichloroethene	hematological effects	3,000	1.4E-06	5.2E-02	7.1E-08	1.0E-02	7E-06	2.7E-01	3.7E-07	1.0E-02	4E-05
1,1,1-Trichloroethane	liver toxicity	1,000	1.4E-06	3.5E-03	4.8E-09	9.0E-02	5E-08	6.0E-03	8.2E-09	9.0E-02	9E-08
Tetrachloroethene	liver toxicity	1,000	1.4E-06	2.2E-02	3.0E-08	1.0E-02	3E-06	9.6E-02	1.3E-07	1.0E-02	1E-05
Chlorobenzene	liver and kidney toxicity	1,000	1.4E-06	3.2E-03	4.3E-09	2.0E-02	2E-07	6.0E-03	8.2E-09	2.0E-02	4E-07
						Sub-total	1E-05			Sub-total	5E-05
Aromatics											
Toluene	liver and kidney weight changes	1,000	1.4E-06	1.9E-02	2.6E-08	2.0E-01	1E-07	9.8E-02	1.3E-07	2.0E-01	7E-07
Ethylbenzene	liver and kidney toxicity	1,000	1.4E-06	8.7E-03	1.2E-08	1.0E-01	1E-07	3.7E-02	5.1E-08	1.0E-01	5E-07
Xylene	decreased body weight, increased mortality	100	1.4E-06	2.6E-02	3.5E-08	2.0E+00	2E-08	1.4E-01	1.9E-07	2.0E+00	1E-07
						Sub-total	3E-07			Sub-total	1E-06
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	1.4E-06	1.4E-02	1.8E-08	1.0E-01	2E-07	5.6E-02	7.7E-08	1.0E-01	8E-07
						Sub-total	2E-07			Sub-total	8E-07
				Sub-total volatile organics			1E-05	Sub-total volatile organics			6E-05
Semi-volatiles											
Polynuclear Aromatic Hydrocarbons											
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	4.9E-07	3.1E-02	1.5E-08	4.0E-02	4E-07	5.3E-02	2.6E-08	4.0E-02	6E-07
						Sub-total	4E-07			Sub-total	6E-07
Phenols											
Phenol	developmental effects	100	1.4E-06	2.3E-01	3.2E-07	6.0E-01	5E-07	5.8E-01	7.9E-07	6.0E-01	1E-06
2-Chlorophenol	reproductive effects	1,000	1.4E-06	1.9E-01	2.6E-07	5.0E-03	5E-05	3.2E-01	4.4E-07	5.0E-03	9E-05
						Sub-total	5E-05			Sub-total	9E-05
Aromatics											
1,2,4-Trichlorobenzene	increased adrenal weight	1,000	1.4E-06	1.2E-01	1.6E-07	1.0E-02	2E-05	2.0E-01	2.7E-07	1.0E-02	3E-05
						Sub-total	2E-05			Sub-total	3E-05
				Sub-total semi-volatile organics			7E-05	Sub-total semi-volatile organics			1E-04
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	1.1E+00	4.1E-07	3.0E-04	1E-03	1.8E+00	7.0E-07	3.0E-04	2E-03
Barium	increased blood pressure	3	3.9E-07	4.2E+01	1.6E-05	7.0E-02	2E-04	7.0E+01	2.8E-05	7.0E-02	4E-04
Beryllium	none	100	3.9E-07	6.8E-01	2.6E-07	5.0E-03	5E-05	1.5E+00	5.9E-07	5.0E-03	1E-04
Chromium	none	500	3.9E-07	6.8E+00	2.7E-06	5.0E-03	5E-04	1.2E+01	4.9E-06	5.0E-03	1E-03
Copper	gastrointestinal	NA	3.9E-07	6.9E+00	2.7E-06	3.7E-02	7E-05	1.6E+01	6.4E-06	3.7E-02	2E-04
Manganese	central nervous system effects	1	3.9E-07	5.1E+02	2.0E-04	1.0E-01	2E-03	2.1E+03	8.2E-04	1.0E-01	8E-03
Nickel	reduced body and organ weight	300	3.9E-07	1.9E+00	7.5E-07	2.0E-02	4E-05	3.2E+00	1.3E-06	2.0E-02	6E-05
Vanadium	none	100	3.9E-07	1.5E+01	6.0E-06	7.0E-03	9E-04	2.6E+01	1.0E-05	7.0E-03	1E-03
Zinc	anemia	10	3.9E-07	5.8E+01	2.3E-05	2.0E-01	1E-04	1.0E+02	4.0E-05	2.0E-01	2E-04
					Sub-total metals		5E-03		Sub-total metals		1E-02
PCBs and Pesticides											
Dieldrin	liver lesions	100	1.4E-06	9.3E-05	1.3E-10	5.0E-05	3E-06	1.6E-04	2.2E-10	5.0E-05	4E-06
Endrin	convulsions and liver lesions	100	1.4E-06	1.9E-04	2.6E-10	3.0E-04	9E-07	3.2E-04	4.4E-10	3.0E-04	1E-06
4,4'-DDT	liver lesions	100	2.2E-07	3.1E-04	6.7E-11	5.0E-04	1E-07	5.3E-04	1.1E-10	5.0E-04	2E-07
				Sub-total PCB & pesticides			4E-06	Sub-total PCB & pesticides			6E-06
				Estimated hazard index			5E-03	Estimated hazard index			1E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; North Seep
Current Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,2-Dichloroethane	circulatory system	B2	2.0E-07	5.2E-03	1.0E-09	9.1E-02	9E-11	1.6E-02	3.1E-09	9.1E-02	3E-10
Trichloroethene	liver	B2	2.0E-07	9.4E-03	1.8E-09	1.1E-02	2E-11	3.7E-02	7.2E-09	1.1E-02	8E-11
Tetrachloroethene	liver	B2	2.0E-07	2.2E-02	4.4E-09	5.1E-02	2E-10	9.6E-02	1.9E-08	5.1E-02	1E-09
						Sub-total	3E-10			Sub-total	1E-09
Aromatics											
Benzene	leukemia	A	2.0E-07	3.4E-03	6.7E-10	2.9E-02	2E-11	7.0E-03	1.4E-09	2.9E-02	4E-11
						Sub-total	2E-11			Sub-total	4E-11
				Sub-total volatile organics			4E-10	Sub-total volatile organics			1E-09
Metals											
Arsenic	skin	A	5.6E-08	1.1E+00	5.9E-08	1.8E+00	1E-07	1.8E+00	1.0E-07	1.8E+00	2E-07
Beryllium	total tumors	B2	5.6E-08	6.8E-01	3.8E-08	4.3E+00	2E-07	1.5E+00	8.4E-08	4.3E+00	4E-07
					Sub-total metals		3E-07		Sub-total metals		5E-07
PCBs and Pesticides											
Dieldrin	liver	B2	2.0E-07	9.3E-05	1.8E-11	1.6E+01	3E-10	1.6E-04	3.1E-11	1.6E+01	5E-10
4,4'-DDE	liver	B2	3.1E-08	7.6E-04	2.3E-11	3.4E-01	8E-12	1.3E-03	4.0E-11	3.4E-01	1E-11
4,4'-DDT	liver	B2	3.1E-08	3.1E-04	9.5E-12	3.4E-01	3E-12	5.3E-04	1.6E-11	3.4E-01	6E-12
				Sub-total PCB & pesticides			3E-10	Sub-total PCB & pesticides			5E-10
				Estimated incremental cancer risk			3E-07	Estimated incremental cancer risk			5E-07

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

18 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; North Seep
Future Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
Chloroethane	ND	300	2.7E-06	9.0E-03	2.5E-08	4.0E-01	6E-08	2.9E-02	7.9E-08	4.0E-01	2E-07
1,1-Dichloroethane	none	1,000	2.7E-06	3.2E-02	8.9E-08	1.0E-01	9E-07	1.7E-01	4.7E-07	1.0E-01	5E-06
1,2-Dichloroethene	hematological effects	3,000	2.7E-06	5.2E-02	1.4E-07	1.0E-02	1E-05	2.7E-01	7.4E-07	1.0E-02	7E-05
1,1,1-Trichloroethane	liver toxicity	1,000	2.7E-06	3.5E-03	9.6E-09	9.0E-02	1E-07	6.0E-03	1.6E-08	9.0E-02	2E-07
Tetrachloroethene	liver toxicity	1,000	2.7E-06	2.2E-02	6.1E-08	1.0E-02	6E-06	9.6E-02	2.6E-07	1.0E-02	3E-05
Chlorobenzene	liver and kidney toxicity	1,000	2.7E-06	3.2E-03	8.7E-09	2.0E-02	4E-07	6.0E-03	1.6E-08	2.0E-02	8E-07
						Sub-total	**2E-05**			**Sub-total**	**1E-04**
Aromatics											
Toluene	liver and kidney weight changes	1,000	2.7E-06	1.9E-02	5.2E-08	2.0E-01	3E-07	9.8E-02	2.7E-07	2.0E-01	1E-06
Ethylbenzene	liver and kidney toxicity	1,000	2.7E-06	8.7E-03	2.4E-08	1.0E-01	2E-07	3.7E-02	1.0E-07	1.0E-01	1E-06
Xylene	decreased body weight, increased mortality	100	2.7E-06	2.6E-02	7.1E-08	2.0E+00	4E-08	1.4E-01	3.8E-07	2.0E+00	2E-07
						Sub-total	**5E-07**			**Sub-total**	**3E-06**
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	2.7E-06	1.4E-02	3.7E-08	1.0E-01	4E-07	5.6E-02	1.5E-07	1.0E-01	2E-06
						Sub-total	**4E-07**			**Sub-total**	**2E-06**
				Sub-total volatile organics			**2E-05**	**Sub-total volatile organics**			**1E-04**
Semi-volatiles											
Polynuclear Aromatic Hydrocarbons											
Fluoranthene	nephropathy, liver weight/hematological effects	3,000	9.8E-07	3.1E-02	3.0E-08	4.0E-02	8E-07	5.3E-02	5.2E-08	4.0E-02	1E-06
						Sub-total	**8E-07**			**Sub-total**	**1E-06**
Phenols											
Phenol	developmental effects	100	2.7E-06	2.3E-01	6.4E-07	6.0E-01	1E-06	5.8E-01	1.6E-06	6.0E-01	3E-06
2-Chlorophenol	reproductive effects	1,000	2.7E-06	1.9E-01	5.1E-07	5.0E-03	1E-04	3.2E-01	8.8E-07	5.0E-03	2E-04
						Sub-total	**1E-04**			**Sub-total**	**2E-04**
Aromatics											
1,2,4-Trichlorobenzene	increased adrenal weight	1,000	2.7E-06	1.2E-01	3.2E-07	1.0E-02	3E-05	2.0E-01	5.5E-07	1.0E-02	5E-05
						Sub-total	**3E-05**			**Sub-total**	**5E-05**
				Sub-total semi-volatile organics			**1E-04**	**Sub-total semi-volatile organics**			**2E-04**
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	7.8E-07	1.1E+00	8.3E-07	3.0E-04	3E-03	1.8E+00	1.4E-06	3.0E-04	5E-03
Barium	increased blood pressure	3	7.8E-07	4.2E+01	3.3E-05	7.0E-02	5E-04	7.0E+01	5.5E-05	7.0E-02	8E-04
Beryllium	none	100	7.8E-07	6.8E-01	5.3E-07	5.0E-03	1E-04	1.5E+00	1.2E-06	5.0E-03	2E-04
Chromium	none	500	7.8E-07	6.8E+00	5.3E-06	5.0E-03	1E-03	1.2E+01	9.7E-06	5.0E-03	2E-03
Copper	gastrointestinal	NA	7.8E-07	6.9E+00	5.4E-06	3.7E-02	1E-04	1.6E+01	1.3E-05	3.7E-02	3E-04
Manganese	central nervous system effects	1	7.8E-07	5.1E+02	4.0E-04	1.0E-01	4E-03	2.1E+03	1.6E-03	1.0E-01	2E-02
Nickel	reduced body and organ weight	300	7.8E-07	1.9E+00	1.5E-06	2.0E-02	8E-05	3.2E+00	2.5E-06	2.0E-02	1E-04
Vanadium	none	100	7.8E-07	1.5E+01	1.2E-05	7.0E-03	2E-03	2.6E+01	2.0E-05	7.0E-03	3E-03
Zinc	anemia	10	7.8E-07	5.8E+01	4.6E-05	2.0E-01	2E-04	1.0E+02	7.9E-05	2.0E-01	4E-04
					Sub-total metals		**1E-02**		**Sub-total metals**		**3E-02**
PCBs and Pesticides											
Dieldrin	liver lesions	100	2.7E-06	9.3E-05	2.6E-10	5.0E-05	5E-06	1.6E-04	4.4E-10	5.0E-05	9E-06
Endrin	convulsions and liver lesions	100	2.7E-06	1.9E-04	5.1E-10	3.0E-04	2E-06	3.2E-04	8.8E-10	3.0E-04	3E-06
4,4'-DDT	liver lesions	100	4.3E-07	3.1E-04	1.3E-10	5.0E-04	3E-07	5.3E-04	2.3E-10	5.0E-04	5E-07
				Sub-total PCB & pesticides			**7E-06**	**Sub-total PCB & pesticides**			**1E-05**
				Estimated hazard index			**1E-02**	**Estimated hazard index**			**3E-02**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; North Seep
Future Use; Wading; Trespasser

				Average				Maximum			
Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,2-Dichloroethane	circulatory system	B2	3.9E-07	5.2E-03	2.0E-09	9.1E-02	2E-10	1.6E-02	6.3E-09	9.1E-02	6E-10
Trichloroethene	liver	B2	3.9E-07	9.4E-03	3.7E-09	1.1E-02	4E-11	3.7E-02	1.4E-08	1.1E-02	2E-10
Tetrachloroethene	liver	B2	3.9E-07	2.2E-02	8.7E-09	5.1E-02	4E-10	9.6E-02	3.8E-08	5.1E-02	2E-09
						Sub-total	7E-10			Sub-total	3E-09
Aromatics											
Benzene	leukemia	A	3.9E-07	3.4E-03	1.3E-09	2.9E-02	4E-11	7.0E-03	2.7E-09	2.9E-02	8E-11
						Sub-total	4E-11			Sub-total	8E-11
				Sub-total volatile organics			7E-10	Sub-total volatile organics			3E-09
Metals											
Arsenic	skin	A	1.1E-07	1.1E+00	1.2E-07	1.8E+00	2E-07	1.8E+00	2.0E-07	1.8E+00	4E-07
Beryllium	total tumors	B2	1.1E-07	6.8E-01	7.5E-08	4.3E+00	3E-07	1.5E+00	1.7E-07	4.3E+00	7E-07
					Sub-total metals		5E-07		Sub-total metals		1E-06
PCBs and Pesticides											
Dieldrin	liver	B2	3.9E-07	9.3E-05	3.7E-11	1.6E+01	6E-10	1.6E-04	6.3E-11	1.6E+01	1E-09
4,4'-DDE	liver	B2	6.2E-08	7.6E-04	4.7E-11	3.4E-01	2E-11	1.3E-03	8.0E-11	3.4E-01	3E-11
4,4'-DDT	liver	B2	6.2E-08	3.1E-04	1.9E-11	3.4E-01	6E-12	5.3E-04	3.3E-11	3.4E-01	1E-11
				Sub-total PCB & pesticides			6E-10	Sub-total PCB & pesticides			1E-09
				Estimated incremental cancer risk			5E-07	Estimated incremental cancer risk			1E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; South Seep
Current Use; Wading; Trespasser

TABLE 3

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethane	none	1,000	1.4E-06	3.4E-03	4.7E-09	1.0E-01	5E-08	6.0E-03	8.2E-09	1.0E-01	8E-08
Chloroform	fatty cyst formation in liver	1,000	1.4E-06	1.5E-03	2.1E-09	1.0E-02	2E-07	2.5E-03	3.4E-09	1.0E-02	3E-07
1,1,1-Trichloroethane	liver toxicity	1,000	1.4E-06	1.3E-02	1.8E-08	9.0E-02	2E-07	5.1E-02	7.0E-08	9.0E-02	8E-07
Tetrachloroethene	liver toxicity	1,000	1.4E-06	4.2E-03	5.8E-09	1.0E-02	6E-07	8.0E-03	1.1E-08	1.0E-02	1E-06
						Sub-total	**1E-06**			**Sub-total**	**2E-06**
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	1.4E-06	6.8E-03	9.3E-09	1.0E-01	9E-08	1.4E-02	1.9E-08	1.0E-01	2E-07
						Sub-total	**9E-08**			**Sub-total**	**2E-07**
				Sub-total volatile organics			**1E-06**	**Sub-total volatile organics**			**2E-06**
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.4E-06	3.7E-02	5.1E-08	2.0E-02	3E-06	6.2E-02	8.5E-08	2.0E-02	4E-06
				Sub-total semi-volatile organics			**3E-06**	**Sub-total semi-volatile organics**			**4E-06**
Metals											
Barium	increased blood pressure	3	3.9E-07	3.0E+01	1.2E-05	7.0E-02	2E-04	5.9E+01	2.3E-05	7.0E-02	3E-04
Beryllium	none	100	3.9E-07	2.5E+00	9.9E-07	5.0E-03	2E-04	5.3E+00	2.1E-06	5.0E-03	4E-04
Cadmium	renal damage	10	3.9E-07	4.8E-01	1.9E-07	5.0E-04	4E-04	7.6E-01	3.0E-07	5.0E-04	6E-04
Chromium	none	500	3.9E-07	6.4E+00	2.5E-06	5.0E-03	5E-04	1.2E+01	4.7E-06	5.0E-03	9E-04
Copper	gastrointestinal	NA	3.9E-07	4.5E+00	1.8E-06	3.7E-02	5E-05	1.1E+01	4.1E-06	3.7E-02	1E-04
Manganese	central nervous system effects	1	3.9E-07	9.8E+01	3.8E-05	1.0E-01	4E-04	1.8E+02	6.9E-05	1.0E-01	7E-04
Nickel	reduced body and organ weight	300	3.9E-07	2.8E+00	1.1E-06	2.0E-02	6E-05	4.5E+00	1.8E-06	2.0E-02	9E-05
Vanadium	none	100	3.9E-07	8.8E+00	3.5E-06	7.0E-03	5E-04	1.5E+01	5.7E-06	7.0E-03	8E-04
Zinc	anemia	10	3.9E-07	4.2E+01	1.7E-05	2.0E-01	8E-05	7.1E+01	2.8E-05	2.0E-01	1E-04
				Sub-total metals			**2E-03**	**Sub-total metals**			**4E-03**
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver and kidney toxicity	1,000	1.4E-06	5.5E-04	7.5E-10	3.0E-04	2E-06	2.4E-03	3.3E-09	3.0E-04	1E-05
Aldrin	liver toxicity	1,000	2.2E-07	1.1E-04	2.3E-11	3.0E-05	8E-07	1.8E-04	3.9E-11	3.0E-05	1E-06
Dieldrin	liver lesions	100	1.4E-06	3.5E-04	4.8E-10	5.0E-05	1E-05	5.8E-04	7.9E-10	5.0E-05	2E-05
Endrin	convulsions and liver lesions	100	2.2E-07	2.5E-04	5.4E-11	3.0E-04	2E-07	4.2E-04	9.0E-11	3.0E-04	3E-07
4,4'-DDT	liver lesions	100	2.2E-07	7.3E-04	1.6E-10	5.0E-04	3E-07	3.0E-03	6.5E-10	5.0E-04	1E-06
Methoxychlor	developmental effects	1,000	2.2E-07	1.5E-02	3.3E-09	5.0E-03	7E-07	2.7E-02	5.8E-09	5.0E-03	1E-06
Gamma Chlordane	liver necrosis	1,000	2.2E-07	8.2E-05	1.8E-11	6.0E-05	3E-07	2.2E-04	4.7E-11	6.0E-05	8E-07
				Sub-total PCBs and pesticides			**1E-05**	**Sub-total PCBs and pesticides**			**3E-05**
				Estimated hazard index			**2E-03**	**Estimated hazard index**			**4E-03**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; South Seep
Current Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average Exposure Conc.	Average Average Daily Dose	Average Cancer Potency Factor	Average Incremental Cancer Risk	Maximum Exposure Conc.	Maximum Average Daily Dose	Maximum Cancer Potency Factor	Maximum Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Chloroform	kidney	B2	2.0E-07	1.5E-03	2.9E-10	6.1E-03	2E-12	2.5E-03	4.9E-10	6.1E-03	3E-12
Trichloroethene	liver	B2	2.0E-07	1.8E-03	3.5E-10	1.1E-02	4E-12	3.0E-03	5.9E-10	1.1E-02	6E-12
Tetrachloroethene	liver	B2	2.0E-07	4.2E-03	8.2E-10	5.1E-02	4E-11	8.0E-03	1.6E-09	5.1E-02	8E-11
						Sub-total	5E-11			Sub-total	9E-11
				Sub-total volatile organics			5E-11	Sub-total volatile organics			9E-11
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	2.0E-07	3.7E-02	7.3E-09	1.4E-02	1E-10	6.2E-02	1.2E-08	1.4E-02	2E-10
				Sub-total semi-volatile organics			1E-10	Sub-total semi-volatile organics			2E-10
Metals											
Beryllium	total tumors	B2	5.6E-08	2.5E+00	1.4E-07	4.3E+00	6E-07	5.3E+00	3.0E-07	4.3E+00	1E-06
				Sub-total metals			6E-07	Sub-total metals			1E-06
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver	B2-C	2.0E-07	5.5E-04	1.1E-10	1.3E+00	1E-10	2.4E-03	4.7E-10	1.3E+00	6E-10
Aldrin	liver	B2	3.1E-08	1.1E-04	3.3E-12	1.2E+01	4E-11	1.8E-04	5.5E-12	1.2E+01	6E-11
Dieldrin	liver	B2	2.0E-07	3.5E-04	6.8E-11	1.6E+01	1E-09	5.6E-04	1.1E-10	1.6E+01	2E-09
4,4'-DDE	liver	B2	3.1E-08	1.5E-03	4.7E-11	3.4E-01	2E-11	6.9E-03	2.1E-10	3.4E-01	7E-11
4,4'-DDT	liver	B2	3.1E-08	7.3E-04	2.2E-11	3.4E-01	8E-12	3.0E-03	9.2E-11	3.4E-01	3E-11
Gamma Chlordane	liver	B2	3.1E-08	8.2E-05	2.5E-12	1.3E+00	3E-12	2.2E-04	6.8E-12	1.3E+00	9E-12
				Sub-total PCBs and pesticides			1E-09	Sub-total PCBs and pesticides			3E-09
				Estimated incremental cancer risk			6E-07	Estimated incremental cancer risk			1E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

22 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; South Seep
Future Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethane	none	1,000	2.7E-06	3.4E-03	9.3E-09	1.0E-01	9E-08	6.0E-03	1.6E-08	1.0E-01	2E-07
Chloroform	fatty cyst formation in liver	1,000	2.7E-06	1.5E-03	4.1E-09	1.0E-02	4E-07	2.5E-03	6.8E-09	1.0E-02	7E-07
1,1,1-Trichloroethane	liver toxicity	1,000	2.7E-06	1.3E-02	3.6E-08	9.0E-02	4E-07	5.1E-02	1.4E-07	9.0E-02	2E-06
Tetrachloroethene	liver toxicity	1,000	2.7E-06	4.2E-03	1.2E-08	1.0E-02	1E-06	8.0E-03	2.2E-08	1.0E-02	2E-06
						Sub-total	2E-06			Sub-total	5E-06
Water Solubles											
Acetone	increased liver and kidney weight, nephrotoxicity	1,000	2.7E-06	6.8E-03	1.9E-08	1.0E-01	2E-07	1.4E-02	3.8E-08	1.0E-01	4E-07
						Sub-total	2E-07			Sub-total	4E-07
				Sub-total volatile organics			2E-06	**Sub-total volatile organics**			5E-06
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	2.7E-06	3.7E-02	1.0E-07	2.0E-02	5E-06	6.2E-02	1.7E-07	2.0E-02	8E-06
				Sub-total semi-volatile organics			5E-06	**Sub-total semi-volatile organics**			8E-06
Metals											
Barium	increased blood pressure	3	7.8E-07	3.0E+01	2.3E-05	7.0E-02	3E-04	5.9E+01	4.6E-05	7.0E-02	7E-04
Beryllium	none	100	7.8E-07	2.5E+00	2.0E-06	5.0E-03	4E-04	5.3E+00	4.1E-06	5.0E-03	8E-04
Cadmium	renal damage	10	7.8E-07	4.8E-01	3.7E-07	5.0E-04	7E-04	7.6E-01	5.9E-07	5.0E-04	1E-03
Chromium	none	500	7.8E-07	6.4E+00	5.0E-06	5.0E-03	1E-03	1.2E+01	9.3E-06	5.0E-03	2E-03
Copper	gastrointestinal	NA	7.8E-07	4.5E+00	3.5E-06	3.7E-02	1E-04	1.1E+01	8.3E-06	3.7E-02	2E-04
Manganese	central nervous system effects	1	7.8E-07	9.8E+01	7.7E-05	1.0E-01	8E-04	1.8E+02	1.4E-04	1.0E-01	1E-03
Nickel	reduced body and organ weight	300	7.8E-07	2.8E+00	2.2E-06	2.0E-02	1E-04	4.5E+00	3.5E-06	2.0E-02	2E-04
Vanadium	none	100	7.8E-07	8.8E+00	6.9E-06	7.0E-03	1E-03	1.5E+01	1.1E-05	7.0E-03	2E-03
Zinc	anemia	10	7.8E-07	4.2E+01	3.3E-05	2.0E-01	2E-04	7.1E+01	5.5E-05	2.0E-01	3E-04
				Sub-total metals			5E-03	**Sub-total metals**			8E-03
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver and kidney toxicity	1,000	2.7E-06	5.5E-04	1.5E-09	3.0E-04	5E-06	2.4E-03	6.6E-09	3.0E-04	2E-05
Aldrin	liver toxicity	1,000	4.3E-07	1.1E-04	4.6E-11	3.0E-05	2E-06	1.8E-04	7.7E-11	3.0E-05	3E-06
Dieldrin	liver lesions	100	2.7E-06	3.5E-04	9.5E-10	5.0E-05	2E-05	5.8E-04	1.6E-09	5.0E-05	3E-05
Endrin	convulsions and liver lesions	100	4.3E-07	2.5E-04	1.1E-10	3.0E-04	4E-07	4.2E-04	1.8E-10	3.0E-04	6E-07
4,4'-DDT	liver lesions	100	4.3E-07	7.3E-04	3.1E-10	5.0E-04	6E-07	3.0E-03	1.3E-09	5.0E-04	3E-06
Methoxychlor	developmental effects	1,000	4.3E-07	1.5E-02	6.5E-09	5.0E-03	1E-06	2.7E-02	1.2E-08	5.0E-03	2E-06
Gamma Chlordane	liver necrosis	1,000	4.3E-07	8.2E-05	3.5E-11	6.0E-05	6E-07	2.2E-04	9.5E-11	6.0E-05	2E-06
				Sub-total PCBs and pesticides			3E-05	**Sub-total PCBs and pesticides**			6E-05
				Estimated hazard index			5E-03	**Estimated hazard index**			8E-03

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.
NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; South Seep
Future Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Chloroform	kidney	B2	3.9E-07	1.5E-03	5.9E-10	6.1E-03	4E-12	2.5E-03	9.8E-10	6.1E-03	6E-12
Trichloroethene	liver	B2	3.9E-07	1.8E-03	7.0E-10	1.1E-02	8E-12	3.0E-03	1.2E-09	1.1E-02	1E-11
Tetrachloroethene	liver	B2	3.9E-07	4.2E-03	1.6E-09	5.1E-02	8E-11	8.0E-03	3.1E-09	5.1E-02	2E-10
						Sub-total	1E-10			Sub-total	2E-10
				Sub-total volatile organics			1E-10	Sub-total volatile organics			2E-10
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	3.9E-07	3.7E-02	1.5E-08	1.4E-02	2E-10	6.2E-02	2.4E-08	1.4E-02	3E-10
				Sub-total semi-volatile organics			2E-10	Sub-total semi-volatile organics			3E-10
Metals											
Beryllium	total tumors	B2	1.1E-07	2.5E+00	2.8E-07	4.3E+00	1E-06	5.3E+00	5.9E-07	4.3E+00	3E-06
				Sub-total metals			1E-06	Sub-total metals			3E-06
PCBs and Pesticides											
Gamma-BHC (Lindane)	liver	B2-C	3.9E-07	5.5E-04	2.1E-10	1.3E+00	3E-10	2.4E-03	9.4E-10	1.3E+00	1E-09
Aldrin	liver	B2	6.2E-08	1.1E-04	6.6E-12	1.2E+01	8E-11	1.8E-04	1.1E-11	1.2E+01	1E-10
Dieldrin	liver	B2	3.9E-07	3.5E-04	1.4E-10	1.6E+01	2E-09	5.8E-04	2.3E-10	1.6E+01	4E-09
4,4'-DDE	liver	B2	6.2E-08	1.5E-03	9.3E-11	3.4E-01	3E-11	6.9E-03	4.2E-10	3.4E-01	1E-10
4,4'-DDT	liver	B2	6.2E-08	7.3E-04	4.5E-11	3.4E-01	2E-11	3.0E-03	1.8E-10	3.4E-01	6E-11
Gamma Chlordane	liver	B2	6.2E-08	8.2E-05	5.0E-12	1.3E+00	7E-12	2.2E-04	1.4E-11	1.3E+00	2E-11
				Sub-total PCBs and pesticides			3E-09	Sub-total PCBs and pesticides			5E-09
				Estimated incremental cancer risk			1E-06	Estimated incremental cancer risk			3E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; East Pond
Current Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Aromatics											
Toluene	liver and kidney weight changes	1000	1.4E-06	6.2E-03	8.4E-09	2.0E-01	4E-08	1.7E-02	2.3E-08	2.0E-01	1E-07
						Sub-total	4E-08			Sub-total	1E-07
Water Solubles											
2-Butanone	fetal toxicty	1000	1.4E-06	8.2E-03	1.1E-08	5.0E-02	2E-07	1.8E-02	2.5E-08	5.0E-02	5E-07
						Sub-total	2E-07			Sub-total	5E-07
				Sub-total volatile organics			3E-07	Sub-total volatile organics			6E-07
Semi-volatiles											
Phenols											
2-Methylphenol	decreased body weight, neurotoxicty	1000	1.4E-06	7.8E-02	1.1E-07	5.0E-02	2E-06	1.3E-01	1.8E-07	5.0E-02	4E-06
				Sub-total semi-volatile organics			2E-06	Sub-total semi-volatile organics			4E-06
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	1.3E+00	5.2E-07	3.0E-04	2E-03	2.5E+00	9.8E-07	3.0E-04	3E-03
Barium	increased blood pressure	3	3.9E-07	2.2E+01	8.8E-06	7.0E-02	1E-04	3.6E+01	1.4E-05	7.0E-02	2E-04
Beryllium	none	100	3.9E-07	9.4E-01	3.7E-07	5.0E-03	7E-05	2.1E+00	8.2E-07	5.0E-03	2E-04
Chromium	none	500	3.9E-07	1.1E+01	4.3E-06	5.0E-03	9E-04	2.2E+01	8.8E-06	5.0E-03	2E-03
Copper	gastrointestinal	NA	3.9E-07	3.5E+00	1.4E-06	3.7E-02	4E-05	8.4E+00	3.3E-06	3.7E-02	9E-05
Manganese	central nervous system effects	1	3.9E-07	9.7E+01	3.8E-05	1.0E-01	4E-04	2.5E+02	9.7E-05	1.0E-01	1E-03
Vanadium	none	100	3.9E-07	2.0E+01	7.7E-06	7.0E-03	1E-03	5.2E+01	2.0E-05	7.0E-03	3E-03
Zinc	anemia	10	3.9E-07	4.3E+01	1.7E-05	2.0E-01	8E-05	5.9E+01	2.3E-05	2.0E-01	1E-04
				Sub-total metals			4E-03	Sub-total metals			9E-03
PCBs and Pesticides											
Endrin	convulsions and liver lesions	100	2.2E-07	1.5E-04	3.1E-11	3.0E-04	1E-07	2.5E-04	5.4E-11	3.0E-04	2E-07
Endosulfan II	kidney toxicty	1000	1.4E-06	5.8E-05	8.0E-11	5.0E-05	2E-06	1.0E-04	1.4E-10	5.0E-05	3E-06
				Sub-total PCBs and pesticides			2E-06	Sub-total PCBs and pesticides			3E-06
				Estimated hazard index			4E-03	Estimated hazard index			9E-03

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; East Pond
Current Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average Exposure Conc.	Average Average Daily Dose	Average Cancer Potency Factor	Average Incremental Cancer Risk	Maximum Exposure Conc.	Maximum Average Daily Dose	Maximum Cancer Potency Factor	Maximum Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Metals											
Arsenic	skin	A	5.6E-08	1.3E+00	7.5E-08	1.8E+00	1E-07	2.5E+00	1.4E-07	1.8E+00	2E-07
Beryllium	total tumors	B2	5.6E-08	9.4E-01	5.3E-08	4.3E+00	2E-07	2.1E+00	1.2E-07	4.3E+00	5E-07
				Sub-total metals			4E-07	Sub-total metals			7E-07
PCBs and Pesticides											
4,4'-DDE	liver	B2	3.1E-08	1.1E-04	3.4E-12	3.4E-01	1E-12	1.9E-04	5.8E-12	3.4E-01	2E-12
				Sub-total PCBs and pesticides			1E-12	Sub-total PCBs and pesticides			2E-12
				Estimated incremental cancer risk			4E-07	Estimated incremental cancer risk			7E-07

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

26 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; East Pond
Future Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor l/kg/day	Average: Exposure Conc. mg/l	Average: Average Daily Dose mg/kg/day	Average: Reference Dose mg/kg/day	Average: Hazard Index	Maximum: Exposure Conc. mg/l	Maximum: Average Daily Dose mg/kg/day	Maximum: Reference Dose mg/kg/day	Maximum: Hazard Index
Volatile Organic Compounds											
Halogenated Organics											
Toluene	liver and kidney weight changes	1000	2.7E-06	6.2E-03	1.7E-08	2.0E-01	8E-08	1.7E-02	4.7E-08	2.0E-01	2E-07
						Sub-total	8E-08			Sub-total	2E-07
Water Solubles											
2-Butanone	fetal toxicity	1000	2.7E-06	8.2E-03	2.2E-08	5.0E-02	4E-07	1.8E-02	4.9E-08	5.0E-02	1E-06
						Sub-total	4E-07			Sub-total	1E-06
				Sub-total volatile organics			5E-07	Sub-total volatile organics			1E-06
Semi-volatiles											
Phenols											
2-Methylphenol	decreased body weight, neurotoxicity	1000	2.7E-06	7.8E-02	2.1E-07	5.0E-02	4E-06	1.3E-01	3.6E-07	5.0E-02	7E-06
				Sub-total semi-volatile organics			4E-06	Sub-total semi-volatile organics			7E-06
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	7.8E-07	1.3E+00	1.0E-06	3.0E-04	3E-03	2.5E+00	2.0E-06	3.0E-04	7E-03
Barium	increased blood pressure	3	7.8E-07	2.2E+01	1.8E-05	7.0E-02	3E-04	3.6E+01	2.8E-05	7.0E-02	4E-04
Beryllium	none	100	7.8E-07	9.4E-01	7.4E-07	5.0E-03	1E-04	2.1E+00	1.6E-06	5.0E-03	3E-04
Chromium	none	500	7.8E-07	1.1E+01	8.6E-06	5.0E-03	2E-03	2.2E+01	1.8E-05	5.0E-03	4E-03
Copper	gastrointestinal	NA	7.8E-07	3.5E+00	2.7E-06	3.7E-02	7E-05	8.4E+00	6.6E-06	3.7E-02	2E-04
Manganese	central nervous system effects	1	7.8E-07	9.7E+01	7.6E-05	1.0E-01	8E-04	2.5E+02	1.9E-04	1.0E-01	2E-03
Vanadium	none	100	7.8E-07	2.0E+01	1.5E-05	7.0E-03	2E-03	5.2E+01	4.0E-05	7.0E-03	6E-03
Zinc	anemia	10	7.8E-07	4.3E+01	3.3E-05	2.0E-01	2E-04	5.9E+01	4.6E-05	2.0E-01	2E-04
				Sub-total metals			9E-03	Sub-total metals			2E-02
PCBs and Pesticides											
Endrin	convulsions and liver lesions	100	4.3E-07	1.5E-04	6.3E-11	3.0E-04	2E-07	2.5E-04	1.1E-10	3.0E-04	4E-07
Endosulfan II	kidney toxicity	1000	2.7E-06	5.8E-05	1.6E-10	5.0E-05	3E-06	1.0E-04	2.7E-10	5.0E-05	5E-06
				Sub-total PCBs and pesticides			3E-06	Sub-total PCBs and pesticides			6E-06
				Estimated hazard index			9E-03	Estimated hazard index			2E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; East Pond
Future Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Metals											
Arsenic	skin	A	1.1E-07	1.3E+00	1.5E-07	1.8E+00	3E-07	2.5E+00	2.8E-07	1.8E+00	5E-07
Beryllium	total tumors	B2	1.1E-07	9.4E-01	1.1E-07	4.3E+00	5E-07	2.1E+00	2.3E-07	4.3E+00	1E-06
				Sub-total metals			7E-07	Sub-total metals			1E-06
PCBs and Pesticides											
4,4'-DDE	liver	B2	6.2E-08	1.1E-04	6.8E-12	3.4E-01	2E-12	1.9E-04	1.2E-11	3.4E-01	4E-12
				Sub-total PCBs and pesticides			2E-12	Sub-total PCBs and pesticides			4E-12
				Estimated incremental cancer risk			7E-07	Estimated incremental cancer risk			1E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; SW-11
Current Use; Wading; Trespasser

TABLE 3

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Aromatics											
Toluene	liver and kidney weight changes	1,000	1.4E-06	5.3E-02	7.3E-08	2.0E-01	4E-07	5.3E-02	7.3E-08	2.0E-01	4E-07
						Sub-total	4E-07			Sub-total	4E-07
Water Solubles											
2-Butanone	fetal toxicity	1,000	1.4E-06	1.9E-01	2.6E-07	5.0E-02	5E-06	1.9E-01	2.6E-07	5.0E-02	5E-06
						Sub-total	5E-06			Sub-total	5E-06
				Sub-total volatile organics			6E-06	Sub-total volatile organics			6E-06
Semi-volatiles											
Phthalates											
Di-n-butyl phthalate	increased mortality	1,000	1.4E-06	1.2E+00	1.6E-06	1.0E-01	2E-05	1.2E+00	1.6E-06	1.0E-01	2E-05
				Sub-total semi-volatile organics			2E-05	Sub-total semi-volatile organics			2E-05
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	3.9E-07	3.7E+00	1.4E-06	3.0E-04	5E-03	3.7E+00	1.4E-06	3.0E-04	5E-03
Barium	increased blood pressure	3	3.9E-07	7.1E+01	2.8E-05	7.0E-02	4E-04	7.1E+01	2.8E-05	7.0E-02	4E-04
Beryllium	none	100	3.9E-07	4.8E+00	1.9E-06	5.0E-03	4E-04	4.8E+00	1.9E-06	5.0E-03	4E-04
Copper	gastrointestinal	NA	3.9E-07	1.8E+01	6.8E-06	3.7E-02	2E-04	1.8E+01	6.8E-06	3.7E-02	2E-04
Manganese	central nervous system effects	1	3.9E-07	3.9E+01	1.5E-05	1.0E-01	2E-04	3.9E+01	1.5E-05	1.0E-01	2E-04
Nickel	reduced body and organ weight	300	3.9E-07	8.5E+00	3.3E-06	2.0E-02	2E-04	8.5E+00	3.3E-06	2.0E-02	2E-04
Vanadium	none	100	3.9E-07	1.0E+01	4.0E-06	7.0E-03	6E-04	1.0E+01	4.0E-06	7.0E-03	6E-04
Zinc	anemia	10	3.9E-07	6.8E+01	2.7E-05	2.0E-01	1E-04	6.8E+01	2.7E-05	2.0E-01	1E-04
				Sub-total metals			7E-03	Sub-total metals			7E-03
				Estimated hazard index			7E-03	Estimated hazard index			7E-03

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; SW-11
Current Use; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Metals											
Arsenic	skin	A	5.6E-08	3.7E+00	2.1E-07	1.8E+00	4E-07	3.7E+00	2.1E-07	1.8E+00	4E-07
Beryllium	total tumors	B2	5.6E-08	4.8E+00	2.7E-07	4.3E+00	1E-06	4.8E+00	2.7E-07	4.3E+00	1E-06
				Sub-total metals			2E-06	Sub-total metals			2E-06
				Estimated incremental cancer risk			2E-06	Estimated incremental cancer risk			2E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

30 of 58

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; SW-11
Future Use; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Aromatics											
Toluene	liver and kidney weight changes	1,000	2.7E-06	5.3E-02	1.5E-07	2.0E-01	7E-07	5.3E-02	1.5E-07	2.0E-01	7E-07
						Sub-total	7E-07			Sub-total	7E-07
Water Solubles											
2-Butanone	fetal toxicty	1,000	2.7E-06	1.9E-01	5.2E-07	5.0E-02	1E-05	1.9E-01	5.2E-07	5.0E-02	1E-05
						Sub-total	1E-05			Sub-total	1E-05
				Sub-total volatile organics			1E-05	Sub-total volatile organics			1E-05
Semi-volatiles											
Phthalates											
Di-n-butyl phthalate	increased mortality	1,000	2.7E-06	1.2E+00	3.3E-06	1.0E-01	3E-05	1.2E+00	3.3E-06	1.0E-01	3E-05
				Sub-total semi-volatile organics			3E-05	Sub-total semi-volatile organics			3E-05
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	7.8E-07	3.7E+00	2.9E-06	3.0E-04	1E-02	3.7E+00	2.9E-06	3.0E-04	1E-02
Barium	increased blood pressure	3	7.8E-07	7.1E+01	5.6E-05	7.0E-02	8E-04	7.1E+01	5.6E-05	7.0E-02	8E-04
Beryllium	none	100	7.8E-07	4.8E+00	3.8E-06	5.0E-03	8E-04	4.8E+00	3.8E-06	5.0E-03	8E-04
Copper	gastrointestinal	NA	7.8E-07	1.8E+01	1.4E-05	3.7E-02	4E-04	1.8E+01	1.4E-05	3.7E-02	4E-04
Manganese	central nervous system effects	1	7.8E-07	3.9E+01	3.0E-05	1.0E-01	3E-04	3.9E+01	3.0E-05	1.0E-01	3E-04
Nickel	reduced body and organ weight	300	7.8E-07	8.5E+00	6.7E-06	2.0E-02	3E-04	8.5E+00	6.7E-06	2.0E-02	3E-04
Vanadium	none	100	7.8E-07	1.0E+01	7.9E-06	7.0E-03	1E-03	1.0E+01	7.9E-06	7.0E-03	1E-03
Zinc	anemia	10	7.8E-07	6.8E+01	5.3E-05	2.0E-01	3E-04	6.8E+01	5.3E-05	2.0E-01	3E-04
				Sub-total metals			1E-02	Sub-total metals			1E-02
				Estimated hazard index			1E-02	Estimated hazard index			1E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.
NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

31 of 58

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion and Dermal Contact of Sediment
Sediments; SW-11
Future Use; Wading; Trespassing

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Metals											
Arsenic	skin	A	1.1E-07	3.7E+00	4.1E-07	1.8E+00	7E-07	3.7E+00	4.1E-07	1.8E+00	7E-07
Beryllium	total tumors	B2	1.1E-07	4.8E+00	5.4E-07	4.3E+00	2E-06	4.8E+00	5.4E-07	4.3E+00	2E-06
				Sub-total metals			3E-06	Sub-total metals			3E-06
				Estimated incremental cancer risk			3E-06	Estimated incremental cancer risk			3E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; North Seep
Current; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	9.8E-06	4.4E-03	4.3E-08	9.0E-03	5E-06	2.9E-02	2.8E-07	9.0E-03	3E-05
1,1-Dichloroethane	none	1,000	9.8E-06	9.5E-02	9.3E-07	1.0E-01	9E-06	8.0E-01	7.8E-06	1.0E-01	8E-05
1,2-Dichloroethene	hematological effects	3,000	9.8E-06	1.6E-01	1.6E-06	1.0E-02	2E-04	7.6E-01	7.4E-06	1.0E-02	7E-04
1,1,1-Trichloroethane	liver toxicity	1,000	9.8E-06	1.2E-01	1.1E-06	9.0E-02	1E-05	1.0E+00	9.8E-06	9.0E-02	1E-04
Carbon Tetrachloride	liver lesions	1,000	9.8E-06	1.3E-03	1.3E-08	7.0E-04	2E-05	4.0E-04	3.9E-09	7.0E-04	6E-06
Tetrachloroethene	liver toxicity	1,000	9.8E-06	1.9E-02	1.8E-07	1.0E-02	2E-05	1.5E-01	1.5E-06	1.0E-02	1E-04
						Sub-total	2E-04			Sub-total	1E-03
Aromatics											
Toluene	liver and kidney weight changes	1,000	9.8E-06	6.9E-02	6.8E-07	2.0E-01	3E-06	6.1E-01	6.0E-06	2.0E-01	3E-05
Ethylbenzene	liver and kidney toxicity	1,000	9.8E-06	9.4E-03	9.2E-08	1.0E-01	9E-07	7.3E-02	7.1E-07	1.0E-01	7E-06
						Sub-total	4E-06			Sub-total	4E-05
				Sub-total volatile organics			2E-04	Sub-total volatile organics			1E-03
Semi-Volatiles											
Aromatics											
1,2,4-Trichlorobenzene	increased adrenal weight	1,000	9.8E-06	5.1E-03	5.0E-08	1.0E-02	5E-06	6.0E-03	5.9E-08	1.0E-02	6E-06
						Sub-total	6E-06			Sub-total	6E-06
				Sub-total semi-volatile organics			9E-06	Sub-total semi-volatile organics			1E-05
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	9.8E-06	1.8E-03	1.8E-08	3.0E-04	6E-05	3.6E-03	3.5E-08	3.0E-04	1E-04
Barium	increased blood pressure	3	9.8E-06	7.4E-02	7.2E-07	7.0E-02	1E-05	2.1E-01	2.0E-06	7.0E-02	3E-05
Beryllium	none	100	9.8E-06	2.9E-03	2.9E-08	5.0E-03	6E-06	6.4E-03	6.3E-08	5.0E-03	1E-05
Cadmium	renal damage	10	9.8E-06	2.2E-03	2.2E-08	5.0E-04	4E-05	4.0E-03	3.9E-08	5.0E-04	8E-05
Chromium	none	500	9.8E-06	6.1E-03	6.0E-08	5.0E-03	1E-05	1.5E-02	1.4E-07	5.0E-03	3E-05
Copper	gastrointestinal	NA	9.8E-06	9.4E-03	9.2E-08	3.7E-02	2E-06	3.2E-02	3.1E-07	3.7E-02	8E-06
Manganese	central nervous system effects	1	9.8E-06	2.1E+00	2.1E-05	1.0E-01	2E-04	1.2E+01	1.2E-04	1.0E-01	1E-03
Mercury	renal effects	1,000	9.8E-06	1.2E-04	1.2E-09	3.0E-04	4E-06	3.0E-04	2.9E-09	3.0E-04	1E-05
Vanadium	none	100	9.8E-06	1.7E-02	1.7E-07	7.0E-03	2E-05	6.6E-02	6.5E-07	7.0E-03	9E-05
Zinc	anemia	10	9.8E-06	1.1E-01	1.1E-06	2.0E-01	5E-06	3.7E-01	3.6E-06	2.0E-01	2E-05
				Sub-total metals			4E-04	Sub-total metals			2E-03
Pcbs and Pesticides											
Dieldrin	liver lesions	100	9.8E-06	6.9E-05	6.7E-10	5.0E-05	1E-05	1.8E-04	1.8E-09	5.0E-05	4E-05
				Sub-total PCBs and pesticides			1E-05	Sub-total PCBs and pesticides			4E-05
				Estimated hazard index			6E-04	Estimated hazard index			3E-03

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; North Seep
Current; Wading; Trespasser

TABLE 3

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	adrenal	C	1.4E-06	4.4E-03	6.1E-09	6.0E-01	4E-09	2.9E-02	4.1E-08	6.0E-01	2E-08
Chloroform	kidney	B2	1.4E-06	1.9E-03	2.6E-09	6.1E-03	2E-11	5.0E-03	7.0E-09	6.1E-03	4E-11
1,2-Dichloroethane	circulatory system	B2	1.4E-06	1.2E-02	1.6E-08	9.1E-02	1E-09	9.5E-02	1.3E-07	9.1E-02	1E-08
Carbon Tetrachloride	liver	B2	1.4E-06	1.3E-03	1.8E-09	1.3E-01	2E-10	4.0E-04	5.6E-10	1.3E-01	7E-11
Trichloroethene	liver	B2	1.4E-06	6.8E-02	9.5E-08	1.1E-02	1E-09	5.6E-01	7.8E-07	1.1E-02	9E-09
Tetrachloroethene	liver	B2	1.4E-06	1.9E-02	2.6E-08	5.1E-02	1E-09	1.5E-01	2.1E-07	5.1E-02	1E-08
						Sub-total	8E-09			Sub-total	6E-08
Aromatics											
Benzene	leukemia	A	1.4E-06	1.3E-02	1.9E-08	2.9E-02	5E-10	1.1E-01	1.5E-07	2.9E-02	4E-09
						Sub-total	5E-10			Sub-total	4E-09
				Sub-total volatile organics			8E-09	Sub-total volatile organics			6E-08
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.4E-06	5.1E-03	7.1E-09	1.4E-02	1E-10	7.0E-03	9.8E-09	1.4E-02	1E-10
						Sub-total	1E-10			Sub-total	1E-10
Ethers											
Bis (2-Chloroethyl) Ether	liver	B2	1.4E-06	5.2E-03	7.3E-09	1.1E+00	8E-09	7.0E-03	9.8E-09	1.1E+00	1E-08
						Sub-total	8E-09			Sub-total	1E-08
Other											
Isophorone	kidney	C	1.4E-06	5.8E-03	8.1E-09	4.1E-03	3E-11	1.2E-02	1.7E-08	4.1E-03	7E-11
						Sub-total	3E-11			Sub-total	7E-11
				Sub-total semi-volatile organics			8E-09	Sub-total semi-volatile organics			1E-08
Metals											
Arsenic	skin	A	1.4E-06	1.8E-03	2.6E-09	1.8E+00	5E-09	3.6E-03	5.0E-09	1.8E+00	9E-09
Beryllium	total tumors	B2	1.4E-06	2.9E-03	4.1E-09	4.3E+00	2E-08	6.4E-03	8.9E-09	4.3E+00	4E-08
				Sub-total metals			2E-08	Sub-total metals			5E-08
Pcbs and Pesticides											
Heptachlor	liver	B2	1.4E-06	4.4E-05	6.2E-11	4.5E+00	3E-10	1.6E-04	2.2E-10	4.5E+00	1E-09
Dieldrin	liver	B2	1.4E-06	6.9E-05	9.6E-11	1.6E+01	2E-09	1.8E-04	2.5E-10	1.6E+01	4E-09
				Sub-total PCBs and pesticides			2E-09	Sub-total PCBs and pesticides			5E-09
				Estimated incremental cancer risk			3E-08	Estimated incremental cancer risk			1E-07

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; North Seep
Future; Wading; Trespasser

35 of 58

TABLE 3

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1000	1.5E-05	4.4E-03	6.4E-08	9.0E-03	7E-06	2.9E-02	4.3E-07	9.0E-03	5E-05
1,1-Dichloroethane	none	1000	1.5E-05	9.5E-02	1.4E-06	1.0E-01	1E-05	8.0E-01	1.2E-05	1.0E-01	1E-04
1,2-Dichloroethene	hematological effects	3000	1.5E-05	1.6E-01	2.4E-06	1.0E-02	2E-04	7.6E-01	1.1E-05	1.0E-02	1E-03
1,1,1-Trichloroethane	liver toxicity	1000	1.5E-05	1.2E-01	1.7E-06	9.0E-02	2E-05	1.0E+00	1.5E-05	9.0E-02	2E-04
Carbon Tetrachloride	liver lesions	1000	1.5E-05	1.3E-03	1.9E-08	7.0E-04	3E-05	4.0E-04	5.9E-09	7.0E-04	8E-06
Tetrachloroethene	liver toxicity	1000	1.5E-05	1.9E-02	2.7E-07	1.0E-02	3E-05	1.5E-01	2.2E-06	1.0E-02	2E-04
						Sub-total	**3E-04**			**Sub-total**	**2E-03**
Aromatics											
Toluene	liver and kidney weight changes	1000	1.5E-05	6.9E-02	1.0E-06	2.0E-01	5E-06	6.1E-01	9.0E-06	2.0E-01	4E-05
Ethylbenzene	liver and kidney toxicity	1000	1.5E-05	9.4E-03	1.4E-07	1.0E-01	1E-06	7.3E-02	1.1E-06	1.0E-01	1E-05
						Sub-total	**7E-06**			**Sub-total**	**6E-05**
				Sub-total volatile organics			**3E-04**	**Sub-total volatile organics**			**2E-03**
Semi-Volatiles											
Aromatics											
1,2,4-Trichlorobenzene	increased adrenal weight	1000	1.5E-05	5.1E-03	7.5E-08	1.0E-02	8E-06	6.0E-03	8.8E-08	1.0E-02	9E-06
						Sub-total	**8E-06**			**Sub-total**	**9E-06**
				Sub-total semi-volatile organics			**1E-05**	**Sub-total semi-volatile organics**			**2E-05**
Metals											
Arsenic	atosis, hyperpigmentation, possible vascular eff	3	1.5E-05	1.8E-03	2.7E-08	3.0E-04	9E-05	3.6E-03	5.3E-08	3.0E-04	2E-04
Barium	increased blood pressure	3	1.5E-05	7.4E-02	1.1E-06	7.0E-02	2E-05	2.1E-01	3.0E-06	7.0E-02	4E-05
Beryllium	none	100	1.5E-05	2.9E-03	4.3E-08	5.0E-03	9E-06	6.4E-03	9.4E-08	5.0E-03	2E-05
Cadmium	renal damage	10	1.5E-05	2.2E-03	3.3E-08	5.0E-04	7E-05	4.0E-03	5.9E-08	5.0E-04	1E-04
Chromium	none	500	1.5E-05	6.1E-03	8.9E-08	5.0E-03	2E-05	1.5E-02	2.2E-07	5.0E-03	4E-05
Copper	gastrointestinal	NA	1.5E-05	9.4E-03	1.4E-07	3.7E-02	4E-06	3.2E-02	4.7E-07	3.7E-02	1E-05
Manganese	central nervous system effects	1	1.5E-05	2.1E+00	3.1E-05	1.0E-01	3E-04	1.2E+01	1.8E-04	1.0E-01	2E-03
Mercury	renal effects	1000	1.5E-05	1.2E-04	1.8E-09	3.0E-04	6E-06	3.0E-04	4.4E-09	3.0E-04	1E-05
Vanadium	none	100	1.5E-05	1.7E-02	2.5E-07	7.0E-03	4E-05	6.6E-02	9.7E-07	7.0E-03	1E-04
Zinc	anemia	10	1.5E-05	1.1E-01	1.6E-06	2.0E-01	8E-06	3.7E-01	5.4E-06	2.0E-01	3E-05
				Sub-total metals			**6E-04**	**Sub-total metals**			**2E-03**
Pcbs and Pesticides											
Dieldrin *	liver lesions	100	1.5E-05	6.9E-05	1.0E-09	5.0E-05	2E-05	1.8E-04	2.6E-09	5.0E-05	5E-05
				Sub-total PCBs and pesticides			**2E-05**	**Sub-total PCBs and pesticides**			**6E-05**
				Estimated hazard index			**9E-04**	**Estimated hazard index**			**4E-03**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; North Seep
Future; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor l/kg/day	Average: Exposure Conc. mg/l	Average: Average Daily Dose mg/kg/day	Average: Cancer Potency Factor mg/kg/day -1	Average: Incremental Cancer Risk	Maximum: Exposure Conc. mg/l	Maximum: Average Daily Dose mg/kg/day	Maximum: Cancer Potency Factor mg/kg/day -1	Maximum: Incremental Cancer Risk
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	adrenal	C	2.1E-06	4.4E-03	9.2E-09	6.0E-01	6E-09	2.9E-02	6.1E-08	6.0E-01	4E-08
Chloroform	kidney	B2	2.1E-06	1.9E-03	4.0E-09	6.1E-03	2E-11	5.0E-03	1.0E-08	6.1E-03	6E-11
1,2-Dichloroethane	circulatory system	B2	2.1E-06	1.2E-02	2.4E-08	9.1E-02	2E-09	9.5E-02	2.0E-07	9.1E-02	2E-08
Carbon Tetrachloride	liver	B2	2.1E-06	1.3E-03	2.7E-09	1.3E-01	3E-10	4.0E-04	8.4E-10	1.3E-01	1E-10
Trichloroethene	liver	B2	2.1E-06	6.8E-02	1.4E-07	1.1E-02	2E-09	5.6E-01	1.2E-06	1.1E-02	1E-08
Tetrachloroethene	liver	B2	2.1E-06	1.9E-02	3.9E-08	5.1E-02	2E-09	1.5E-01	3.1E-07	5.1E-02	2E-08
						Sub-total	1E-08			Sub-total	8E-08
Aromatics											
Benzene	leukemia	A	2.1E-06	1.3E-02	2.8E-08	2.9E-02	8E-10	1.1E-01	2.3E-07	2.9E-02	7E-09
						Sub-total	8E-10			Sub-total	7E-09
				Sub-total volatile organics			1E-08	Sub-total volatile organics			9E-08
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	2.1E-06	5.1E-03	1.1E-08	1.4E-02	2E-10	7.0E-03	1.5E-08	1.4E-02	2E-10
						Sub-total	2E-10			Sub-total	2E-10
Ethers											
Bis (2-Chloroethyl) Ether	liver	B2	2.1E-06	5.2E-03	1.1E-08	1.1E+00	1E-08	7.0E-03	1.5E-08	1.1E+00	2E-08
						Sub-total	1E-08			Sub-total	2E-08
Other											
Isophorone	kidney	C	2.1E-06	5.8E-03	1.2E-08	4.1E-03	5E-11	1.2E-02	2.5E-08	4.1E-03	1E-10
						Sub-total	5E-11			Sub-total	1E-10
				Sub-total semi-volatile organics			1E-08	Sub-total semi-volatile organics			2E-08
Metals											
Arsenic	skin	A	2.1E-06	1.8E-03	3.9E-09	1.8E+00	7E-09	3.6E-03	7.5E-09	1.8E+00	1E-08
Beryllium	total tumors	B2	2.1E-06	2.9E-03	6.2E-09	4.3E+00	3E-08	6.4E-03	1.3E-08	4.3E+00	6E-08
				Sub-total metals			3E-08	Sub-total metals			7E-08
Pcbs and Pesticides											
Heptachlor	liver	B2	2.1E-06	4.4E-05	9.3E-11	4.5E+00	4E-10	1.6E-04	3.4E-10	4.5E+00	2E-09
Dieldrin	liver	B2	2.1E-06	6.9E-05	1.4E-10	1.6E+01	2E-09	1.8E-04	3.8E-10	1.6E+01	6E-09
				Sub-total PCBs and pesticides			3E-09	Sub-total PCBs and pesticides			8E-09
				Estimated incremental cancer risk			5E-08	Estimated incremental cancer risk			2E-07

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; South Seep
Current; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor (l/kg/day)	Average: Exposure Conc. (mg/l)	Average: Average Daily Dose (mg/kg/day)	Average: Reference Dose (mg/kg/day)	Average: Hazard Index	Maximum: Exposure Conc. (mg/l)	Maximum: Average Daily Dose (mg/kg/day)	Maximum: Reference Dose (mg/kg/day)	Maximum: Hazard Index
Volatile Organic Compounds											
Halogenated Organics											
1,1,2-Trichloro-1,2,2-Trifluoroetha	psychomotor impairment	10	9.8E-06	3.0E-03	2.9E-08	3.0E+01	1E-09	4.0E-03	3.9E-08	3 0E+01	1E-09
1,1-Dichloroethene	liver lesions	1,000	9.8E-06	4.3E-03	4.2E-08	9.0E-03	5E-06	7.0E-03	6.8E-08	9.0E-03	8E-06
1,1-Dichloroethane	none	1,000	9.8E-06	1.5E-03	1.5E-08	1.0E-01	1E-07	2.0E-03	2.0E-08	1 0E-01	2E-07
Chloroform	fatty cyst formation in liver	1,000	9.8E-06	1.9E-02	1.9E-07	1.0E-02	2E-05	4.4E-02	4.3E-07	1.0E-02	4E-05
1,1,1-Trichloroethane	liver toxicity	1,000	9.8E-06	2.2E-01	2.1E-06	9.0E-02	2E-05	4.6E-01	4.5E-06	9.0E-02	5E-05
1,1,2-Trichloroethane	serum clinical chemistry effects	1,000	9.8E-06	2.6E-03	2.6E-08	4.0E-03	6E-06	5.0E-03	4.9E-08	4.0E-03	1E-05
Tetrachloroethene	liver toxicity	1,000	9.8E-06	7.8E-03	7.6E-08	1.0E-02	8E-06	1.4E-02	1.4E-07	1.0E-02	1E-05
						Sub-total	6E-05			Sub-total	1E-04
				Sub-total volatile organics			6E-05	Sub-total volatile organics			1E-04
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	9.8E-06	4.5E-03	4.4E-08	2.0E-02	2E-06	3.0E-03	2.9E-08	2.0E-02	1E-06
						Sub-total	2E-06			Sub-total	1E-06
				Sub-total semi-volatile organics			2E-06	Sub-total semi-volatile organics			1E-06
Metals											
Barium	increased blood pressure	3	9.8E-06	1.7E-02	1.7E-07	7.0E-02	2E-06	2.7E-02	2.6E-07	7.0E-02	4E-06
Beryllium	none	100	9.8E-06	9.0E-04	8.8E-09	5.0E-03	2E-06	1.4E-03	1.4E-08	5.0E-03	3E-06
Manganese	central nervous system effects	1	9.8E-06	5.4E-01	5.3E-06	1.0E-01	5E-05	1.1E+00	1.0E-05	1.0E-01	1E-04
Zinc	anemia	10	9.8E-06	9.3E-03	9.1E-08	2.0E-01	5E-07	1.5E-02	1.4E-07	2.0E-01	7E-07
				Sub-total metals			6E-05	Sub-total metals			1E-04
				Estimated hazard index			1E-04	Estimated hazard index			2E-04

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Surface Water; South Seep
Current; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	adrenal	C	1.4E-06	4.3E-03	5.9E-09	6.0E-01	4E-09	7.0E-03	9.8E-09	6.0E-01	6E-09
Chloroform	kidney	B2	1.4E-06	1.9E-02	2.7E-08	6.1E-03	2E-10	4.4E-02	6.2E-08	6.1E-03	4E-10
1,2-Dichloroethane	circulatory system	B2	1.4E-06	6.1E-03	8.6E-09	9.1E-02	8E-10	1.9E-02	2.7E-08	9.1E-02	2E-09
1,2-Dichloropropane	liver	B2	1.4E-06	9.4E-03	1.3E-08	6.8E-02	9E-10	2.5E-02	3.5E-08	6.8E-02	2E-09
Trichloroethene	liver	B2	1.4E-06	9.6E-03	1.3E-08	1.1E-02	1E-10	1.9E-02	2.7E-08	1.1E-02	3E-10
1,1,2-Trichloroethane	liver	C	1.4E-06	2.6E-03	3.7E-09	5.7E-02	2E-10	5.0E-03	7.0E-09	5.7E-02	4E-10
Tetrachloroethene	liver	B2	1.4E-06	7.8E-03	1.1E-08	5.1E-02	6E-10	1.4E-02	2.0E-08	5.1E-02	1E-09
						Sub-total	6E-09			**Sub-total**	1E-08
				Sub-total volatile organics			6E-09	**Sub-total volatile organics**			1E-08
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.4E-06	4.5E-03	6.3E-09	1.4E-02	9E-11	3.0E-03	4.2E-09	1.4E-02	6E-11
						Sub-total	9E-11			**Sub-total**	6E-11
				Sub-total semi-volatile organics			9E-11	**Sub-total semi-volatile organics**			6E-11
Metals											
Beryllium	total tumors	B2	1.4E-06	9.0E-04	1.3E-09	4.3E+00	5E-09	1.4E-03	2.0E-09	4.3E+00	8E-09
				Sub-total metals			5E-09	**Sub-total metals**			8E-09
				Estimated incremental cancer risk			1E-08	**Estimated incremental cancer risk**			2E-08

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; South Seep
Future; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1,2-Trichloro-1,2,2-Trifluoroetha	psychomotor impairment	10	1.5E-05	3.0E-03	4.4E-08	3.0E+01	1E-09	4.0E-03	5.9E-08	3.0E+01	2E-09
1,1-Dichloroethene	liver lesions	1,000	1.5E-05	4.3E-03	6.2E-08	9.0E-03	7E-06	7.0E-03	1.0E-07	9.0E-03	1E-05
1,1-Dichloroethane	none	1,000	1.5E-05	1.5E-03	2.2E-08	1.0E-01	2E-07	2.0E-03	2.9E-08	1.0E-01	3E-07
Chloroform	fatty cyst formation in liver	1,000	1.5E-05	1.9E-02	2.8E-07	1.0E-02	3E-05	4.4E-02	6.5E-07	1.0E-02	6E-05
1,1,1-Trichloroethane	liver toxicity	1,000	1.5E-05	2.2E-01	3.2E-06	9.0E-02	4E-05	4.6E-01	6.8E-06	9.0E-02	8E-05
1,1,2-Trichloroethane	serum clinical chemistry effects	1,000	1.5E-05	2.6E-03	3.9E-08	4.0E-03	1E-05	5.0E-03	7.3E-08	4.0E-03	2E-05
Tetrachloroethene	liver toxicity	1,000	1.5E-05	7.8E-03	1.1E-07	1.0E-02	1E-05	1.4E-02	2.1E-07	1.0E-02	2E-05
						Sub-total	**9E-05**			**Sub-total**	**2E-04**
				Sub-total volatile organics			**9E-05**	**Sub-total volatile organics**			**2E-04**
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.5E-05	4.5E-03	6.6E-08	2.0E-02	3E-06	3.0E-03	4.4E-08	2.0E-02	2E-06
						Sub-total	**3E-06**			**Sub-total**	**2E-06**
				Sub-total semi-volatile organics			**3E-06**	**Sub-total semi-volatile organics**			**2E-06**
Metals											
Barium	increased blood pressure	3	1.5E-05	1.7E-02	2.5E-07	7.0E-02	4E-06	2.7E-02	4.0E-07	7.0E-02	6E-06
Beryllium	none	100	1.5E-05	9.0E-04	1.3E-08	5.0E-03	3E-06	1.4E-03	2.1E-08	5.0E-03	4E-06
Manganese	central nervous system effects	1	1.5E-05	5.4E-01	7.9E-06	1.0E-01	8E-05	1.1E+00	1.6E-05	1.0E-01	2E-04
Zinc	anemia	10	1.5E-05	9.3E-03	1.4E-07	2.0E-01	7E-07	1.5E-02	2.2E-07	2.0E-01	1E-06
				Sub-total metals			**9E-05**	**Sub-total metals**			**2E-04**
				Estimated hazard index			**2E-04**	**Estimated hazard index**			**4E-04**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; South Seep
Future; Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	adrenal	C	2.1E-06	4.3E-03	8.9E-09	6.0E-01	5E-09	7.0E-03	1.5E-08	6.0E-01	9E-09
Chloroform	kidney	B2	2.1E-06	1.9E-02	4.1E-08	6.1E-03	2E-10	4.4E-02	9.2E-08	6.1E-03	6E-10
1,2-Dichloroethane	circulatory system	B2	2.1E-06	6.1E-03	1.3E-08	9.1E-02	1E-09	1.9E-02	4.0E-08	9.1E-02	4E-09
1,2-Dichloropropane	liver	B2	2.1E-06	9.4E-03	2.0E-08	6.8E-02	1E-09	2.5E-02	5.2E-08	6.8E-02	4E-09
Trichloroethene	liver	B2	2.1E-06	9.6E-03	2.0E-08	1.1E-02	2E-10	1.9E-02	4.0E-08	1.1E-02	4E-10
1,1,2-Trichloroethane	liver	C	2.1E-06	2.6E-03	5.5E-09	5.7E-02	3E-10	5.0E-03	1.0E-08	5.7E-02	6E-10
Tetrachloroethene	liver	B2	2.1E-06	7.8E-03	1.6E-08	5.1E-02	8E-10	1.4E-02	2.9E-08	5.1E-02	1E-09
						Sub-total	**9E-09**			**Sub-total**	**2E-08**
				Sub-total volatile organics			**9E-09**	**Sub-total volatile organics**			**2E-08**
Semi-Volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	2.1E-06	4.5E-03	9.4E-09	1.4E-02	1E-10	3.0E-03	6.3E-09	1.4E-02	9E-11
						Sub-total	**1E-10**			**Sub-total**	**9E-11**
				Sub-total semi-volatile organics			**1E-10**	**Sub-total semi-volatile organics**			**9E-11**
Metals											
Beryllium	total tumors	B2	2.1E-06	9.0E-04	1.9E-09	4.3E+00	8E-09	1.4E-03	2.9E-09	4.3E+00	1E-08
				Sub-total metals			**8E-09**	**Sub-total metals**			**1E-08**
				Estimated incremental cancer risk			**2E-08**	**Estimated incremental cancer risk**			**3E-08**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; SW-11
Current; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Metals											
Manganese	central nervous system effects	1	9.8E-06	1.4E-02	1.4E-07	1.0E-01	1E-06	1.6E-02	1.6E-07	1.0E-01	2E-06
Mercury	renal effects	1,000	9.8E-06	1.7E-04	1.7E-09	3.0E-04	6E-06	2.4E-04	2.3E-09	3.0E-04	8E-06
				Sub-total metals			7E-06	Sub-total metals			9E-06
				Estimated hazard index			7E-06	Estimated hazard index			9E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

41 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Dermal Contact with Surface Water
Surface Water; SW-11
Future; Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Metals											
Manganese	ND	.	1.5E-05	1.4E-02	2.1E-07	1.0E-01	2E-06	1.6E-02	2.3E-07	1.0E-01	2E-06
Mercury	ND		1.5E-05	1.7E-04	2.5E-09	3.0E-04	8E-06	2.4E-04	3.5E-09	3.0E-04	1E-05
				Sub-total metals			1E-05	**Sub-total metals**			1E-05
				Estimated hazard index			1E-05	**Estimated hazard index**			1E-05

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water
Surface Water; Swamp
Current; Swimming and Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	9.9E-05	3.1E-03	3.1E-07	9.0E-03	3E-05	2.5E-02	2.5E-06	9.0E-03	3E-04
1,1-Dichloroethane	none	1,000	9.9E-05	4.1E-02	4.1E-06	1.0E-01	4E-05	7.5E-01	7.4E-05	1.0E-01	7E-04
cis-1,2-Dichloroethene	hematological effects	3,000	9.9E-05	7.6E-02	7.6E-06	1.0E-02	8E-04	8.4E-01	8.3E-05	1.0E-02	8E-03
1,2-Dichloroethene	hematological effects	3,000	9.9E-05	1.1E-02	1.1E-06	1.0E-02	1E-04	7.4E-02	7.3E-06	1.0E-02	7E-04
Chloroform	fatty cyst formation in liver	1,000	9.9E-05	2.3E-03	2.2E-07	1.0E-02	2E-05	1.3E-02	1.3E-06	1.0E-02	1E-04
1,1,1-Trichloroethane	liver toxicity	1,000	9.9E-05	2.0E-02	2.0E-06	9.0E-02	2E-05	3.6E-01	3.5E-05	9.0E-02	4E-04
Tetrachloroethene	liver toxicity	1,000	9.9E-05	3.6E-03	3.6E-07	1.0E-02	4E-05	4.5E-02	4.4E-06	1.0E-02	4E-04
Chlorobenzene	liver and kidney toxicity	1,000	9.9E-05	3.0E-03	3.0E-07	2.0E-02	1E-05	3.0E-02	3.0E-06	2.0E-02	1E-04
						Sub-total	1E-03			Sub-total	1E-02
				Sub-total volatile organics			1E-03	Sub-total volatile organics			1E-02
Semi-Volatile Organics											
Phenols											
4-Methylphenol	decreased body weight, neurotoxicity	1,000	9.9E-05	9.1E-03	9.0E-07	5.0E-02	2E-05	6.8E-02	6.7E-06	5.0E-02	1E-04
2,4-Dichlorophenol	immunological effects	100	9.9E-05	5.3E-03	5.2E-07	3.0E-03	2E-04	1.1E-02	1.0E-06	3.0E-03	3E-04
						Sub-total	3E-04			Sub-total	6E-04
				Sub-total semi-volatile organics			6E-04	Sub-total semi-volatile organics			8E-04
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	9.9E-05	1.6E-03	1.6E-07	3.0E-04	5E-04	4.0E-03	4.0E-07	3.0E-04	1E-03
Barium	increased blood pressure	3	9.9E-05	7.9E-02	7.8E-06	7.0E-02	1E-04	5.0E-01	5.0E-05	7.0E-02	7E-04
Cadmium	renal damage	10	9.9E-05	2.0E-03	2.0E-07	5.0E-04	4E-04	3.9E-03	3.9E-07	5.0E-04	8E-04
Chromium	none	500	9.9E-05	4.1E-03	4.1E-07	5.0E-03	8E-05	4.8E-02	4.7E-06	5.0E-03	9E-04
Copper	gastrointestinal	NA	9.9E-05	1.5E-02	1.5E-06	3.7E-02	4E-05	1.4E-01	1.4E-05	3.7E-02	4E-04
Manganese	central nervous system effects	1	9.9E-05	2.1E+00	2.1E-04	1.0E-01	2E-03	1.0E+01	9.9E-04	1.0E-01	1E-02
Mercury	renal effects	1,000	9.9E-05	1.2E-04	1.2E-08	3.0E-04	4E-05	4.4E-04	4.4E-08	3.0E-04	1E-04
Nickel	reduced body and organ weight	300	9.9E-05	6.0E-03	5.9E-07	2.0E-02	3E-05	3.2E-02	3.1E-06	2.0E-02	2E-04
Vanadium	none	100	9.9E-05	1.8E-02	1.7E-06	7.0E-03	2E-04	9.0E-02	8.9E-06	7.0E-03	1E-03
Zinc	anemia	10	9.9E-05	1.4E-01	1.3E-05	2.0E-01	7E-05	5.7E-01	5.6E-05	2.0E-01	3E-04
				Sub-total metals			4E-03	Sub-total metals			2E-02
				Estimated hazard index			5E-03	*Estimated hazard index*			3E-02

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Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water

Surface Water; Swamp

Current; Swimming and Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor l/kg/day	Average: Exposure Conc. mg/l	Average: Average Daily Dose mg/kg/day	Average: Cancer Potency Factor mg/kg/day -1	Average: Incremental Cancer Risk	Maximum: Exposure Conc. mg/l	Maximum: Average Daily Dose mg/kg/day	Maximum: Cancer Potency Factor mg/kg/day -1	Maximum: Incremental Cancer Risk
Volatile Organic Compounds											
Halogenated Organics											
Vinyl Chloride	lung	A	1.4E-05	5.0E-03	7.1E-08	1.9E+00	1E-07	4.9E-02	6.9E-07	1.9E+00	1E-06
Dichloromethane	liver	B2	1.4E-05	1.9E-03	2.6E-08	7.5E-03	2E-10	4.5E-03	6.4E-08	7.5E-03	5E-10
1,1-Dichloroethene	adrenal	C	1.4E-05	3.1E-03	4.4E-08	6.0E-01	3E-08	2.5E-02	3.5E-07	6.0E-01	2E-07
Chloroform	kidney	B2	1.4E-05	2.3E-03	3.2E-08	6.1E-03	2E-10	1.3E-02	1.8E-07	6.1E-03	1E-09
1,2-Dichloroethane	circulatory system	B2	1.4E-05	5.9E-03	8.4E-08	9.1E-02	8E-09	8.7E-02	1.2E-06	9.1E-02	1E-07
1,2-Dichloropropane	liver	B2	1.4E-05	1.7E-03	2.4E-08	6.8E-02	2E-09	3.0E-04	4.2E-09	6.8E-02	3E-10
Trichloroethene	liver	B2	1.4E-05	2.5E-03	3.5E-08	1.1E-02	4E-10	2.4E-02	3.4E-07	1.1E-02	4E-09
Tetrachloroethene	liver	B2	1.4E-05	3.6E-03	5.1E-08	5.1E-02	3E-09	4.5E-02	6.3E-07	5.1E-02	3E-08
1,4-Dichlorobenzene	liver	C	1.4E-05	3.4E-04	4.8E-09	2.4E-02	1E-10	1.0E-04	1.4E-09	2.4E-02	3E-11
						Sub-total	2E-07			Sub-total	2E-06
Aromatics											
Benzene	leukemia	A	1.4E-05	4.7E-03	6.7E-08	2.9E-02	2E-09	7.0E-02	9.8E-07	2.9E-02	3E-08
						Sub-total	2E-07			Sub-total	2E-06
				Sub-total volatile organics			4E-07	Sub-total volatile organics			4E-06
Semi-Volatile Organics											
Polynuclear Aromatic Hydrocarbons											
Benzo(a)pyrene	stomach	B2	1.4E-05	4.7E-03	6.6E-08	7.3E+00	5E-07	6.0E-03	8.5E-08	7.3E+00	6E-07
						Sub-total	5E-07			Sub-total	6E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.4E-05	4.2E-03	5.9E-08	1.4E-02	8E-10	7.0E-03	9.9E-08	1.4E-02	1E-09
						Sub-total	8E-10			Sub-total	1E-09
Other											
Isophorone	kidney	C	1.4E-05	4.3E-03	6.1E-08	4.1E-03	3E-10	2.0E-03	2.8E-08	4.1E-03	1E-10
						Sub-total	3E-10			Sub-total	1E-10
				Sub-total semi-volatile organics			5E-07	Sub-total semi-volatile organics			6E-07
Metals											
Arsenic	skin	A	1.4E-05	1.6E-03	2.3E-08	1.8E+00	4E-08	4.0E-03	5.7E-08	1.8E+00	1E-07
Beryllium	total tumors	B2	1.4E-05	9.4E-04	1.3E-08	4.3E+00	6E-08	5.8E-03	8.2E-08	4.3E+00	4E-07
				Sub-total metals			1E-07	Sub-total metals			5E-07
PCBs and Pesticides											
Aroclor 1248	liver	B2	1.4E-05	2.1E-04	3.0E-09	7.7E+00	2E-08	2.4E-04	3.4E-09	7.7E+00	3E-08
Aroclor 1260	liver	B2	1.4E-05	3.5E-04	5.0E-09	7.7E+00	4E-08	2.0E-04	2.8E-09	7.7E+00	2E-08
				Sub-total PCBs and pesticides			6E-08	Sub-total PCBs and pesticides			5E-08
				Estimated incremental risk			1E-06	Estimated incremental risk			5E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water

Surface Water; Swamp

Future; Swimming and Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	2.4E-04	3.1E-03	7.5E-07	9.0E-03	8E-05	2.5E-02	5.9E-06	9.0E-03	7E-04
1,1-Dichloroethane	none	1,000	2.4E-04	4.1E-02	9.8E-06	1.0E-01	1E-04	7.5E-01	1.8E-04	1.0E-01	2E-03
cis-1,2-Dichloroethene	hematological effects	3,000	2.4E-04	7.6E-02	1.8E-05	1.0E-02	2E-03	8.4E-01	2.0E-04	1.0E-02	2E-02
1,2-Dichloroethene	hematological effects	3,000	2.4E-04	1.1E-02	2.5E-06	1.0E-02	3E-04	7.4E-02	1.8E-05	1.0E-02	2E-03
Chloroform	fatty cyst formation in liver	1,000	2.4E-04	2.3E-03	5.3E-07	1.0E-02	5E-05	1.3E-02	3.1E-06	1.0E-02	3E-04
1,1,1-Trichloroethane	liver toxicity	1,000	2.4E-04	2.0E-02	4.8E-06	9.0E-02	5E-05	3.6E-01	8.4E-05	9.0E-02	9E-04
Tetrachloroethene	liver toxicity	1,000	2.4E-04	3.6E-03	8.5E-07	1.0E-02	9E-05	4.5E-02	1.1E-05	1.0E-02	1E-03
Chlorobenzene	liver and kidney toxicity	1,000	2.4E-04	3.0E-03	7.1E-07	2.0E-02	4E-05	3.0E-02	7.1E-06	2.0E-02	4E-04
						Sub-total	**3E-03**			**Sub-total**	**3E-02**
				Sub-total volatile organics			**3E-03**	**Sub-total volatile organics**			**3E-02**
Semi-Volatile Organics											
Phenols											
4-Methylphenol	decreased body weight, neurotoxicity	1,000	2.4E-04	9.1E-03	2.2E-06	5.0E-02	4E-05	6.8E-02	1.6E-05	5.0E-02	3E-04
2,4-Dichlorophenol	immunological effects	100	2.4E-04	5.3E-03	1.2E-06	3.0E-03	4E-04	1.1E-02	2.5E-06	3.0E-03	8E-04
						Sub-total	**8E-04**			**Sub-total**	**1E-03**
				Sub-total semi-volatile organics			**1E-03**	**Sub-total semi-volatile organics**			**2E-03**
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	2.4E-04	1.6E-03	3.8E-07	3.0E-04	1E-03	4.0E-03	9.5E-07	3.0E-04	3E-03
Barium	increased blood pressure	3	2.4E-04	7.9E-02	1.9E-05	7.0E-02	3E-04	5.0E-01	1.2E-04	7.0E-02	2E-03
Cadmium	renal damage	10	2.4E-04	2.0E-03	4.9E-07	5.0E-04	1E-03	3.9E-03	9.3E-07	5.0E-04	2E-03
Chromium	none	500	2.4E-04	4.1E-03	9.8E-07	5.0E-03	2E-04	4.8E-02	1.1E-05	5.0E-03	2E-03
Copper	gastrointestinal	NA	2.4E-04	1.5E-02	3.5E-06	3.7E-02	9E-05	1.4E-01	3.3E-05	3.7E-02	9E-04
Manganese	central nervous system effects	1	2.4E-04	2.1E+00	5.0E-04	1.0E-01	5E-03	1.0E+01	2.4E-03	1.0E-01	2E-02
Mercury	renal effects	1,000	2.4E-04	1.2E-04	3.0E-08	3.0E-04	1E-04	4.4E-04	1.0E-07	3.0E-04	3E-04
Nickel	reduced body and organ weight	300	2.4E-04	6.0E-03	1.4E-06	2.0E-02	7E-05	3.2E-02	7.6E-06	2.0E-02	4E-04
Vanadium	none	100	2.4E-04	1.8E-02	4.2E-06	7.0E-03	6E-04	9.0E-02	2.1E-05	7.0E-03	3E-03
Zinc	anemia	10	2.4E-04	1.4E-01	3.2E-05	2.0E-01	2E-04	5.7E-01	1.4E-04	2.0E-01	7E-04
				Sub-total metals			**9E-03**	**Sub-total metals**			**4E-02**
				Estimated hazard index			**1E-02**	**Estimated hazard index**			**7E-02**

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NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water
Surface Water; Swamp
Future; Swimming and Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average Exposure Conc.	Average Average Daily Dose	Average Cancer Potency Factor	Average Incremental Cancer Risk	Maximum Exposure Conc.	Maximum Average Daily Dose	Maximum Cancer Potency Factor	Maximum Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Vinyl Chloride	lung	A	3.4E-05	5.0E-03	1.7E-07	1.9E+00	3E-07	4.9E-02	1.6E-06	1.9E+00	3E-06
Dichloromethane	liver	B2	3.4E-05	1.9E-03	6.3E-08	7.5E-03	5E-10	4.5E-03	1.5E-07	7.5E-03	1E-09
1,1-Dichloroethene	adrenal	C	3.4E-05	3.1E-03	1.1E-07	6.0E-01	6E-08	2.5E-02	8.5E-07	6.0E-01	5E-07
Chloroform	kidney	B2	3.4E-05	2.3E-03	7.6E-08	6.1E-03	5E-10	1.3E-02	4.4E-07	6.1E-03	3E-09
1,2-Dichloroethane	circulatory system	B2	3.4E-05	5.9E-03	2.0E-07	9.1E-02	2E-08	8.7E-02	2.9E-06	9.1E-02	3E-07
1,2-Dichloropropane	liver	B2	3.4E-05	1.7E-03	5.7E-08	6.8E-02	4E-09	3.0E-04	1.0E-08	6.8E-02	7E-10
Trichloroethene	liver	B2	3.4E-05	2.5E-03	8.4E-08	1.1E-02	9E-10	2.4E-02	8.2E-07	1.1E-02	9E-09
Tetrachloroethene	liver	B2	3.4E-05	3.6E-03	1.2E-07	5.1E-02	6E-09	4.5E-02	1.5E-06	5.1E-02	8E-08
1,4-Dichlorobenzene	liver	C	3.4E-05	3.4E-04	1.1E-08	2.4E-02	3E-10	1.0E-04	3.4E-09	2.4E-02	8E-11
						Sub-total	4E-07			Sub-total	4E-06
Aromatics											
Benzene	leukemia	A	3.4E-05	4.7E-03	1.6E-07	2.9E-02	5E-09	7.0E-02	2.4E-06	2.9E-02	7E-08
						Sub-total	5E-07			Sub-total	4E-06
				Sub-total volatile organics			9E-07				8E-06
Semi-Volatile Organics											
Polynuclear Aromatic Hydrocarbons											
Benzo(a)pyrene	stomach	B2	3.4E-05	4.7E-03	1.6E-07	7.3E+00	1E-06	6.0E-03	2.0E-07	7.3E+00	1E-06
						Sub-total	1E-06			Sub-total	1E-06
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	3.4E-05	4.2E-03	1.4E-07	1.4E-02	2E-09	7.0E-03	2.4E-07	1.4E-02	3E-09
						Sub-total	2E-09			Sub-total	3E-09
Other											
Isophorone	kidney	C	3.4E-05	4.3E-03	1.5E-07	4.1E-03	6E-10	2.0E-03	6.8E-08	4.1E-03	3E-10
						Sub-total	6E-10			Sub-total	3E-10
				Sub-total semi-volatile organics			1E-06	Sub-total semi-volatile organics			1E-06
Metals											
Arsenic	skin	A	3.4E-05	1.6E-03	5.4E-08	1.8E+00	9E-08	4.0E-03	1.4E-07	1.8E+00	2E-07
Beryllium	total tumors	B2	3.4E-05	9.4E-04	3.2E-08	4.3E+00	1E-07	5.8E-03	2.0E-07	4.3E+00	8E-07
				Sub-total metals			2E-07	Sub-total metals			1E-06
PCBs and Pesticides											
Aroclor 1248	liver	B2	3.4E-05	2.1E-04	7.1E-09	7.7E+00	5E-08	2.4E-04	8.2E-09	7.7E+00	6E-08
Aroclor 1260	liver	B2	3.4E-05	3.5E-04	1.2E-08	7.7E+00	9E-08	2.0E-04	6.8E-09	7.7E+00	5E-08
				Sub-total PCBs and pesticides			1E-07	Sub-total PCBs and pesticides			1E-07
				Estimated incremental risk			2E-06	Estimated incremental risk			1E-05

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

46 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water
Surface Water; East Pond
Current; Swimming and Wading; Trespasser

				Average				Maximum			
Compounds	Health Effects	Uncertainty Factor	Exposure Factor l/kg/day	Exposure Conc. mg/l	Average Daily Dose mg/kg/day	Reference Dose mg/kg/day	Hazard Index	Exposure Conc. mg/kg	Average Daily Dose mg/kg/day	Reference Dose mg/kg/day	Hazard Index
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver toxicity	100	9.9E-05	2.7E-03	2.7E-07	6.0E-02	4E-06	9.0E-03	8.9E-07	6.0E-02	1E-05
						Sub-total	4E-06			Sub-total	1E-05
				Sub-total volatile organics			4E-06	Sub-total volatile organics			1E-05
Semi-volatiles											
Phenols											
Phenol	developmental effects	100	9.9E-05	3.6E-03	3.5E-07	6.0E-01	6E-07	1.0E-03	9.9E-08	6.0E-01	2E-07
						Sub-total	6E-07			Sub-total	2E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	9.9E-05	4.8E-03	4.8E-07	2.0E-02	2E-05	6.0E-03	5.9E-07	2.0E-02	3E-05
						Sub-total	2E-05			Sub-total	3E-05
				Sub-total semi-volatile organics			2E-05	Sub-total semi-volatile organics			3E-05
Metals											
Manganese	central nervous system effects	1	9.9E-05	2.1E-02	2.1E-06	1.0E-01	2E-05	4.1E-02	4.1E-06	1.0E-01	4E-05
Zinc	anemia	10	9.9E-05	4.4E-03	4.3E-07	2.0E-01	2E-06	7.5E-03	7.4E-07	2.0E-01	4E-06
				Sub-total metals			8E-05	Sub-total metals			1E-04
				Estimated hazard index			1E-04	Estimated hazard index			2E-04

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NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water
Surface Water; East Pond
Current; Swimming and Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk	Exposure Conc.	Average Daily Dose	Cancer Potency Factor	Incremental Cancer Risk
			l/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver	B2	1.4E-05	2.7E-03	3.8E-08	7.5E-03	3E-10	9.0E-03	1.3E-07	7.5E-03	1E-09
						Sub-total	**3E-10**			**Sub-total**	**1E-09**
				Sub-total volatile organics			**3E-10**	**Sub-total volatile organics**			**1E-09**
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.4E-05	4.8E-03	6.8E-08	1.4E-02	1E-09	6.0E-03	8.5E-08	1.4E-02	1E-09
						Sub-total	**1E-09**			**Sub-total**	**1E-09**
				Sub-total semi-volatile organics			**1E-09**	**Sub-total semi-volatile organics**			**1E-09**
				Estimated incremental cancer risk			***1E-09***	***Estimated incremental cancer risk***			***2E-09***

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

48 of 58

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water
Surface Water; East Pond
Future; Swimming and Wading; Trespasser

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average				Maximum			
				Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver toxicity	100	2.4E-04	2.7E-03	6.4E-07	6.0E-02	1E-05	9.0E-03	2.1E-06	6.0E-02	4E-05
						Sub-total	1E-05			**Sub-total**	4E-05
				Sub-total volatile organics			1E-05	**Sub-total volatile organics**			4E-05
Semi-volatiles											
Phenols											
Phenol	developmental effects	100	2.4E-04	3.6E-03	8.5E-07	6.0E-01	1E-06	1.0E-03	2.4E-07	6.0E-01	4E-07
						Sub-total	1E-06			**Sub-total**	4E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	2.4E-04	4.6E-03	1.1E-06	2.0E-02	6E-05	6.0E-03	1.4E-06	2.0E-02	7E-05
						Sub-total	6E-05			**Sub-total**	7E-05
				Sub-total semi-volatile organics			6E-05	**Sub-total semi-volatile organics**			7E-05
Metals											
Manganese	central nervous system effects	1	2.4E-04	2.1E-02	5.0E-06	1.0E-01	5E-05	4.1E-02	9.7E-06	1.0E-01	1E-04
Zinc	anemia	10	2.4E-04	4.4E-03	1.0E-06	2.0E-01	5E-06	7.5E-03	1.8E-06	2.0E-01	9E-06
				Sub-total metals			2E-04	**Sub-total metals**			4E-04
				Estimated hazard index			3E-04	**Estimated hazard index**			5E-04

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NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Incidental Ingestion of and Dermal Contact with Surface Water

Surface Water; East Pond
Future; Swimming and Wading; Trespasser

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			l/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver	B2	3.4E-05	2.7E-03	9.2E-08	7.5E-03	7E-10	9.0E-03	3.1E-07	7.5E-03	2E-09
						Sub-total	**7E-10**			**Sub-total**	**2E-09**
				Sub-total volatile organics			**7E-10**	**Sub-total volatile organics**			**2E-09**
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	3.4E-05	4.6E-03	1.6E-07	1.4E-02	2E-09	6.0E-03	2.0E-07	1.4E-02	3E-09
						Sub-total	**2E-09**			**Sub-total**	**3E-09**
				Sub-total semi-volatile organics			**2E-09**	**Sub-total semi-volatile organics**			**3E-09**
				Estimated incremental cancer risk			**3E-09**	***Estimated incremental cancer risk***			**5E-09**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Surface Water and Fish
Surface Water; Swamp
Future Use; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			l/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
1,1-Dichloroethene	liver lesions	1,000	9.2E-02	3.1E-03	2.9E-04	9.0E-03	3E-02	2.5E-02	2.3E-03	9.0E-03	3E-01
1,1-Dichloroethane	none	1,000	9.1E-02	4.1E-02	3.8E-03	1.0E-01	4E-02	7.5E-01	6.8E-02	1.0E-01	7E-01
cis-1,2-Dichloroethene	hematological effects	3,000	9.2E-02	7.6E-02	7.0E-03	1.0E-02	7E-01	8.4E-01	7.7E-02	1.0E-02	8E+00
1,2-Dichloroethene	hematological effects	3,000	9.2E-02	1.1E-02	9.8E-04	1.0E-02	1E-01	7.4E-02	6.8E-03	1.0E-02	7E-01
Chloroform	fatty cyst formation in liver	1,000	9.2E-02	2.3E-03	2.1E-04	1.0E-02	2E-02	1.3E-02	1.2E-03	1.0E-02	1E-01
1,1,1-Trichloroethane	liver toxicity	1,000	9.2E-02	2.0E-02	1.8E-03	9.0E-02	2E-02	3.6E-01	3.3E-02	9.0E-02	4E-01
Tetrachloroethene	liver toxicity	1,000	9.5E-02	3.6E-03	3.4E-04	1.0E-02	3E-02	4.5E-02	4.2E-03	1.0E-02	4E-01
Chlorobenzene	liver and kidney toxicity	1,000	9.2E-02	3.0E-03	2.8E-04	2.0E-02	1E-02	3.0E-02	2.8E-03	2.0E-02	1E-01
						Sub-total	1E+00			Sub-total	1E+01
				Sub-total volatile organics			1E+00	Sub-total volatile organics			1E+01
Semi-Volatile Organics											
Phenols											
4-Methylphenol	decreased body weight, neurotoxicity	1,000	9.1E-02	9.1E-03	8.3E-04	5.0E-02	2E-02	6.8E-02	6.2E-03	5.0E-02	1E-01
2,4-Dichlorophenol	immunological effects	100	9.6E-02	5.3E-03	5.0E-04	3.0E-03	2E-01	1.1E-02	1.0E-03	3.0E-03	3E-01
						Sub-total	3E-01			Sub-total	6E-01
				Sub-total semi-volatile organics			7E-01	Sub-total semi-volatile organics			9E-01
Metals											
Arsenic	keratosis, hyperpigmentation, possible vascular	3	9.1E-02	1.6E-03	1.5E-04	3.0E-04	5E-01	4.0E-03	3.7E-04	3.0E-04	1E+00
Barium	increased blood pressure	3	9.1E-02	7.9E-02	7.2E-03	7.0E-02	1E-01	5.0E-01	4.6E-02	7.0E-02	7E-01
Beryllium	none	100	9.3E-02	9.4E-04	8.8E-05	5.0E-03	2E-02	5.8E-03	5.4E-04	5.0E-03	1E-01
Cadmium	renal damage	10	1.0E-01	2.0E-03	2.0E-04	5.0E-04	4E-01	3.9E-03	3.9E-04	5.0E-04	8E-01
Chromium	none	500	9.3E-02	4.1E-03	3.8E-04	5.0E-03	8E-02	4.8E-02	4.5E-03	5.0E-03	9E-01
Copper	gastrointestinal	NA	1.1E-01	1.5E-02	1.7E-03	3.7E-02	5E-02	1.4E-01	1.6E-02	3.7E-02	4E-01
Manganese	central nervous system effects	1	9.1E-02	2.1E+00	1.9E-01	1.0E-01	2E+00	1.0E+01	9.1E-01	1.0E-01	9E+00
Mercury	renal effects	1,000	7.0E-01	1.2E-04	8.8E-05	3.0E-04	3E-01	4.4E-04	3.1E-04	3.0E-04	1E+00
Nickel	reduced body and organ weight	300	9.7E-02	6.0E-03	5.8E-04	2.0E-02	3E-02	3.2E-02	3.1E-03	2.0E-02	2E-01
Vanadium	none	100	9.1E-02	1.8E-02	1.6E-03	7.0E-03	2E-01	9.0E-02	8.2E-03	7.0E-03	1E+00
Zinc	anemia	10	9.1E-02	1.4E-01	1.2E-02	2.0E-01	6E-02	5.7E-01	5.2E-02	2.0E-01	3E-01
				Sub-total metals			4E+00	Sub-total metals			2E+01
				Estimated hazard index			5E+00	Estimated hazard index			3E+01
				Estimated liver* hazard index			3E-01	Estimated liver* hazard index			2E+00
				Estimated kidney* hazard index			3E-02	Estimated kidney* hazard index			3E-01
				Estimated CNS** hazard index			2E+00	Estimated CNS** hazard index			9E+00
				Estimated other*** hazard index			3E+00	Estimated other*** hazard index			2E+01

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.
NA = As a result of inadequate toxicity data no reference dose was calculated, therefore, no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)
* - Hazard indicies for analytes identified as affecting the liver and kidney were included in both the liver and kidney risk estimations
** - "CNS" refers to central nervous system effects
*** - "Other" refers to the analytes not identified as affecting the liver, kidney, or central nervous system.

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Surface Water and Fish
Surface Water; Swamp
Future Use; Residential

52 OF 58

TABLE 3

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			l/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Vinyl Chloride	lung	A	1.5E-02	5.0E-03	7.5E-05	1.9E+00	1E-04	4.9E-02	7.2E-04	1.9E+00	1E-03
Dichloromethane	liver	B2	1.5E-02	1.9E-03	2.8E-05	7.5E-03	2E-07	4.5E-03	6.7E-05	7.5E-03	5E-07
1,1-Dichloroethene	adrenal	C	1.5E-02	3.1E-03	4.7E-05	6.0E-01	3E-05	2.5E-02	3.8E-04	6.0E-01	2E-04
Chloroform	kidney	B2	1.5E-02	2.3E-03	3.4E-05	6.1E-03	2E-07	1.3E-02	2.0E-04	6.1E-03	1E-06
1,2-Dichloroethane	circulatory system	B2	1.5E-02	5.9E-03	8.8E-05	9.1E-02	8E-06	8.7E-02	1.3E-03	9.1E-02	1E-04
1,2-Dichloropropane	liver	B2	1.5E-02	1.7E-03	2.5E-05	6.8E-02	2E-06	3.0E-04	4.5E-06	6.8E-02	3E-07
Trichloroethene	liver	B2	1.5E-02	2.5E-03	3.8E-05	1.1E-02	4E-07	2.4E-02	3.7E-04	1.1E-02	4E-06
Tetrachloroethene	liver	B2	1.6E-02	3.6E-03	5.9E-05	5.1E-02	3E-06	4.5E-02	7.3E-04	5.1E-02	4E-05
1,4-Dichlorobenzene	liver	C	1.6E-02	3.4E-04	5.9E-06	2.4E-02	1E-07	1.0E-04	1.6E-06	2.4E-02	4E-08
						Sub-total	2E-04			Sub-total	2E-03
Aromatics											
Benzene	leukemia	A	1.5E-02	4.7E-03	7.1E-05	2.9E-02	2E-06	7.0E-02	1.1E-03	2.9E-02	3E-05
						Sub-total	2E-04			Sub-total	2E-03
				Sub-total volatile organics			4E-04	Sub-total volatile organics			4E-03
Semi-Volatile Organics											
Polynuclear Aromatic Hydrocarbons											
Benzo(a)pyrene	stomach	B2	1.5E-02	4.7E-03	7.0E-05	7.3E+00	5E-04	6.0E-03	9.0E-05	7.3E+00	7E-04
						Sub-total	5E-04			Sub-total	7E-04
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.5E-02	4.2E-03	6.3E-05	1.4E-02	9E-07	7.0E-03	1.0E-04	1.4E-02	1E-06
						Sub-total	9E-07			Sub-total	1E-06
Other											
Isophorone	kidney	C	1.5E-02	4.3E-03	6.4E-05	4.1E-03	3E-07	2.0E-03	3.0E-05	4.1E-03	1E-07
						Sub-total	3E-07			Sub-total	1E-07
				Sub-total semi-volatile organics			5E-04	Sub-total semi-volatile organics			7E-04
Metals											
Arsenic	skin	A	1.5E-02	1.6E-03	2.4E-05	1.8E+00	4E-05	4.0E-03	6.0E-05	1.8E+00	1E-04
Beryllium	total tumors	B2	1.6E-02	9.4E-04	1.5E-05	4.3E+00	6E-05	5.8E-03	9.2E-05	4.3E+00	4E-04
				Sub-total metals			1E-04	Sub-total metals			5E-04
PCBs and Pesticides											
Aroclor 1248	liver	B2	3.4E+00	2.1E-04	7.1E-04	7.7E+00	5E-03	2.4E-04	8.2E-04	7.7E+00	6E-03
Aroclor 1260	liver	B2	3.4E+00	3.5E-04	1.2E-03	7.7E+00	9E-03	2.0E-04	6.8E-04	7.7E+00	5E-03
				Sub-total PCBs and pesticides			1E-02	Sub-total PCBs and pesticides			1E-02
				Estimated incremental risk			2E-02	Estimated incremental risk			2E-02

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Surface Water and Fish
Surface Water; East Pond
Future; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor (l/kg/day)	Average: Exposure Conc. (mg/l)	Average: Average Daily Dose (mg/kg/day)	Average: Reference Dose (mg/kg/day)	Average: Hazard Index	Maximum: Exposure Conc. (mg/kg)	Maximum: Average Daily Dose (mg/kg/day)	Maximum: Reference Dose (mg/kg/day)	Maximum: Hazard Index
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver toxicity	100	9.1E-02	2.7E-03	2.5E-04	6.0E-02	4E-03	9.0E-03	8.2E-04	6.0E-02	1E-02
						Sub-total	4E-03			Sub-total	1E-02
				Sub-total volatile organics			4E-03	Sub-total volatile organics			1E-02
Semi-volatiles											
Phenols											
Phenol	developmental effects	100	1.6E-04	3.6E-03	5.6E-07	6.0E-01	9E-07	1.0E-03	1.6E-07	6.0E-01	3E-07
						Sub-total	9E-07			Sub-total	3E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.1E-04	4.8E-03	5.4E-07	2.0E-02	3E-05	6.0E-03	6.7E-07	2.0E-02	3E-05
				Sub-total semi-volatile organics			3E-05	Sub-total semi-volatile organics			3E-05
Metals											
Copper	gastrointestinal	NA	2.2E-02	5.4E-03	1.2E-04	3.7E-02	3E-03	9.3E-03	2.1E-04	3.7E-02	6E-03
Manganese	central nervous system effects	1	1.1E-04	2.1E-02	2.3E-06	1.0E-01	2E-05	4.1E-02	4.6E-06	1.0E-01	5E-05
Mercury	renal effects	1,000	6.1E-01	1.2E-04	7.5E-05	3.0E-04	3E-01	2.4E-04	1.5E-04	3.0E-04	5E-01
Zinc	anemia	10	1.1E-04	4.4E-03	4.9E-07	2.0E-01	2E-06	7.5E-03	8.3E-07	2.0E-01	4E-06
				Sub-total metals			3E-01	Sub-total metals			5E-01
				Estimated hazard index			3E-01	Estimated hazard index			5E-01

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

TABLE 3

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Surface Water and Fish
Surface Water; East Pond
Future; Residential

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			l/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver	B2	1.5E-02	2.7E-03	4.0E-05	7.5E-03	3E-07	9.0E-03	1.3E-04	7.5E-03	1E-06
						Sub-total	3E-07			Sub-total	1E-06
				Sub-total volatile organics			3E-07	Sub-total volatile organics			1E-06
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	1.5E-02	4.8E-03	7.2E-05	1.4E-02	1E-06	6.0E-03	9.0E-05	1.4E-02	1E-06
				Sub-total semi-volatile organics			1E-06	Sub-total semi-volatile organics			1E-06
				Estimated incremental cancer risk			1E-06	Estimated incremental cancer risk			2E-06

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

TABLE 3

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Fish
Surface Water; Swamp
Current; Residential

Compounds	Health Effects	Uncertainty Factor	BCF	Exposure Factor	Average				Maximum			
					Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index	Exposure Conc.	Average Daily Dose	Reference Dose	Hazard Index
			(l/kg)	kg/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/l	mg/kg/day	mg/kg/day	
Volatile Organic Compounds												
Halogenated Organics												
1,1-Dichloroethene	liver lesions	1,000	5.6	6.2E-04	3.1E-03	2.0E-06	9.0E-03	2E-04	2.6E-02	1.6E-05	9.0E-03	2E-03
cis-1,2-Dichloroethene	hematological effects	3,000	1.6	1.8E-04	7.6E-02	1.4E-06	1.0E-02	1E-03	8.4E 01	1.6E 04	1.0E 02	1E 02
1,2-Dichloroethene	hematological effects	3,000	1.6	1.8E-04	1.1E-02	1.9E-06	1.0E-02	2E-04	7.4E-02	1.3E-05	1.0E-02	1E-03
1,1,1-Trichloroethane	liver toxicity	1,000	5.6	6.2E-04	2.0E-02	1.2E-05	9.0E-02	1E-04	3.6E-01	2.2E-04	9.0E-02	2E-03
Tetrachloroethene	liver toxicity	1,000	31	3.4E-03	3.6E-03	1.2E-05	1.0E-02	1E-03	4.5E-02	1.5E-04	1.0E-02	2E-02
Chlorobenzene	liver and kidney toxicity	1,000	10	1.1E-03	3.0E-03	3.3E-06	2.0E-02	2E-04	3.0E-02	3.3E-05	2.0E-02	2E-03
							Sub-total	**3E-03**			**Sub-total**	**4E-02**
Aromatics												
Toluene	liver and kidney weight changes	1,000	10.7	1.2E-03	2.1E-02	2.5E-05	2.0E-01	1E-04	1.7E-01	2.0E-04	2.0E-01	1E-03
Ethylbenzene	liver and kidney toxicity	1,000	37.5	4.2E-03	3.7E-03	1.5E-05	1.0E-01	2E-04	4.5E-02	1.9E-04	1.0E-01	2E-03
							Sub-total	**3E-04**			**Sub-total**	**3E-03**
					Sub-total volatile organics			**4E-03**	**Sub-total volatile organics**			**4E-02**
Semi-Volatile Organics												
Phenols												
2,4-Dichlorophenol	immunological effects	100	41	4.6E-03	5.3E-03	2.4E-05	3.0E-03	8E-03	1.1E-02	4.8E-05	3.0E-03	2E-02
							Sub-total	**8E-03**			**Sub-total**	**2E-02**
Aromatics												
1,2-Dichlorobenzene	liver and kidney	1,000	56	6.2E-03	5.6E-03	3.5E-05	9.0E-02	4E-04	3.1E-02	1.9E-04	9.0E-02	2E-03
1,2,4-Trichlorobenzene	increased adrenal weight	1,000	2,800	3.1E-01	4.4E-03	1.4E-03	1.0E-02	1E-01	3.0E-03	9.3E-04	1.0E-02	9E-02
							Sub-total	**1E-01**			**Sub-total**	**1E-01**
					Sub-total semi-volatile organics			**1E-01**	**Sub-total semi-volatile organics**			**1E-01**
Metals												
Arsenic	keratosis, hyperpigmentation, possible vascular	3	1	1.1E-04	1.6E-03	1.8E-07	3.0E-04	6E-04	4.0E-03	4.4E-07	3.0E-04	1E-03
Beryllium	none	100	19	2.1E-03	9.4E-04	2.0E-06	5.0E-03	4E-04	6.8E-03	1.2E-05	5.0E-03	2E-03
Cadmium	renal damage	10	81	9.0E-03	2.0E-03	1.8E-05	5.0E-04	4E-02	3.9E-03	3.5E-05	5.0E-04	7E-02
Chromium	none	500	16	1.8E-03	4.1E-03	7.3E-06	5.0E-03	1E-03	4.8E-02	8.5E-05	5.0E-03	2E-02
Copper	gastrointestinal	NA	200	2.2E-02	1.5E-02	3.3E-04	3.7E-02	9E-03	1.4E-01	3.1E-03	3.7E-02	8E-02
Manganese	central nervous system effects	1	1	1.1E-04	2.1E+00	2.3E-04	1.0E-01	2E-03	1.0E+01	1.1E-03	1.0E-01	1E-02
Mercury	renal effects	1,000	5,500	6.1E-01	1.2E-04	7.6E-05	3.0E-04	3E-01	4.4E-04	2.7E-04	3.0E-04	9E-01
Nickel	reduced body and organ weight	300	47	5.2E-03	6.0E-03	3.1E-05	2.0E-02	2E-03	3.2E-02	1.7E-04	2.0E-02	8E-03
Vanadium	none	100	1	1.1E-04	1.8E-02	1.9E-06	7.0E-03	3E-04	9.0E-02	1.0E-05	7.0E-03	1E-03
					Sub-total metals			**3E-01**	**Sub-total metals**			**1E+00**
PCBs and Pesticides												
Methoxychlor	developmental effects	1,000	8,300	9.2E-01	2.5E-04	2.3E-04	5.0E-03	5E-02	4.3E-04	4.0E-04	5.0E-03	8E-02
					Sub-total pcbs and pesticides			**5E-02**	**Sub-total pcbs and pesticides**			**8E-02**
					Estimated hazard index			**5E-01**	**Estimated hazard index**			**1E+00**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST. 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Fish
Surface Water; Swamp
Current; Residential

Compounds	Type of Cancer	Weight of Evidence	BCF	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Cancer Potency Factor	Average: Incremental Cancer Risk	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Cancer Potency Factor	Maximum: Incremental Cancer Risk
			(l/kg)	kg/kg/day	mg/l	mg/kg/day	mg/kg/day -1		mg/l	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds												
Halogenated Organics												
Vinyl Chloride	lung	A	1.2	5.6E-05	5.0E-03	2.8E-07	1.9E+00	5E-07	4.9E-02	2.7E-06	1.9E+00	5E-06
Dichloromethane	liver	B2	1	4.8E-05	1.9E-03	8.8E-08	7.5E-03	7E-10	4.5E-03	2.1E-07	7.5E-03	2E-09
1,1-Dichloroethene	adrenal	C	5.6	2.7E-04	3.1E-03	8.4E-07	6.0E-01	5E-07	2.5E-02	6.7E-06	6.0E-01	4E-06
Chloroform	kidney	B2	3.8	1.8E-04	2.3E-03	4.0E-07	6.1E-03	2E-09	1.3E-02	2.3E-06	6.1E-03	1E-08
1,2-Dichloroethane	circulatory system	B2	1	4.8E-05	5.9E-03	2.8E-07	9.1E-02	3E-08	8.7E-02	4.1E-06	9.1E-02	4E-07
1,2-Dichloropropane	liver	B2	1	4.8E-05	1.7E-03	7.9E-08	6.8E-02	5E-09	3.0E-04	1.4E-08	6.8E-02	1E-09
Trichloroethene	liver	B2	10.6	5.0E-04	2.5E-03	1.3E-06	1.1E-02	1E-08	2.4E-02	1.2E-05	1.1E-02	1E-07
Tetrachloroethene	liver	B2	31	1.5E-03	3.6E-03	5.3E-06	5.1E-02	3E-07	4.5E-02	6.6E-05	5.1E-02	3E-06
1,4-Dichlorobenzene	liver	C	56	2.7E-03	3.4E-04	9.0E-07	2.4E-02	2E-08	1.0E-04	2.7E-07	2.4E-02	6E-09
							Sub-total	**1E-06**			**Sub-total**	**1E-05**
Aromatics												
Benzene	leukemia	A	5.2	2.5E-04	4.7E-03	1.2E-06	2.9E-02	3E-08	7.0E-02	1.7E-05	2.9E-02	5E-07
							Sub-total	**3E-08**			**Sub-total**	**5E-07**
					Sub-total volatile organics			**1E-06**	**Sub-total volatile organics**			**1E-05**
Semi-Volatile Organics												
Polynuclear Aromatic Hydrocarbons												
Benzo(a)pyrene	stomach	B2	1	4.8E-05	4.7E-03	2.2E-07	7.3E+00	2E-06	6.0E-03	2.9E-07	7.3E+00	2E-06
							Sub-total	**2E-06**			**Sub-total**	**2E-06**
Phthalates												
Bis (2-Ethylhexyl) phthalate	liver	B2	1	4.8E-05	4.2E-03	2.0E-07	1.4E-02	3E-09	7.0E-03	3.3E-07	1.4E-02	5E-09
							Sub-total	**3E-09**			**Sub-total**	**5E-09**
Other												
Isophorone	kidney	C	1	4.8E-05	4.3E-03	2.1E-07	4.1E-03	8E-10	2.0E-03	9.5E-08	4.1E-03	4E-10
							Sub-total	**8E-10**			**Sub-total**	**4E-10**
					Sub-total semi-volatile organics			**2E-06**	**Sub-total semi-volatile organics**			**2E-06**
Metals												
Arsenic	skin	A	1	4.8E-05	1.6E-03	7.6E-08	1.8E+00	1E-07	4.0E-03	1.9E-07	1.8E+00	3E-07
Beryllium	total tumors	B2	19	9.1E-04	9.4E-04	8.5E-07	4.3E+00	4E-06	5.8E-03	5.2E-06	4.3E+00	2E-05
					Sub-total metals			**4E-06**	**Sub-total metals**			**2E-05**
PCBs and Pesticides												
Aroclor 1248	liver	B2	71,000	3.4E+00	2.1E-04	7.1E-04	7.7E+00	5E-03	2.4E-04	8.1E-04	7.7E+00	6E-03
Aroclor 1260	liver	B2	71,000	3.4E+00	3.5E-04	1.2E-03	7.7E+00	9E-03	2.0E-04	6.8E-04	7.7E+00	5E-03
					Sub-total pcbs and pesticides			**1E-02**	**Sub-total pcbs and pesticides**			**1E-02**
					Estimated incremental cancer risk			**1E-02**	**Estimated incremental cancer risk**			**1E-02**

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

Non-Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Fish
Surface Water; East Pond
Current; Residential

Compounds	Health Effects	Uncertainty Factor	Exposure Factor	Average: Exposure Conc.	Average: Average Daily Dose	Average: Reference Dose	Average: Hazard Index	Maximum: Exposure Conc.	Maximum: Average Daily Dose	Maximum: Reference Dose	Maximum: Hazard Index
			kg/kg/day	mg/l	mg/kg/day	mg/kg/day		mg/kg	mg/kg/day	mg/kg/day	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver toxicity	100	1.1E-04	2.7E-03	3.0E-07	6.0E-02	5E-06	9.0E-03	1.0E-06	6.0E-02	2E-05
						Sub-total	5E-06			**Sub-total**	2E-05
				Sub-total volatile organics			5E-06	**Sub-total volatile organics**			2E-05
Semi-volatiles											
Phenols											
Phenol	developmental effects	100	1.6E-04	3.6E-03	5.6E-07	6.0E-01	9E-07	1.0E-03	1.6E-07	6.0E-01	3E-07
						Sub-total	9E-07			**Sub-total**	3E-07
Phthalates											
Bis (2-Ethylhexyl) phthalate	increased liver weight	1,000	1.1E-04	4.8E-03	5.4E-07	2.0E-02	3E-05	6.0E-03	6.7E-07	2.0E-02	3E-05
				Sub-total semi-volatile organics			3E-05	**Sub-total semi-volatile organics**			3E-05
Metals											
Copper	gastrointestinal	NA	2.2E-02	5.4E-03	1.2E-04	3.7E-02	3E-03	9.3E-03	2.1E-04	3.7E-02	6E-03
Manganese	central nervous system effects	1	1.1E-04	2.1E-02	2.3E-06	1.0E-01	2E-05	4.1E-02	4.6E-06	1.0E-01	5E-05
Mercury	renal effects	1,000	6.1E-01	1.2E-04	7.5E-05	3.0E-04	3E-01	2.4E-04	1.5E-04	3.0E-04	5E-01
Zinc	anemia	10	1.1E-04	4.4E-03	4.9E-07	2.0E-01	2E-06	7.5E-03	8.3E-07	2.0E-01	4E-06
				Sub-total metals			3E-01	**Sub-total metals**			5E-01
				Estimated hazard index			3E-01	**Estimated hazard index**			5E-01

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

NA = As a result of inadequate toxicity data no reference dose was calculated, therefore no uncertainty factor was applied. The current drinking water standard was adopted and adjusted to the appropriate units (USEPA, HEAST, 1991)

Carcinogenic Risk Characterization for Exposure to Chemicals Via Ingestion of Fish
Surface Water; East Pond
Current; Residential

Compounds	Type of Cancer	Weight of Evidence	Exposure Factor	Average Exposure Conc.	Average Average Daily Dose	Average Cancer Potency Factor	Average Incremental Cancer Risk	Maximum Exposure Conc.	Maximum Average Daily Dose	Maximum Cancer Potency Factor	Maximum Incremental Cancer Risk
			kg/kg/day	mg/kg	mg/kg/day	mg/kg/day -1		mg/kg	mg/kg/day	mg/kg/day -1	
Volatile Organic Compounds											
Halogenated Organics											
Dichloromethane	liver	B2	4.8E-05	2.7E-03	1.3E-07	7.5E-03	1E-09	9.0E-03	4.3E-07	7.5E-03	3E-09
						Sub-total	1E-09			Sub-total	3E-09
				Sub-total volatile organics			1E-09	Sub-total volatile organics			3E-09
Semi-volatiles											
Phthalates											
Bis (2-Ethylhexyl) phthalate	liver	B2	4.8E-05	4.8E-03	2.3E-07	1.4E-02	3E-09	6.0E-03	2.9E-07	1.4E-02	4E-09
				Sub-total semi-volatile organics			3E-09	Sub-total semi-volatile organics			4E-09
				Estimated incremental cancer risk			4E-09	Estimated incremental cancer risk			7E-09

ND = Value or information not determined by sources referenced; refer to dose-response summary tables for a listing of sources.

58 of 58

TABLE 3

Picillo Farm Baseline Ecological Risk Assessment
Exposure Assumptions for American Woodcock

EQUATIONS

Dose (ug/kg/day) = $\frac{[(CS \times IS) + (CF \times IF)] \times A}{BW \times FA}$

CF(ug/kg) = $CS \times BAF \times M$

HQ = Dose/NOAEL

RECEPTOR ASSUMPTIONS

Scenario Parameter	Body Weight (kg)	Soil Ingestion Rate (kg/day)	Food Ingestion Rate (kg/day)	On-site Foraging Area (acres)	Total Foraging Area (acres)	Dry to Wet Weight Conversion Factor
Parameter Symbol	BW	IS	IF	A	FA	M
American Woodcock	0.15	0.006	0.15	5.5	5.5	0.2

CS = Concentration of contaminant in soil
CF = Concentration of contaminant in food (earthworms)
BAF = Contaminant-specific bioaccumulation factor

Picillo Farm Baseline Ecological Risk Assessment
Exposure Assumptions for the Short-tailed Shrew

EQUATIONS

Dose (ug/kg/day) = $\frac{[(CS \times IS) + (CF \times IF)] \times A}{BW \times FA}$ *CF(ug/kg) = CS x BAF x M* *HQ = Dose/NOAEL*

RECEPTOR ASSUMPTIONS

Scenario Parameter	Body Weight (kg)	Soil Ingestion Rate (kg/day)	Food Ingestion Rate (kg/day)	On-site Foraging Area (acres)	Total Foraging Area (acres)	Dry to Wet Weight Conversion Factor
Parameter Symbol	BW	IS	IF	A	FA	M
Short-tailed Shrew	0.02	0.0008	0.02	0.5	0.5	0.2

CS = Concentration of contaminant in soil
CF = Concentration of contaminant in food (earhtworms)
BAF = Contaminant-specific bioaccumulation factor

TABLE 4

Picillo Farm Baseline Ecological Risk Assessment
Risk Characterization for American Woodcock
Terrestrial Soil; Disposal Zone

Compounds	Bioaccumulation Factor	Average					Maximum				
		Soil Conc. ug/kg	Food Conc. ug/kg	Dose ug/kg/day	NOAEL ug/kg/day	Hazard Quotient	Soil Conc. ug/kg	Food Conc. ug/kg	Dose ug/kg/day	NOAEL ug/kg/day	Hazard Quotient
Metals											
Copper	5.2E-01	3.7E+04	3.9E+03	5.4E+03	ND		2.9E+05	3.0E+04	4.1E+04	ND	
Lead	4.5E-01	8.1E+03	7.3E+02	1.0E+03	2.0E+02	5	3.6E+04	3.3E+03	4.7E+03	2.0E+02	24
Nickel	4.1E-01	6.0E+03	5.0E+02	7.4E+02	1.2E+03	0.6	4.8E+04	3.9E+03	5.8E+03	1.2E+03	5
Pesticides	1.5E+01	4.2E+01	1.3E+02	1.3E+02	1.0E+00	130	1.3E+02	4.1E+02	4.1E+02	1.0E+00	411
PCBs	1.5E+01	7.3E+02	2.2E+03	2.2E+03	2.0E+01	112	9.1E+03	2.8E+04	2.8E+04	2.0E+01	1397
Chlorinated VOCs	1.5E+01	1.1E+01	3.4E+01	3.5E+01	ND		2.7E+01	8.2E+01	8.3E+01	ND	
Aromatic VOCs	1.5E+01	1.1E+01	3.3E+01	3.3E+01	ND		4.5E+01	1.4E+02	1.4E+02	ND	
					Total Hazard Index	**248**				**Total Hazard Index**	**1,836**
					Background Risk	**14**				**Background Risk**	**14**
					Bkgrd. as a % of Total	**6%**				**Bkgrd. as a % of Total**	**1%**

ND = Toxicity data are not available at this time, therefore a risk was not estimated.

Picillo Farm Baseline Ecological Risk Assessment
Risk Characterization for Short-tailed Shrew
Terrestrial Soil; Disposal Zone

Compounds	Bioaccumulation Factor	Average					Maximum				
		Soil Conc.	Food Conc.	Dose	NOAEL	Hazard Quotient	Soil Conc.	Food Conc.	Dose	NOAEL	Hazard Quotient
		ug/kg	ug/kg	ug/kg/day	ug/kg/day		ug/kg	ug/kg	ug/kg/day	ug/kg/day	
Metals											
Copper	5.2E-01	3.7E+04	3.9E+03	5.4E+03	4.2E+02	13	2.9E+05	3.0E+04	4.1E+04	4.2E+02	98
Lead	4.5E-01	8.1E+03	7.3E+02	1.0E+03	5.0E+00	209	3.6E+04	3.3E+03	4.7E+03	5.0E+00	946
Nickel	4.1E-01	6.0E+03	5.0E+02	7.4E+02	5.0E+02	1	4.8E+04	3.9E+03	5.8E+03	5.0E+02	12
Pesticides	1.5E+01	4.2E+01	1.3E+02	1.3E+02	1.0E+00	130	1.3E+02	4.1E+02	4.1E+02	1.0E+00	411
PCBs	1.5E+01	7.3E+02	2.2E+03	2.2E+03	2.5E+01	90	9.1E+03	2.8E+04	2.8E+04	2.5E+01	1118
Chlorinated VOCs	1.5E+01	1.1E+01	3.4E+01	3.5E+01	1.0E+02	0.3	2.7E+01	8.2E+01	8.3E+01	1.0E+02	0.8
Aromatic VOCs	1.5E+01	1.1E+01	3.3E+01	3.3E+01	1.0E+02	0.3	4.5E+01	1.4E+02	1.4E+02	1.0E+02	1
					Total Hazard Index	**444**				**Total Hazard Index**	**2,587**
					Background Risk	**571**				**Background Risk**	**571**
					Bkgrd. as a % of Total	**129%**				**Bkgrd. as a % of Total**	**22%**

Green Frog Tadpole and Aquatic Community Hazard Quc[illegible]s and Indices for Surface Water of Wetland Exposure Zone

Contaminants of Concern	Surface Water Concentration			AWQC			Hazard Quotients and Indices					
				Rhode Island		*Federal*	*Rhode Island*				*Federal*	
	Avg.	Max.	Location	acute	chronic	chronic	acute		chronic		chronic	
	ug/l	ug/l		ug/l	ug/l	ug/l	avg.	max.	avg.	max.	avg.	max.
Metals												
Aluminum	5108.06	38000	SW-19	-	-	748	-	-	-	-	7	51
Cadmium	2.11	4	SW-19	0.82	0.38	1.1	3	5	6	10	2	4
Copper	5.73	31.70	SW-19	4.80	3.62	12	1	7	2	9	0.5	3
Iron	25116	306500	SW-25	-	-	1000	-	-	-	-	25	307
Lead	24.68	136	SW-19	13.96	0.54	3.2	2	10	45	250	8	43
Mercury	0.12	0.30	SW-06	2.40	0.01	0.012	0.05	0.1	10	25	10	25
Zinc	64.33	368	SW-19	36.15	32.75	110	2	10	2	11	0.58	3
Sub-total							**7**	**32**	**64**	**305**	**53**	**434**
Pesticides												
Dieldrin	0.06	0.18	SW-18	1.00	0.0019	0.0019	0.06	0.2	31	95	31	95
Heptachlor	0.03	0.16	SW-18	0.52	0.0038	0.0038	0.06	0.3	9	42	9	42
Sub-total							**0.1**	**0.5**	**39**	**137**	**39**	**137**
PCBs												
Not detected												
Phthalates												
Bis (2-Ethylhexyl) phthalate	4.58	7	SW-18	555	12	3.00	0.01	0.01	0.4	0.6	2	2
Diethyl phthalate	4.68	8	SW-02	2,605	58	3.00	0.002	0.003	0.06	0.1	2	3
Dimethyl phthalate	4.79	8	SW-02	1,650	37	3.00	0.003	0.005	0.1	0.2	2	3
Sub-total							**0.01**	**0.02**	**1**	**1**	**5**	**8**
Chlorinated VOCs												
1,1,1-Trichloroethane	113.65	1000	SW-02	-	-	-	-	-	-	-	-	-
1,1,2-Trichloro-1,2,2-Trifluoroethane	8.85	67	SW-25	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	80.68	800	SW-02	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	4.53	29	SW-02	580	13.0	-	0.01	0.05	0.3	2	-	-
1,2-Dichloroethane	11.14	95	SW-02	5,900	131	20,000	0.002	0.02	0.09	0.7	0.001	0.005
1,2-Dichloroethene, (Total)	81.40	760	SW-02	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	3.18	25	SW-23	2,625	58	5,700	0.001	0.01	0.05	0.4	0.0006	0.004
Chlorobenzene	3.45	30	SW-25	795	18	50	0.004	0.04	0.2	2	0.07	0.6
Chloroethane	11.35	130	SW-25	-	-	-	-	-	-	-	-	-
Chloroform	5.83	44	SW-23	1,445	32	1,240	0.004	0.03	0.2	1	0.005	0.04
Tetrachloroethene	12.58	150	SW-02	240	5.3	840	0.05	0.6	2.37	28	0.01	0.2
Tetrahydrofuran	43	78.5	SW-25	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	1.10	3	SW-19	-	-	-	-	-	-	-	-	-
Trichloroethene	34.15	560	SW-02	1,950	43	21,900	0.02	0.29	0.79	13	0.002	0.03
Trichlorofluoromethane	1.49	6	SW-25	-	-	-	-	-	-	-	-	-
Sub-total							**0.09**	**1**	**4**	**48**	**0.09**	**0.8**
Aromatic VOCs												
Benzene	10.19	110	SW-02	265.00	5.90	-	0.04	0.4	2	19	-	-
Ethylbenzene	7.11	73	SW-02	1600.00	36.00	-	0.004	0.05	0.2	2	-	-
Toluene	34.35	610	SW-02	635.00	14.00	-	0.05	0.96	2	44	-	-
Xylenes, (Total)	10.35	140	SW-02	-	-	-	-	-	-	-	-	-
Sub-total							**0.1**	**1**	**4**	**64**	-	-
Total Hazard Index							**8**	**34**	**113**	**555**	**97**	**580**
Bkgrd. Risk							**2**	**2**	**6**	**6**	**2**	**2**
% of total							**26%**	**6%**	**5%**	**1%**	**2%**	**0.3%**

* Indicates that the Rhode Island Water Quality Criteria is based on a water hardness of 25 mg/L.

"-" indicates that the AWQC for the contaminant of concern is unpublished at this time.

TABLE 4

Green Frog Tadpole and Aquatic Community Hazard Quotients and Indices for Surface Water of Aquatic Exposure Zone

Contaminants of Concern	Surface Water Concentration			AWQC			Hazard Quotients and Indices					
				Rhode Island		*Federal*	*Rhode Island*				*Federal*	
	Avg.	Max.	Location	acute	chronic	chronic	acute		chronic		chronic	
	ug/l	ug/l		ug/l	ug/l	ug/l	avg.	max.	avg.	max.	avg.	max.
Metals												
Aluminum	5,005	53,700	SW-26	-	-	748	-	-	-	-	7	72
Cadmium*	2.04	3.90	SW-05	0.82	0.38	1.1	2	5	5	10	2	4
Copper*	13.13	140.00	SW-26	4.80	3.62	12	3	29	4	39	1	12
Iron	18,737	230,000	SW-26	-	-	1000	-	-	-	-	19	230
Lead*	42.11	240.50	SW-15	13.98	0.54	3.2	3	17	77	441	13	75
Mercury	0.13	0.44	SW-26	2.40	0.012	0.012	0.05	0.2	11	37	11	37
Zinc	102.40	569.00	SW-15	36.15	32.75	110	3	16	3	17	0.9	5
Sub-total							**11**	**67**	**100**	**544**	**53**	**434**
Pesticides												
Methoxychlor	0.24	0.43	SW-13	-	-	0.03	-	-	-	-	8	14
Sub-total							**0**	**0**	**0**	**0**	**8**	**14**
PCBs												
Aroclor 1248	0.18	0.24	SW-26	2	0.014	0.014	0.09	0.1	13	17	13	17
Aroclor 1260	0.26	0.20	SW-15	2	0.014	0.014	0.1	0.1	18	14	18	14
Sub-total							**0.2**	**0.2**	**31**	**31**	**31**	**31**
Phthalates												
Bis 2-(Ethylhexyl) phthalate	4.48	7.00	SW-16	555	12	3.00	0.01	0.01	0.4	0.6	1	2
Dimethyl phthalate	4.89	7.00	SW-15	1650	37	3.00	0.003	0.004	0.1	0.2	2	2
Sub-total							**0.01**	**0.02**	**0.5**	**0.8**	**3**	**5**
Chlorinated VOCs												
1,1,1-Trichloroethane	3.95	44.00	SW-15	-	-	-	-	-	-	-	-	
1,1,2-Trichloro-1,2,2-Trifluoroethane	2.29	2.50	SW-15	-	-	-	-	-	-	-	-	
1,1-Dichloroethane	7.26	67.00	SW-15	-	-	-	-	-	-	-	-	
1,2-Dichloroethane	2.00	10.00	SW-05	5900	131	20000	0.0003	0.002	0.02	0.08	0.0001	0.001
1,2-Dichloroethene, (Total)	10.70	74.00	SW-15	-	-	-	-	-	-	-	-	
1,2-Dichloropropane	1.57	0.30	SW-14	2625	58	5700	0.001	0.0001	0.03	0.01	0.0003	0.00005
Chlorobenzene	1.66	2.00	SW-15	795	18	50	0.002	0.003	0.09	0.1	0.03	0.04
Chloroethane	4.93	33.00	SW-15	-	-	-	-	-	-	-	-	
Tetrachloroethene	1.59	2.00	SW-05	240	5.3	840	0.01	0.008	0.3	0.4	0.002	0.002
Tetrahydrofuran	11.67	20.00	SW-05	-	-	-	-	-	-	-	-	
Trichloroethene	1.41	1.00	SW-26	1950	43	21900	0.001	0.0005	0.03	0.02	0.0001	0.00005
Trichlorofluoromethane	1.96	4.00	SW-15	-	-	-	-	-	-	-	-	
Sub-total							**0.01**	**0.01**	**0.5**	**0.6**	**0.04**	**0.04**
Aromatic VOCs												
Benzene	1.59	2.00	SW-15	265	5.9	-	0.01	0.01	0.3	0.3	-	-
Toluene	18.83	165.00	SW-15	635	14	-	0.03	0.3	1	12	-	-
Xylenes, (Total)	1.70	3.00	SW-15	-	-	-	-	-	-	-	-	-
Sub-total							**0.04**	**0.3**	**2**	**12**	**0**	**0**
Total Hazard Index							**11**	**68**	**134**	**589**	**95**	**484**
Bkgrd. Risk							**2**	**2**	**6**	**6**	**2**	**2**
Bkgrd. as a % of Total							**14%**	**2%**	**4%**	**1%**	**2%**	**0.5%**

* indicates that the Rhode Island Water Quality Criteria is based on a water hardeness of 25 mg/L.

"-" indicates that the AWQC for the contaminant of concern is unpublished at this time.

TABLE 5

rce Control Alternatives Retained for Detailed Analysis

SC-1	No Action	o No further action at the Site.
SC-2	Thermally Enhanced Vapor Extraction	o Institutional controls to restrict access to both the disposal and the contaminated ground water. o Dewatering of the soils in the areas where vapor extraction is being performed with treatment and discharge of the ground water. o Hot air injection into the soils followed by vapor extraction to collect and remove the volatilized contaminants. o Catalytic oxidation of the volatilized contaminants in the air stream. o Excavation and off-site disposal of the surface soils contaminated with PCBs.
SC-3	Thermal Desorption	o Institutional controls to restrict access to both the disposal area and the contaminated ground water. o Dewatering of the soils in the areas where vapor extraction and excavation is being performed with treatment and discharge of the ground water. o Vapor extraction of the soils to reduce the contamination prior to excavation. o Excavation of the soils followed by thermal desorption to volatilize the contamination and thermal destruction of the volatilize contaminants.

TABLE 5

		o Excavation and off-site disposal of the surface soils contaminated with PCBs.
SC-4	Off-Site Incineration	o Institutional controls to restrict access to both the disposal area and the contaminated ground water.
		o Dewatering of the soils in the areas where vapor extraction and excavation is being performed with treatment and discharge of the ground water.
		o Vapor extraction of the soils to reduce the contamination prior to excavation.
		o Excavation and off-site disposal of the contaminated soils.

TABLE 5

'gration Management Alternatives Retained for Detailed lysis

MM-1	No Action	o Long-term monitoring of ground water, surface water, and sediments.
MM-2	UV/oxidation or air stripping of the Source and Concentrated Regions and air stripping of the Dilute Region	o Long-term monitoring of ground water, surface water, and sediments. o Ground water extraction in the concentrated and source regions of the plume followed by treatment with metal precipitation and UV/oxidation and carbon adsorption or air stripping and carbon adsorption and then return of treated ground water into the aquifer. o Ground water extraction in the dilute region of the plume followed by treatment with air stripping and carbon adsorption and then return of treated ground water into the aquifer.
MM-3	UV/Oxidation or Air Stripping of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region	o Long-term monitoring of ground water, surface water, and sediments. o Ground water extraction in the concentrated and source region of the plume followed by treatment with metal precipitation and UV/oxidation and carbon adsorption or air stripping and carbon adsorption and then return of treated ground water to the aquifer. o Natural Attenuation of the dilute region of the plume.

Summary - Source Control Final Alternatives - ' Farm Site

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Overall Protectiveness Human Health Protection				
- Ground water ingestion by future users	No reduction in risk.	In conjunction with migration management it would return ground water to its beneficial use within approx. 20 years. Without migration management it would return ground water to its beneficial use within approx. 40 years.	See SC Alternative 2.	See SC Alternative 2.
- Leaching of contaminants from soil into ground water	No reduction in risk.	Thermally enhanced vapor extraction would effectively remove the contaminants and prevent them from leaching into the ground water. A pilot test would be conducted to optimize the system.	Thermal desorption would effectively remove the contaminants, and prevent them from leaching into the ground water.	Thermal desorption would effectively remove the contaminants and prevent them from leaching into the ground water.
Environmental Protection				
- Ecological receptor exposure to surface soils	No reduction in risk.	Contaminated surface soils presenting an unacceptable risk to ecological receptors would be removed and disposed of off-site.	See SC Alternative 2.	See SC Alternative 2.

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Environmental Protection (cont.)				
- Impact on wetlands due to components of the remedial action	No remedial action would be installed; therefore, there would be no effect on the wetland through remedial action.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance (source area would need to be dewatered to implement remedial action).	See SC Alternative 2.	See SC Alternative 2.
Compliance with ARARs Chemical-Specific ARARs	Does not meet health- and risk-based ARARs in ground water in a reasonable time frame. Risk would be present for approximately 500 years.	Would meet health- and risk-based ARARs in the dilute, concentrated, and source regions in approx. 20 years with migration management. Without migration management the contaminated ground water would meet health- and risk-based ARARs in approx. 40 years.	See SC Alternative 2.	See SC Alternative 2.
Location-Specific ARARs	All location-specific ARARs would be met.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance, and, therefore, not meet location-specific ARARs for the wetlands (source area would need to be dewatered to implement remedial action).	See SC Alternative 2.	See SC Alternative 2.
Action-Specific ARARs	No action-specific ARARs since there would be no remedial action.	Would meet all action-specific ARARs including: State air emission regulations and all regulations for the return of the treated ground water into the aquifer.	See SC Alternative 2.	Would meet all action-specific ARARs including: State regulations for the return of the treated ground water into the aquifer and federal regulations on the transportation of hazardous waste.

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Long-Term Effectiveness and Performance Magnitude of Residual Risk				
- Remaining Untreated Waste	Risk to the ground water would be present for approximately 500 years.	The risk due to contamination in the soil and ground water would be permanently reduced through treatment in 20 years with migration management. Without mm, groundwater would continue to pose an unacceptable risk for 40 years	See SC Alternative 2.	See SC Alternative 2.
- Treatment Residuals Remaining	No treatment would be conducted; therefore, no residuals would be generated.	The treatment residuals would be disposed of in a manner to eliminate unacceptable risks. The metal hydroxide sludges from the precipitation unit would be disposed of at a hazardous waste landfill, the spent GAC would be returned to the vendor where it would regenerated, and the free products incinerated.	See SC Alternative 2.	The treatment residuals would be disposed of in a manner to eliminate unacceptable risks. The metal hydroxide sludges from the precipitation unit would be disposed of at a hazardous waste landfill, the spent GAC would be returned to the vendor where it would regenerated, and the free products incinerated.
Adequacy and Reliability of Controls	No controls over remaining contamination. No reliability.	The VOC and the SVOC contamination in the soils would be removed. A pilot study would be performed to optimize the technology.	The contamination in the soils would be removed; therefore, no long term controls would be needed. The remedial technologies selected to treat the soils are reliable.	See SC Alternative 3.

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Reduction of Toxicity, Mobility, or Volume Through Treatment				
Treatment Process Used and Materials Treated	None	Thermally enhanced vapor extraction of the VOCs and the more volatile SVOCs. Off-site treatment of the surface soil PCB contamination.	Thermal desorption of the VOCs and the SVOCs. Off-site treatment of the surface soil PCB contamination.	Off-site incineration of the VOCs, the SVOCs, and the surface soil PCB contamination.
Amount of Hazardous Substances, Pollutants, or Contaminants Destroyed/ Treated/Recycled	None	Significant reduction in contaminant concerntation would be achieved through treatment to achieve the cleanup levels in ground water. The percentage removal would be evaluated in a pilot test program. PCB contaminated soil treated off-site.	Significant reduction in contaminant concerntation would be achieved through treatment to achieve the cleanup levels in ground water. PCB contaminated soil treated off-site.	See SC Alternative 3.
Reduction of Toxicity, Mobility, or Volume through Treatment	None	Toxicity and volume contaminants in soil reduced to below cleanup level.	See SC Alternative 2.	See SC Alternative 2.
Degree to which Treatment is Irreversible	Not applicable No treatment	Completely irreversible	Completely irreversible	Completely irreversible
Type and Quantity of Residuals Remaining after Treatment	No reduction in original contaminants. No treatment.	The metal hydroxide sludges from the precipitation unit would be disposed of at a hazardous waste landfill, the spent GAC would be returned to the vendor where it would regenerated, and the free products incinerated.	See SC Alternative 2.	The metal hydroxide sludges from the precipitation unit would be disposed of at a hazardous waste landfill, the spent GAC would be returned to the vendor where it would regenerated, and the free products incinerated.

TABLE 6

Summary - Source Control Final Alternatives · o Farm Site (cont.)

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Degree to which treatment reduces hazards posed by principal threat	Not applicable. No treatment.	Treatment used to reduce principal threat significantly in the source area	See SC Alternative 2.	See SC Alternative 2.
Short-Term Effectiveness				
Short-Term Risks to the Community during Remedial Action	No additionalincrease over baseline risk would be posed.	There would be no increase in risk to the community due to the implementation of thermally enhanced vapor extraction. The contaminants extracted from the soil would either be condensed and treated off-site or destroyed in the catalytic oxidation system before the air stream is released to the environment. There would be a temporary increase in dust during impermeable liner installation.	Excavation would release volatile compounds and dust to the environment. A vapor extraction system would be operated prior to excavation to reduce volatile contaminants by 60% and engineering control measures would be taken to minimize remaining emissions.	Excavation would release volatile compounds and dust to the environment. A vapor extraction system would be operated prior to excavation to reduce volatile contaminants by 60% and engineering control measures would be taken to minimize remaining emissions. The trucks used to transport the material off-site would be a nuisance to residents. This would be minimized by constructing new roads.
Protection of Workers during Remedial Action	No increase over baseline risks would be posed.	There would be some impact from dermal contact and inhalation during excavation of PCB contaminated surface soil and the installation of the linier for vapor extraction. Protective measures would be taken to minimize risks. The majority of the contaminated soils would remain undisturbed.	There would be impacts from dermal contact and inhalation of VOCs and particulates during excavation and handling of the contamination. Protective measures would be taken to minimize risks.	See SC Alternative 3.
Environmental Impacts	No increase over baseline risk would be posed. Contaminants would continue to be present in the environment.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance.	See SC Alternative 2.	See SC Alternative 2.

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Time until Remedial Action Objectives are Achieved	The contamination in the soil would decrease to below the cleanup levels for the protection of ground water in approx. 500 years.	The contamination in the soil would decrease to below the cleanup levels for the protection of ground water in approx. 6 years, including a one year pilot study	The contamination in the soil would decrease to below the cleanup levels for the protection of ground water in approx. 6 years.	See SC Alternative 3.
Implementation Technical Feasibility	No construction is required.	The construction of the thermally enhanced vapor extraction system can be easily implemented; however, the operation may be moderately difficult. A pilot study would be performed prior to implementation to optimize the system. Additional remedial action can be implemented if necessary.	The construction of the thermal desorption system can be easily implemented; however, the operation may be difficult. Additional remedial action can be implemented if necessary.	The implementation of the excavation would be moderately difficult, and the transportation of the contaminated soil to an off-site facility would be very difficult.
Administrative Feasibility	There would be no need for state or local administrative coordination because there is no implementation of a remedial action.	State and local coordination would be required for the implementation of legal restrictions on the use of ground water on the site and the discharge of treated air and ground water to the environment. No permits required.	See SC Alternative 2.	See SC Alternative 2.
Availability of Services, Capacities, Equipment, Specialists, Materials, and Technologies	No services, capacities, ect. required	No special equipment, material, or specialists required. The equipment and operators to oversee the systems would be readily available. Vendors to supply GAC and to regenerate the spent GAC are available as are TSDFs to dispose of treatment residuals.	See SC Alternative 2.	No special equipment, material, or specialists required. The off-site capacity for the contaminated soil may be limited. Vendors to supply GAC and to regenerate the spent GAC are available as are TSDFs to dispose of treatment residuals.

Summary - Source Control Final Alternatives 'o Farm Site (cont.)

Criteria	SC Alt. 1 No Action	SC Alt. 2 Thermally Enhanced Vapor Extraction	SC Alt. 3 Thermal Desorption	SC Alt. 4 Off-Site Incineration
Cost Capital Cost	$0.00	$2.7 million with migration management $4.3 million without migration management	$1.9 million with migration management $3.5 million without migration management	$2.2 million with migration management $3.8 million without migration management
O&M Costs	$0.00	$1.4 million with migration management $4.1 million without migration management	$22 million with migration management $25 million without migration management	$99 million with migration management $100 million without migration management
Net Present Value of Capital and O&M Costs (using 5% interest rate)	$0.00	$4.1 million $8.4 million	$24 million $29 million	$101 million $104 million
State Acceptance	Detailed comments and responses available in Appendix D of ROD.	Detailed comments and responses available in Appendix D of ROD.	Detailed ocmments and responses availabel in Appendix D of ROD.	Detailed ocmments and responses availabel in Appendix D of ROD.
Community Acceptance	Detailed comments and responses available in *Appendix D of ROD.*	Detailed comments and responses available in *Appendix D of ROD.*	Detailed comments and responses available in *Appendix D of ROD.*	Detailed comments and responses available in Appendix D of ROD.

TABLE 7

Summary - Migration Management F[illegible] Alternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Overall Protectiveness Human Health Protection			
– Ground water ingestion by future users.	No reduction in risk.	In conjunction with source control would return ground water to its beneficial use within approx. 20 years. Without source control would return ground water to its beneficial use within approx. 500 years.	See MM Alternative 2
– Leaching of contaminants from soil into ground water.	No reduction in risk.	Pump and treat actively contains the migration of contaminated ground water but leaves soil contamination in place.	See MM Alternative 2
– Surface water or aquatic organism ingestion.	No reduction in risk.	Return of ground water to its beneficial use would eliminate discharge of contaminants to the surface water and reduce contaminants to below risk- and health-based cleanup levels.	See MM Alternative 2
Environmental Protection			
– Release of contaminants to the Unnamed Swamp	Allows continued release of contaminants to the swamp through the ground water.	Return of ground water to its beneficial use would eliminate discharge of contaminants to the surface water and reduce contaminants to below risk- and health-based cleanup levels.	See MM Alternative 2

Summary - Migration Management F .lternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Environmental Protection (cont.)			
– Ecological receptor exposure to contamination	Allows continued exposure of the ecological receptors to the contamination in surface water and sediments.	Return of ground water to its beneficial use would eliminate discharge of contaminants to the surface water and sediments and reduce contaminants to below ecological risk-based cleanup levels.	See MM Alternative 2
– Impact on wetlands due to components of the remedial action.	No remedial actions would be installed; therefore, there would be no effect on the wetland through remedial action.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance.	Would have less impact than Alt. MM2 on the wetland because a smaller volume of water is being removed and the return of the ground water to the aquifer would be easier.
Compliance with ARARs Chemical-Specific ARARs	Does not meet health- and risk-based ARARs in ground water in a reasonable time frame. Risk would be present for approx 500 years if no source control is implemented.	Would meet health- and risk-based ARARs in the dilute region of the ground water in approx. 8 years and assuming source control in the concentrated and source regions in approx. 20 years. Without source control the concentrated and source regions would meet health- and risk-based ARARs in approx. 500 years.	Would meet health- and risk-based ARARs in the dilute region of the ground water in approx. 20 years and assuming source control in the concentrated and source regions in approx. 20 years. Without source control the concentrated and source regions would meet health- and risk-based ARARs in approx. 500 years.

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Compliance with ARARs (cont.)			
Location-Specific ARARs	No location-specific ARARs.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance, and therefore, not meet location-specific ARARs for the wetlands.	Would have less impact than Alt. MM 2 on the wetland because a smaller volume of water is being removed and the return of the ground water to the aquifer would be easier; however, care would have to be taken to meet location-specific ARARs for the wetlands.
Action-Specific	No action-specific ARARs since there would be no remedial action.	Would meet all action-specific ARARs including: state air stripper regulations, air emission regulations from the air stripper, and all regulations for the return of the treated ground water into the aquifer.	See MM Alternative 2

Summary - Migration Management F ... lternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Long-Term Effectiveness and Performance Magnitude of Residual Risk			
– Remaining Untreated Waste	Baseline risk remains the same. Natural attenuation may eventually decrease the risk; however, risk would be present for approximately 500 years.	Control of the flow of contaminants would minimize the risk. Ground water would be restored to drinking water standards in the dilute region within 8 years and assuming source control in the concentrated and source regions in 20 years. Without source control, the risk in the concentrated and source regions would be reduced to within the NCP risk range in 500 years.	Control of the flow of contaminants would minimize the risk. Ground water would be restored to drinking water standards in the dilute region within 20 years and assuming source control int ch concentrated and source regions in 20 years. Without source contuol the risk in the concentrated and source regions would be reduced to within the NCP risk range in 500 years.
– Treatment Residuals Remaining	No treatment would be conducted; therefore, no residuals would be generated.	The treatment residuals would be disposed of in a manner to eliminate unacceptable risks. The metal hydroxide sludges from the precipitation unit would be disposed of at a hazardous waste landfill, and the spent GAC would be returned to the vendor where it would be regenerated and the solvents incinerated.	See MM Alternative 2

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Adequacy and Reliability of Controls	No controls over remaining contamination. No reliability.	The contamination in the ground water would be removed; therefore, no long-term controls would be needed after cleanup levels are achieved. The remedial technologies selected to treat the ground water are reliable while operating components of the system would require periodic replacements.	See MM Alternative 2
Reduction of Toxicity, Mobility, or Volume Through Treatment			
Treatment or Recycling Process Used and Materials Treated	None	Air stripping of the VOCs in the dilute region ground water with vapor GAC to remove VOCs in the air stream. UV/oxidation and GAC adsorption of the VOCs and SVOCs on air stripper with GAC adsorption and metal precipitation in the concentrated and source regions of the ground water.	No active restoration of the contaminants in the dilute region of ground water . UV/oxidation or air stripper with GAC adsorption of the VOCs and SVOCs and metal precipitation in the concentrated and source regions of the ground water.
Amount of Hazardous Substances, Pollutants or Contaminants Destroyed/Treated/Recycled	None	Contaminants in the dilute, source, and concentrated regions removed to reduce concentration of contaminants below drinking water levels.	Contaminants in the source and concentrated regions removed to reduce concentration of contaminants below drinking water levels. Contaminants in e dilute region would naturally attenuate.

Summary - Migration Management Alternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Reduction of Toxicity, Mobility, or Volume through Treatment	None	Toxicity, mobility, and volumes of contamination reduced in the dilute, source, and concentrated regions through treatment.	Toxicity, mobility, and volume of contamination reduced in the source and concentrated regions through treatments. Toxicity, mobility, or volume of the contaminants in the dilute region reduced through natural attenuation.
Degree to which Treatment is Irreversible	Not applicable. No treatment.	Air stripping and UV/oxidation are irreversible. The spent GAC would be regenerated by the vendor and the absorbed contaminants incinerated.	UV/oxidation are irreversible. The spent GAC would be regenerated by the vendor and the absorbed contaminants destroyed.
Type and Quantity of Residuals Remaining after Treatment	Not applicable.	The metal hydroxide sludges from the precipitation unit and any solids or free products from the equalization tank would be disposed of at a hazardous waste landfill and the spent GAC would be returned to the vendor where it would be regenerated and the absorbed contaminants incinerated.	See MM Alternative 2
Short-Term Effectiveness Short-Term Risks Posed to the Community during Remedial Action	No additional increase over baseline risks would be posed.	There would be no increase in risk to the community due to the implementation of the air stripper and UV/oxidation systems. The air stream from the stripper would be treated using GAC to limit the contaminants released to the environment.	There would be no increase in risk to the community due to the implementation of the UV/oxidation system or air stripper.

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Protection of Workers During Remedial Action	No increase over baseline risks would be posed.	There would be no increase in the risk to the workers due to the implementation of the air stripper and UV/oxidation systems. The air stream from the stripper would be treated using GAC to limit the contaminants released to the environment, and the spent GAC would be removed by the vendor.	There would be no increase in risk to the workers due to the implementation of the UV/oxidation system or air stripper. The air stream from the stripper would be treated using GAC to limit the contaminants released to the environment, and the spent GAC would be removed by the vendor.
Environmental Impacts	No increase over baseline risks would be posed. Contaminants would continue to be present in the environment.	Could potentially dewater part of the wetlands if treated ground water cannot be returned to the aquifer in a manner that would maintain the water balance.	Would have less impact than MM Alt 2 on the wetland because a smaller volume of water is being removed and the return of the ground water to the aquifer would be easier than MM Alt 2; however, care would have to be taken to meet location-specific ARARs for the wetlands.
Time until Remedial Action Objectives are Achieved	Does not meet remedial action objectives in ground water in a reasonable time frame. Ground water risk would continue for approx. 500 years if no source control is implemented.	Would meet remedial action objectives in the dilute region of the ground water in approx. 8 years and assuming source control in the concentrated and source regions in 20 years. Without source control the concentrated and source regions would meet remedial action objectives in approx. 500 years.	Would meet remedial action objectives in the dilute region of the ground water in approx. 20 years and assuming source control in the concentrated and source regions in approx. 20 years. Without source control the concentrated and source regions would meet remedial action objectives in approx. 500 years.

Summary - Migration Management I Alternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Implementation Technical Feasibility	No construction is required and the monitoring program can be easily implemented.	Construction and operation of the air stripper and the UV/oxidation system scan be easily implemented. Both the air stripper and the UV/oxidation system can be expanded as necessary if additional ground water needs to be treated.	Construction and operation of the UV/oxidation/air stripper system can be easily implemented. Both the air stripper or the UV/oxidation system can be expanded as necessary if additional ground water needs to be treated.
Administrative Feasibility	There would be no state or local administrative coordination because there is no implementation of a remedial action. Coordination would be required with the residents to monitor the residential wells. No permits would be required.	State and local coordination would be required for the implementation of legal restrictions on the use of ground water on the site and the discharge of treated air and ground water to the environment. Coordination would also be required with the residents to monitor the residential wells. No permits would be required.	See MM Alternative 2
Availability of Services, Capacities, Equipment, Specialist, Materials, and Technologies	Monitoring services would be readily available in area.	No special equipment, material, or specialists required. The equipment for the air stripper and UV/oxidation system and operators to oversee the systems would be readily available. Vendors to supply GAC and to regenerate the spent GAC are available as are TSDFs to dispose of treatment residuals.	See MM Alternative 2

TABLE 7

Summary - Migration Management Alternatives - Picillo Farm Site

Criteria	MM Alt. 1 No Action	MM Alt. 2 Air Stripper and UV/Oxidation	MM Alt 3. Natural Attenuation & UV/Oxidation
Cost			
Capital Cost	$0.00	$2.2 million	$1.6 million
Total O&M	$4.3 million	$12 million	$10 million
Net Present Value of Capital and O&M Costs (using 5% interest rate) (if performed in conjunction with active SC alternative).	$4.3 million over 500 years without source control.	$14.2 million over 20 years with source control.	$11.6 million over 20 years with source control.
State Acceptance	Detailed comments and responses available in Appendix D of ROD.	Detailed comments and responses available in Appendix D of ROD.	Detailed comments and responses available in Appendix D of ROD.
Community Acceptance	Detailed comments and responses available in Appendix D of ROD.	Detailed comments and responses available in Appendix D of ROD.	Detailed comments and responses available in Appendix D of ROD.

Chemical-Specific Applicable or Relevant and Appropriate Regulations (ARARs) for the Selected Remedy Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Ground Water	Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16, 141.61, 141.62)	Relevant and Appropriate	Enforceable cleanup standards have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in drinking water supplies.	The selected remedy will be assessed to determine compliance with SDWA MCLs for ground water.
	Ground Water	Resource Conservation and Recovery Act (RCRA) Ground water Protection Standard (40 CFR 264.94)	Relevant and Appropriate	The RCRA ground water protection standard is established for ground water monitoring of RCRA permitted treatment, storage, or disposal facilities. The standard is set at either an existing or proposed RCRA-MCL background concentration or an alternate concentration protective of human health and the environment.	RCRA MCLs shall be met for ground water.

Chemical-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Ground Water	U.S. EPA Ground Water Protection Strategy	To Be Continued	Provides objectives for classification and restoration of ground water based on its vulnerability, use, and value.	This strategy is considered in conjunction with the Federal SDWA and Rhode Island Water Quality Standards.
	Surface/Ground Water	SDWA Non-Zero MCL Goals (MCLGs) (40 CFR 141.50-141.51)	Relevant and Appropriate	Nonenforceable health goals for public water systems. The U.S.EPA has promulgated non-zero MCL Goals for specific contaminants.	Treatment will be conducted to meet non-zero MCL Goals.
	Surface/Ground Water	U.S. EPA Health Advisories (HA) and Acceptable Intakes (ADI)	To Be Considered	To provide guidelines for chemicals that may be intermittently encountered in public water supply systems.	HAs and ADIs are considered to assess health risks from contamination at the site.

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Chemical-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Surface Water	Clean Water Act (CWA) Sections 301-304; EPA 44/5-86-001, Ambient Water Quality Criteria (WQC) for Protection of Human Health and Aquatic Life (40 CFR 131)	Relevant and Appropriate	Nonenforceable guidance developed under the CWA, used by the state, in conjunction with a designated use for a stream segment, to establish water quality standards. WQC levels for protection of human health from consuming aquatic organisms (primarily fish) and for protection of aquatic organisms have been developed for several contaminants.	Ambient water quality criteria will be attained in surface waters at the end of remedial action, either through natural attenuation or active remedial measures.
	Soil	TSCA PCB Spill Clean-up Policy (40 CFR Part 761, Subpart G)	To Be Considered	Pertains to recent PCB spills (greater than 50 ppm PCB and occurring after 5/4/87) and establishes clean-up goals for sites depending on use and accessibility.	Used to determine the treatment of PCB contamination and the clean-up levels

Chemical-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	All (As Applicable)	U.S.EPA Risk Reference Doses (RfDs)	To Be Considered	RfDs are dose levels developed by EPA to determine protection against noncarcinogenic effects from contamination exposure.	RfDs will be considered to assess health risks from contaminants at the site.
	All (As Applicable)	U.S.EPA Carcinogen Assessment Group (CAG) Potency Factors	To Be Considered	To compute the incremental cancer risk from exposure to site contaminants.	CAG potency factors will be considered to assess health risks from contaminants at the site.
	All (As Applicable)	Health Effects Assessments (HEAs)	To Be Considered	To present toxicity data for specific chemicals for use in public health assessments.	HEAs will be considered to assess health risks from contaminants at the site.

Chemical-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements	Ground Water	Rhode Island Rules and Reguldations for Ground Water Quality (Regulation DEM-GW-01-92, July 1993)	Relevant and Appropriate	To protect and restore the quality of the state's ground water resources.	The selected remedy will be designed so that discharges to ground water: do not degrade a ground water's classification; do not further degrade a non-attainment ground water; and meet ground water quality standards and preventive action limits. Appropriate monitoring will be conducted to ensure compliance.
	Ground Water	Rules and Regulations for Public Drinking Water (R46-13-DWQ)	Relevant and Appropriate	To establish drinking water MCLs for a number of organic and inorganic contaminants. Adopts standards set forth in the federal SDWA.	Ground water will meet these standards in the selected remedy.

Chemical-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Surface Water	Rhode Island Water Quality Standards (Section 6)	Applicable	Classifies water use and defines water quality standards to protect public health and welfare, enhance the quality of State water, and serve the purposes of the CWA.	Surface waters will meet these standards through remediation of the ground water in the selected remedy.
	Surface Water	Rhode Island Water Quality Regulations (Effective 1/9/85; Amended 10/28/88)	Applicable	To restore, preserve, and enhance the quality of the waters of the state and to protect the waters from pollutants.	Surface waters will meet these regulations through remediation of the ground water in the selected remedy.

**Location-Specific Applicable or Relevant and Appropriate Regulations (ARARs) for the Selected Remedy
Picillo Farm Site, Coventry, Rhode Island**

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Sediment	Clean Water Act (CWA) Section 404(b) (40 CFR 230; 33 CFR 320-330)	Applicable	No discharge of dredged or fill material shall be permitted if there is a practicable alternative that has less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts on the aquatic ecosystem.	There will be no discharge of dredged or fill materials into wetlands.
	Sediment	Protecton of Wetlands Executive Order No. 11490 (40 CFR Part 6)	Applicable	Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands, and to avoid support of new construction in wetlands if a practical alternative exists.	No work will be conducted in the wetlands. Any adverse impacts to wetlands will be minimized.

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Location-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Surface Water	Fish and Wildlife Coordination Act (16 USC 661-666, 40 CFR 6.302(g))	Applicable	This regulation requires protection of fish or wildlife resources related to actions that control or modify water bodies. U.S. Fish and Wildlife Services must be consulted if any Federal Agency proposes to modify water bodies.	The selected remedy will be in compliance with this regulation. U.S. Fish and Wildlife has been consulted. (Note: Check to ensure F&W consultation.)
State Requirements	Ground Water	Rhode Island Rules and Regulations for Ground Water Quality (Regulation DEM-GW-01-92, July 1993)	Applicable to the extent that the standards are more stringent	To protect and restore the quality of the State's ground water resources.	The selected remedy will be designed so that discharges to ground water do not degrade a ground water's classification; do not further degrade a non-attainment ground water; and meet ground water quality standards and preventive action limits. Appropriate monitoring will be conducted to ensure compliance.

Location-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Sediment	Freshwater Wetlands Act (RIGL 2-1-18-27; Title 2, Chapter 1 §§18-27)	Applicable	To minimize physical alteration to wetlands so their beneficial functions can be preserved.	If the selected remedy requires removing, filling, dredging, or altering an RIDEM defined wetland, or conducting work within 50 feet of a wetland, it will be demonstrated that the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Remedial action will be conducted so that impacts to wetlands will be minimized or mitigated.

Location-Specific ARARs for the Selected Remedy (continued)
Picillo Farm Site, Coventry, Rhode Island

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Sediment	Rules and Regulations Governing the Enforcement of the Fresh Water Wetlands Act (August 1990)	Applicable	Establishes strict guidelines for the alteration of fresh water wetlands.	The selected remedy will be designed and conducted to minimize impact on wetlands. Sedimentation of fresh water wetlands will be prevented. The effect on drainage and/or runoff characteristics and wildlife habitat will also be considered. In addition, no work will be conducted in the wetlands.

Action-Specific Applicable or Relevant and Appropriate Regulations (ARARs) Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Air	Resource Conservation and Recovery Act (40 CFR 265, Subpart P)	Relevant and Appropriate	Regulations contain requirements for air pollutant emissions from thermal units.	The selected remedy shall meet the requirements set forth in this subpart.
	Air	Resource Conservation and Recovery Act (40 CFR 264, Subpart AA)	Relevant and Appropriate depending on concentration of emission	Regulations contain air pollutant emmission standards for process vents, closed vent systems, and control devices at hazardous waste treatment, storage, and disposal facilities.	The selected remedy shall meet the requirements of these regulations set forth in this subpart.
	Air	Clean Air Act (40 CFR 61.348)	Relevant and Appropriate	Regulations establish the hazardous air pollutant emission standard for benzene.	The selected remedy shall meet the requirements of these regulations for benzene emissions.
	Air	Clean Air Act (40 CFR 61.63)	Relevant and Appropriate	Regulations establish the hazardous air pollutant emission standard for vinyl chloride.	The selected remedy shall meet the requirements of these regulations for vinyl chloride emissions.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Air	OSWER Directive 9355.0-28: Air Stripper Control Guidance	To Be Considered	This document provides guidance on the control of air emissions from air strippers used at Superfund sites.	This document will be considered if an air stripper, as provided for in the selected remedy, is required.
	Air	USEPA Region I Memo from Louis Gitto to Merrill Hohman (July 12, 1989)	To Be Considered	Superfund air strippers in ozone non-attainment areas will generally merit controls on VOC emissions.	This document will be considered if an air stripper, as provided for in the selected remedy, is required.
	Sediment	Interim Sediment Quality Criteria	To Be Considered	These criteria were developed by U.S. EPA for certain hydrophobic organic compounds, including PCBs, to protect benthic organisms. The criteria for PCBs is 19.5/g PCB/g carbon.	If sediments need to be remediated, the cleanup levels developed for sediments will be consistent with interim criteria.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Soil	Toxic Substance Control Act (40 CFR 761)	Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm	All materials that contain PCBs at concentrations of 50 ppm or greater shall be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. On-site storage facilities for PCBs shall meet, at a minimum, the following criteria: (1) Adequate roof and walls to prevent rain, (2) Adequate floor with continuous curbing, (3) No openings that would permit liquids to flow from curbed area, and (4) Not located at a site that is below the 100-year flood water elevation.	The selected remedy will meet these regulations for PCB-contaminated materials stored, treated, or disposed of.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements (Cont.)	Surface Water	Clean Water Act National Pollutant Discharge Elimination System (40 CFR Parts 122 and 125)	Applicable	Regulates the point source discharge of water into public surface waters.	Requirements of these regulations will be met if treated ground water is discharged to surface waters.
State Requirements	Air	Air Pollution Control Regulation No. 1: Visible Emissions (Section 1)	Applicable	Sets limits on opacity of emissions.	The selected remedy will require control of visible emissions if 20 percent opacity is exceeded for more than 3 minutes in any hour.
	Air	Air Pollution Control Regulation No. 17: Odors (Section 17)	Applicable	This regulation prohibits the emission of any air contaminant or combination of air contaminants which create an objectionable odor beyond the property line of the site.	Odorous emissions from remediation activities must be monitored and controlled, if necessary, to prevent objectionable odors beyond the property line.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Air	Air Pollution Control Regulation No. 22: Air Toxics (Section 22)	Applicable	This regulation prohibits the emission of specified contaminants at rates which would result in ground level concentrations greater than acceptable ambient levels set in the regulation.	The selected remedy will be constructed such that emission levels listed in this regulation will be met.
	Air	Air Pollution Control Regulation No. 5: Fugitive Dust (Section 5)	Applicable	Requires that reasonable precautions be taken to prevent particulate matter from becoming airborne.	The selected remedy must use good industrial practices to prevent causing airborne particulate matter.
	Air	Air Pollution control Regulation No. 15: Organic Solvent Emissions (Section 15)	Applicable	This regulation sets limits on the amount of organic solvents emitted into the atmosphere.	Emissions of organic solvents will be controlled to ensure that the standards are met.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Air	Rhode Island Policy on Permitting Air Strippers	To Be Considered	Establish permitting requirements for air stripper installations.	This document will be considered if an air stripper needs to be implemented. This document will guide discussions with RIDEM regarding the use of air strippers in remedial actions.
	Waste	Rhode Island Hazardous Waste Rules and Regulations (Section 8)	Relevant and Appropriate	Outlines requirements for general waste analysis, security measures, inspections, and training requirements.	The selected remedy will be constructed, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained.
	Waste	Rhode Island Hazardous Waste Rules and Regulations (Sections 9.18, 9.19)	Relevant and Appropriate	Outlines operational requirements for proper and safe management and conditions for containers and tanks regarding treatment, storage, and disposal facilities.	The selected remedy will conform with the proper and safe usage of tanks and containers in accordance with these requirements.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Ground Water	Rhode Island Rules and Regulations for Ground Water Quality (Regulation DEM-GW-01-92, July 1993)	Relevant and Appropriate	To protect and restore the quality of the state's ground water resources.	Remedial actions will be designed so that discharges to ground water: do not degrade a ground water's classification; do not further degrade a non-attainment ground water; and meet ground water quality standards and preventive action limits. Appropriate monitoring will be conducted to ensure compliance.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Ground Water	Rhode Island Underground Injection Control Program Rules and Regulations (June 1984)	Applicable	Regulations preserve the quality of the ground water from contamination by discharge into injection wells and other subsurface waste disposal of hazardous and other wastes. Regulates proper location, design, construction, maintenance, and operation of injection wells and other subsurface disposal systems to prevent ground water contamination.	If treated water is reinjected into the aquifer, Class V wells will be designed, constructed, and operated in accordance with these regulations so as to prevent ground water contamination.
	Surface Water	Rhode Island Water Quality Regulations (Sections 7, 8, 10, and 17)	Applicable	No person shall place or discharge pollutants into any waters of the State unless the discharge complies with effluent standards and limitations.	If treated water is discharged into surface waters, the selected remedy will be designed so that discharge to surface water will meet water quality standards and limitations.

Action-Specific ARARs
Picillo Farm Site, Coventry, Rhode Island for the Selected Remedy

Authority	Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements (Cont.)	Surface Water	Rhode Island Water Quality Standards (Section 6)	Applicable	Classifies water use and defines water quality goals to protect public health and welfare, enhance the quality of state water, and serve the purposes of the CWA.	If discharges to surface waters from the remedial action is necessary, these discharges must meet these standards.

APPENDIX C

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

STATE OF RHODE ISLAND CONCURRENCE LETTER

State of Rhode Island and Providence Plantations
Department of Environmental Management
Office of the Director
9 Hayes Street
Providence, RI 02908

send to
Mel Hoffman,
Bill Walsh-Rogalski.

23 September 1993

Paul Keough
Acting Regional Administrator
Environmental Protection Agency, Region 1
John F. Kennedy Federal Building
Boston, MA 02203-2211

RE: Record of Decision for the Picillo Farm Superfund Site, Coventry, Rhode Island

Dear Mr. Keough:

This is to advise you that the State of Rhode Island concurs with the selected remedy detailed in the September 1993 Record of Decision for the Remedial Action of the Picillo Farm Superfund site. This concurrence is based upon all aspects of the abovementioned Record of Decision being adequately addressed and implemented during design, construction and operation of the remedy.

The Department wishes to specifically emphasize the following aspects of the Record of Decision:

- The remedy as proposed and implemented must ensure compliance with all applicable or relevant and appropriate State and Federal statues, regulations and policies.
- Contaminant specific interim cleanup goals, as stated in this Record of Decision, are an acceptable short term strategy. However, the long term remedial objective is to restore the site to acceptable levels that satisfy the remedial risk goals for an anticipated future use as a possible residential area.
- This remedy must identify institutional controls that are applicable throughout the remedial action project life, which are protective of human health. Also, in the event that the remedial risk goals cannot be achieved, long-term controls (applicable after the remedy is terminated) must be instituted to prevent an unacceptable risk to human health and the environment.

- The Record of Decision states that extracted groundwater will be treated by ultraviolet (UV)/oxidation and carbon adsorption <u>or</u> air stripping and carbon adsorption. Based upon its long-term effectiveness and on-site destruction capabilities of contaminants, the State prefers the implementation of (UV)/oxidation over air stripping. Air stripping transfers contamination to another media rather than offering destruction ability.

Finally, I urge EPA to make every effort to assure that the remedy will be implemented in a timely and efficient manner.

Thank you for providing us with an opportunity to review and concur with this important Record of Decision.

Sincerely,

Louise Durfee, Director
Department of Environmental Management

cc: James Fester, Associate Director, DEM
Merill Hohman, Director, EPA Region I Waste Management Division
Dick Boynton, Chief, RI Superfund Section
Terrence Gray, Chief, DEM Division of Site Remediation
Claude Cote, Esq. DEM Office of Legal Services
Warren Angell, Supervising Engineer, DEM Division of Site Remediation
Anna Krasko, Remedial Project Manager

PIC.ROD/jb

APPENDIX D

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

RESPONSIVENESS SUMMARY

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION I

SUPERFUND

RESPONSIVENESS SUMMARY
PICILLO FARM SITE
COVENTRY, RHODE ISLAND

SEPTEMBER 1993

Table of Contents

A. Introduction

The U.S. Environmental Protection Agency (EPA) held a 30-day public comment period from June 30, 1993 to July 29, 1993 to provide an opportunity for interested parties to comment on the Remedial Investigation (RI), the Feasibility Study (FS), and the Proposed Plan prepared for the Picillo Farm Superfund Site in Coventry, Rhode Island. EPA made a preliminary recommendation of its preferred alternative for the Site cleanup plan in the Proposed Plan issued on June 15, 1993, before the start of the public comment period. A collection of all documents used by EPA in choosing this alternative was made available for review at the EPA Records Center (90 Canal Street, Boston, MA) and at the Coventry Public Library (1672 Flat River Road, Coventry, RI). These documents are known collectively as the Administrative Record.

The purpose of this Responsiveness Summary is to document EPA responses to the comments and questions raised during the public comment period. The comments submitted during the public comment period are available in the Administrative Record for the Picillo Farm Superfund Site. EPA considered all of the comments before selecting a final remedial alternative to address contamination at the Site. The final remedial alternative is described in the Record of Decision.

B. Overview of Remedial Alternatives Considered in the Feasibility Study and Proposed Plan

Using information gathered during the Remedial Investigation, the Human Health Risk Assessment, and the Ecological Risk Assessment, EPA identified several cleanup objectives for the Site. The primary cleanup objective is to reduce the risks to human health and the environment posed by exposure to the on-site source areas and to contamination that has migrated, or may potentially migrate, off site.

After identifying the cleanup objectives, EPA developed and evaluated potential cleanup alternatives, called remedial alternatives. The Feasibility Study report describes in detail all of the remedial alternatives considered for addressing contamination at the Site. The Proposed Plan summarizes each of the remedial alternatives which were considered, and describes EPA's preferred alternative. The alternatives considered were the following:

Source Control Alternatives

SC-1: No Action
SC-2: Thermally Enhanced Vapor Extraction
SC-3: Thermal Desorption
SC-4: Off-Site Incineration

Management of Migration Alternatives

MM-1: No Action
MM-2: UV/Oxidation or Air Stripping and Carbon Adsorption of the Source and Concentrated Ground water Regions and Air Stripping with Carbon Adsorption of the Dilute Ground water Region
MM-3: UV/Oxidation or Air Stripping and Carbon Adsorption of the Source and Concentrated Ground water Regions and Natural Attenuation of the Dilute Ground water Region

The preferred alternative selected by EPA to address the Site contamination includes:

- Alternative SC-2 which involves treating soil contaminated with volatile organic compounds and semi-volatile organic compounds on Site using an enhanced vapor extraction system. In addition, surface soil contaminated with polychlorinated biphenyls (PCBs) would be excavated and disposed of off site in an EPA-approved landfill.

- Alternative MM-3 which involves extraction and on-site treatment of the concentrated and source regions of the ground water contamination plume and allowing the dilute portion of the ground water contamination plume to naturally attenuate.

After a careful review of the comments made during the public comment period EPA documented the selected remedy in the Record of Decision. Source Control and Management of Migration alternatives considered for the Picillo Farm Site are described in detail in the Feasibility Study and Proposed Plan.

C. Overview of Public Reaction to the Agency's Preferred Alternative

Judging from the comments received during the public comment period, the residents and the Rhode Island Department of Environmental Management (RIDEM) support the extracting and treating of the contaminated ground water and the selected contaminated soil treatment system which uses thermally enhanced vapor extraction. They did, however, have strong concerns regarding the specifics of the residential well monitoring program.

The potentially responsible parties (PRPs) did not support the preferred alternative. They did not feel that the Site warranted a cleanup at this time, in particular, they opposed any ground water cleanup.

D. Background on Community Involvement

Community interest in the Picillo Farm Superfund Site dates to 1977 after an explosion occurred at the Site. In July 1980, a citizen's group called Save Our Water (SOW) was organized to represent local citizen concerns over contamination at the Site and its potential impact on local residents. There has been significant community interest in the Site over the past few months in response to the Proposed Plan. On June 29, 1993, over 50 people attended a public informational meeting held by EPA and several residents provided comments during the public comment period.

The major community concern identified in the Community Relations Plan (September 7, 1990) and during the public comment period was the drinking water quality in the vicinity of the Site. Residents are concerned that the ground water contamination plume will reach their private drinking water supplies and were concerned about frequency of the residential well monitoring. They are also concerned about more private wells being installed, which could change the contaminated ground water flow and contaminate other wells.

E. Summary of Public Comments Received During Public Comment Period and Agency Responses

This Responsiveness Summary addresses comments received by EPA during the public comment period (June 30, 1993 through July 29, 1993).

Part A: Summary of Comments Received from Residents and Interested Parties

Both oral and written comments on EPA's Proposed Plan were received from residents of Coventry, Rhode Island, and a neighboring community. Written comments were also received from a Rhode Island based environmental advocacy group and a private thermal oxidation manufacturing firm.

Comment A-1: Several residents in the area commented on the residential well sampling program. They felt that wells in the area should be tested periodically throughout the whole 20 years that it takes for the cleanup of the ground water contamination. In addition, they stated that a commitment was made by the RIDEM and the RIDOH in the early 1980s to test the residential wells within one-half mile of the Site every six months, and drinking water testing has not been conducted that often. The residents felt that their wells should be tested every six months.

EPA's Response: Residential well monitoring was initiated in the late 1970s, soon after the Site was discovered, when little data existed about the extent and movement of ground water contamination at the Site. Since then, 75 monitoring wells have been installed at, and near, the Site in order to delineate and to monitor the contaminated ground water plume. Residential wells in the area have been monitored on an approximately yearly basis for more than ten years and none were found to be contaminated. Based upon the data available at this time, EPA and RIDOH are planning to monitor residential wells annually within approximately one-half mile area at the early stages of the cleanup activities. This testing will include new residences which have been constructed since the early 1980s. As the soil and ground water are being cleaned up, based on evaluation of the monitoring data, EPA will periodically evaluate the extent and frequency of sampling of residential wells in the vicinity of the Picillo Farm Site.

Comment A-2: Several residents requested clarification on the following issues:

- The exact placement of the sentinel wells (including how far these wells are from the residents and from the contamination).
- How long it would take for the contamination to reach the residential wells, once it was detected in the sentinel wells.
- What notification procedures for the residents would be used and what actions would be taken if contamination was detected in the sentinel wells.

EPA's Response: Sentinel wells would be located beyond the margins of the contaminant plume, in regions of non-contaminated ground water between the disposal area and the residential wells, to monitor any contaminated plume migration. It is currently anticipated that these wells will be placed to the northeast, and west of the former disposal Site. The exact locations and number of wells have not been determined at this time; placement will be determined as part of the preliminary remedial design based on the hydrogeological characteristics of the area. Each well would probably be located at least 1,000 feet from the nearest residential well and monitored at least annually.

Combined with monitoring of a selected group of the existing monitoring wells installed by EPA, sufficient warning of plume migration would be available. Should the plume reach a sentinel well, EPA would notify the nearest residents. However, with the implementation of the selected ground water alternative, it is not anticipated that contamination will reach the sentinel wells given the preferred alternative for ground water containment through extraction and treatment that EPA is proposing.

Comment A-3: A commenter stated that the 30 days was an insufficient amount of time for the citizens to become fully educated and to properly prepare to comment on the Proposed Plan.

EPA's Response: The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the rules and regulations under which EPA conducts Superfund response actions, specifies that EPA is to provide a reasonable opportunity, not less than 30 calendar days for submission of written and oral comments on the Proposed Plan and the supporting information. Throughout the remedial investigation and feasibility study (RI/FS), EPA has made technical documents available for review at the information repository located in the Coventry Public Library and at 90 Canal Street in Boston. EPA mailed the Proposed Plan to addressees on the mailing list two weeks in advance of the public comment period and held its public meeting early in the comment period to explain the proposed clean up plan and to address questions. Finally, interested parties may request an extension of the comment period for an additional 30 days if they believe more time is necessary to review the information. After follow-up discussions with this commenter to verify whether an extension was being requested, it was confirmed that no extension had been requested.

Comment A-4: A representative of a local environmental group commented that there was no mention of surface water cleanup in the proposed plan. The commenter asked if the surface water will be addressed as part of the cleanup.

EPA's Response: The surface water is currently contaminated as a result of contaminants in the ground water which discharges into the surface water at various seeps. After discharge to the surface water, contaminants either remain in the surface water, are sorbed to sediment particles or volatilize (evaporate) into the air. The ground water remedial measures will provide for the cleanup of surface water by eliminating the transport of contaminated ground water to the surface water. The contamination currently present in the surface water will naturally attenuate over a relatively short time period (approximately 20 years), once discharge of the contaminated plume to the surface is reduced by extraction and treatment of the most contaminated regions of the plume.

Comment A-5: A resident requested that EPA proceed with the proposed plan and not wait for funding in order to avoid delaying the cleanup if negotiations are tied up in litigation.

EPA's Response: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, gives EPA the authority to enter into agreements with potentially responsible parties to perform response actions when it is in the public interest and will expedite effective remedial actions and minimize litigation. It is EPA policy to set time frames for responsible parties to indicate their willingness to conduct remedial actions under Superfund. These procedures are called Special Notice and set a time frame of 60 days after receiving special notice for the responsible parties to make a proposal to EPA for undertaking or financing a remedial action. Should these procedures be unsuccessful, EPA has the option of ordering the responsible parties to conduct the remedial action or to finance cleanup itself using Superfund monies.

Comment A-6: A resident requested that a Rhode Island Department of Environmental Management (RIDEM) representative be at the Site during all operations.

EPA's Response: EPA's policy is to notify the RIDEM of all Site activities and give RIDEM the opportunity to observe all field activities. EPA also finances RIDEM's superfund oversight through a cooperative agreement with the State of Rhode Island. However, RIDEM makes independent decisions on the scope and extent of its oversight of Superfund response actions.

Comment A-7: A commenter suggested that EPA should send copies of all correspondence, reports, data, etc., to Save Our Water, the Town of Coventry, RIDEM, and RIDOH for review. A resident commented that town officials should be notified of the progress on the Site on a monthly basis. In addition, several residents suggested that periodic meetings should be held to inform the community concerning the progress of the clean-up activities.

EPA's Response: Currently, EPA sends site-related technical documents for review and comment to RIDEM, which, in turn, may forward the material to any other state agencies, such as RIDOH. In addition, copies of all documents EPA considered in selecting the remedy for the Site were regularly forwarded to the information repository. Fact sheets explaining progress at the Site or public informational meetings may be scheduled at pivotal stages of the project such as at the completion of the design phase for the selected cleanup option or prior to commencing field activities. EPA will contact the Town Manager periodically to notify him of significant Site events and progress. EPA staff may be contacted by telephone or in writing to request information on the Site activities.

Comment A-8: Several residents stated that EPA did not specify whether technicians or trained personnel will be on Site monitoring the daily operation of both the ground water and soil treatment systems. The residents also asked whether contaminated air and water would be contained within the Treatment Building if the treatment system failed. They stated that in the event of a failure of one of the treatment systems, the nearby residents should be notified and these notification measures should be specified by EPA. Finally, the residents stated that a plan should be implemented to insure the safety of the community.

EPA's Response: EPA and/or its contractor will be present on the Site to oversee the operations of the treatment systems. In the event of a failure in the vapor extraction system upstream of the vacuum pump, the system would no longer pump contaminated vapors from the soil, and therefore no contaminants would be released to the atmosphere. The piping downstream of the ground water pumps or the vacuum pump would be monitored by automated flow controllers, and if one of the pipes was to rupture, flow would be stopped at the flow controller. Once flow was stopped at the flow controller, the system would automatically shut down and sound an alarm to notify the proper individuals to check the system. Using this type of control system, the chance of a release to the environment would be minimized.

A Site Health and Safety Plan will be prepared prior to commencing the field activities and will contain contingencies in the event of an emergency. All field workers will receive hazardous material emergency response training and will be required to sign off on the Plan and to implement the Plan in the event of an emergency. In the event of an accidental release of a chemical(s) or contaminated ground water or soil such that a potential danger is posed to nearby residents, EPA will notify the residents, local authorities, the RIDEM, as well as EPA's Environmental Services Division who have the capability of responding to chemical spills and emergencies.

Comment A-9: Several residents commented that nearby families should be notified in advance when certain phases of the cleanup plan are implemented by means other than the newsletters.

EPA's Response: EPA will contact the Town Manager when significant phases of cleanup activities are to be implemented. In addition, information updates will be sent to the local newspapers for publication. The Kent County Daily Times and the Providence Journal usually cover the Site activities. Information updates for the cleanup activities mailed to those on the Site mailing list, will include detailed schedules so local residents will know what Site activities to expect.

Comment A-10: A resident commented that EPA should send a truck traffic schedule to the schools when schools are in session during truck traffic times. In addition, the resident commented that trucks should not be on Perry Hill Road at the time school buses are traveling on that road.

EPA's Response: EPA will inquire about the school bus schedule in the vicinity of the Site and will make every attempt to minimize truck traffic during those times when school buses travel on nearby roads, Perry Hill Road in particular.

Comment A-11: A resident commented that Perry Hill Road is in poor condition already, and the heavy equipment traveling into the Site may further destroy the road. The commenter felt that EPA should take measures to repair the road if the Site related traffic further destroy it.

EPA's Response: EPA is prohibited from using Fund monies for activities that are not directly the result of a release(s) of hazardous substances. For example, EPA may not use Fund monies for improvements to roadways that are already in poor condition. EPA's contractors are, however, responsible for any damage that they cause to private and public property during their work to conduct cleanup activities. These contractors are also required to carry liability insurance to cover property damage claims. Should responsible parties conduct the work, EPA will require PRPs to provide similar assurances for their contractors' work.

Comment A-12: One of the commenters stated that a right-of-way

(Piggy Hill Lane) to the Site exists on his property. The commenter expressed concern about road damage during construction and requested that his property rights be respected.

EPA's Response: The proposed plan is essentially a conceptual design of the most appropriate remedial measures for the Picillo Farm Site. Once this plan is approved, and a Record of Decision is signed, the conceptual plan is developed further with actual design specifications and drawings. During the design phase of the remediation, all aspects of the construction are evaluated to determine potential impacts to the local residents and environment. Prior to start of field activities, an access agreement would have to be signed by residents to allow EPA access to their property. The contractor constructing the remedial system will be required by contractual agreement to follow any measures within the contract including those intended to prevent any potential adverse impacts to the local residents. EPA contractors are responsible for any damages that they cause to private and public property.

Comment A-13: One resident commented that alternative MM-2 (which includes active treatment of the dilute zone of the ground water contamination plume) is preferable to the MM-3 alternative which does not actively treat the dilute portion of the contaminated plume. The commenter stated that the selection of alternative MM-3 is not consistent with the National Superfund Objectives because it does not minimize untreated waste to the extent practicable; it does not offer the same protection of human health and the environment as MM-2; it uses the wetlands as a sink for untreated contaminants in the diluted ground water plume; and its choice as a preferred alternative appears to be justified on cost alone rather than protection of human health and the environment. The commenter also believes that gaps in the data, such as uncertainty in PCB data, extent of the distal portion of the plume, and degree of biogeochemical attenuation, are further reasons for not relying on natural attenuation for treatment of the dilute ground water.

EPA's Response: The groundwater plume was divided into regions during the feasibility study because significant variation in contaminant identity and concentrations could warrant different treatment technologies. As described in the ROD, the three regions were delineated based on total volatile concentrations. In addition, the source and concentrated regions encompass an area where most of the SVOCs were found, which are more difficult to treat than VOCs.

Alternative MM-3 was selected based on the nine evaluation criteria as described in the Record of Decision. Alternative MM-3 relies on natural attenuation of the dilute region of the plume, which is estimated to take approximately 20 years. Alternative MM-2 utilizes treatment of the dilute portion of the plume which is estimated to take approximately 8 years. However, the restoration time of approximately 20 years for the source and concentrated regions of the plume is similar in both alternatives. Thus, the active remediation of the dilute region of the plume would not be able to speed the overall remediation timeframe. In addition, extracting the ground water in the dilute region in Alternative MM-2 would have a greater adverse impact on the wetlands than allowing the low concentration of contaminants to reach the wetlands once the dilute region is isolated by extracting and treating the source and concentrated regions of the plume. It should also be noted that there has been no evidence of Dense Non-Aqueous Phase Liquids (DNAPLs) in the dilute region of the plume.

With regard to uncertainty in the PCB data for sediment and surface water, the ROD specifies additional data collection at the pre-design stage to verify presence of PCBs in these media and to determine if active remediation of the sediment is warranted.

Although detectable levels of contaminants were found in MW-68 (2,500 feet southwest of the disposal area) and MW-40A and 40-B (2,500 west of the disposal area), these detectable levels are in the low parts per billion concentration range, and the contaminated ground water plume which exceeds cleanup levels is delineated over a smaller area.

Installation of monitoring wells is difficult in the open area of the Unnamed Swamp, however the monitoring program specified in the ROD includes an option of installing additional sampling points in that area to monitor changes in contaminant concentration as the cleanup progresses. Extraction and treatment of the ground water in the source and concentrated regions of the plume is expected to limit further contaminant discharge in currently contaminated surface water. The significantly lower concentration of contaminants in surface water as compare to the concentrations in ground water and the decrease of contaminants downgradient of discharge points indicates that main processes of natural attenuation (i.e., dilution, volatilization, biodegradation adsorption, and chemical reactions) are reducing contaminant concentrations. Once the ground water is extracted and treated in the source and concentrated regions of the plume, discharge of contaminants into the dilute region of the plume and the wetlands will be reduced.

Since it is difficult to quantify each of the natural processes, the natural attenuation of the dilute region of the plume will be monitored as part of a long-term environmental monitoring program and the impact on the wetlands will be evaluated at least every five years. If the natural attenuation is not progressing as expected or a new technology is available, EPA may recommend changes to the remediation plan at that time.

Comment A-14: A resident commented that the highly localized variability of soil porosity, permeability, and/or transmissivity is readily acknowledged by EPA's technical consultant. The commenter questioned how elevated gas pressures would promote uniform treatment of a three-dimensional soil mass if selective transmission channels through the soil are likely to occur. Phases of the soil mass would be effectively treated while other phases would be isolated from the main gas channel. The commenter asked if soil temperatures will be elevated to such a degree that thermal conduction will effect volatilization throughout the entire mass.

EPA's Response: Thermally enhanced vapor extraction is not intended to increase the gas pressure in the soils, but instead to elevate the temperature of the air in the soil and thereby increase the volatility of the residual contamination. If there are portions of the soil mass that are not being effectively treated due to preferential flow patterns, EPA will consider modifying the location of the injection wells or the extraction wells to increase air flow to this part of the soil. The conduction of heat through the soil mass will be one of the parameters that will be considered during the pilot study.

Comment A-15: A commenter questioned whether the selected alternative would be discontinued if test results were not favorable. In addition, the commenter expressed concern that the 60% to 70% treatment efficiency will be determined through use of an extended sample averaging. The commenter felt that a treatment standard of 90% should be expected, rather than 60 to 70%, and that thermal desorption (SC-3) would provide a greater treatment efficiency.

EPA's Response: The treatment efficiency of the thermally enhanced vapor extraction system would depend on the initial concentrations in the area being treated because the objective of the remediation is to reduce the contamination in the soil below the established cleanup levels. In the areas near the trenches this would mean a treatment efficiency of 90 to 99%. The treatment efficiency for vapor extraction in Alternatives SC-3 and SC-4 would only be 60 to 70% in order to reduce the volatile organic concentrations prior to excavation. In alternatives SC-3 and SC-4 in-situ treatment is not required to meet cleanup levels. EPA may consider other enhancement to the vapor extraction system based on results of the pilot test.

Comment A-16: A Rhode Island environmental group commented that Alternatives SC-2 and MM-3 (the preferred alternatives) are the best methods for treating the contaminated soil and ground water. This commenter expressed concern that because Alternative SC-2 employs innovative technology and will need to be pilot-tested, unforeseen delays could arise that would hinder the cleanup operation. In addition, the commenter expressed reservations on the length of time it will take for the dilute portion of the plume to naturally attenuate with Alternative MM-3.

EPA's Response: The pilot tests that are to be conducted at the Picillo Farm Site would be designed to be an initial phase of cleanup, and not just as a pilot test program. To accomplish this, the pilot system will be designed as a module of the full-scale system with the vapor extraction and hot air injection wells installed in a manner which allows them to be used in the full-scale system. In addition, the objective of the pilot program will be to collect operating data, and to begin the remediation of the Site. This will not only allow EPA to begin the remediation quickly, but also to collect additional data that can be used to fine tune the rest of the Site cleanup and to ensure the most effective Site cleanup possible.

An additional concern was the length of time that the dilute portion of the plume would take to naturally attenuate. The dilute portion of the plume will be continually monitored in order to ensure that the contamination source has been isolated from the dilute plume and that natural attenuation is occurring at a rate which will lead to obtaining the remedial cleanup objective in a reasonable timeframe. At least every five years, EPA will review the data that has been collected and determine if the selected remedial alternative is working effectively and will reach the remedial objectives within the estimated time frame. If the system is not working as expected or a new technology is available, EPA can recommend changes to the remediation plan at that time.

Comment A-17: One commenter suggested that the patented Closed Loop Oxidation System (CLOS) by MRK Incineration can be used to desorb and destroy the thermally desorbed soil contaminants to carbon dioxide and water with no emissions to the atmosphere.

EPA's Response: Catalytic oxidation as a process option was selected for evaluation in the detailed analysis as a representative process option based on the effectiveness, implementability and cost evaluation for treating similarly contaminated air streams with concentrations and flow rates similar to those found at Picillo Farm. However, during the remedial design other process options under the thermal oxidation technology may be considered, such as the Closed Loop Oxidation System.

Part B: Summary of Comments Received from the State

Two sets of comments were received from the state (one from RI Department of Environmental Management (RIDEM) and one from the RI Department of Health Division of Drinking Water Quality (RIDOH)).

Comment B-1: RIDEM requested that EPA provide a recommendation on a frequency for residential well monitoring. RIDOH felt that all monitoring of private drinking water wells, whether by EPA or the State of Rhode Island, should be coordinated with RIDOH, Division of Drinking Water Quality. In addition, the State felt that the remedy documented in the ROD should include residential well monitoring to be continued until some time certain in the future, when all available data substantiates a termination of this program.

EPA's Response: The monitoring program specified in the ROD includes residential well monitoring. Currently, the State is conducting annual monitoring under cooperative agreement funding from EPA. Based upon past data which found no Site related contamination of residential wells, annual monitoring of residential wells within one-half mile of the Site will be evaluated periodically, and the frequency and extent of sampling may be modified in the future.

Comment B-2: RIDEM commented that it may be necessary for EPA to evaluate the option of extending the sampling locations and monitoring well locations to more conclusively delineate the extent of contamination west of the Site.

EPA's Response: The monitoring program specified in the ROD includes the option of extending the sampling locations and monitoring wells to further delineate the extent of contamination in the Unnamed Swamp to be considered during the remedial design phase.

Comment B-3: RIDEM recommended that EPA evaluate the placement of sentinel wells to the west of the Site in the deep bedrock aquifer. The approximate location of these wells should be northwest of the Unnamed Swamp provided that this area is accessible.

EPA's Response: The monitoring program specified in the ROD includes the option of installation of sentinel wells west of the Site. If after evaluation it is determined that wells are necessary and installation is considered feasible, exact placement of these wells would be determined during the design.

Comment B-4: RIDEM noted that residents are concerned about the occurrence rate of cancer in the vicinity of the Site. RIDEM asked for an explanation as to why a public health assessment is not being conducted at this time by EPA or by the Agency for Toxic Substance and Disease Registry (ATSDR).

EPA's Response: In response to the comment about cancer rates, EPA contacted ATSDR which in turn, contacted RIDOH. RIDOH examined data on the occurrence rate of cancer in Coventry, RI, and concluded that "there is no significant increase in cancer rates around the Picillo Farm Site". This information was based on the 1980 Census, for the time periods of 1978-82 and 1983-87.

Health studies are conducted at or near Superfund Sites by ATSDR. A health assessment was conducted by ATSDR for the Site in 1989. That study stated that the Site is of potential public health concern because of the potential risk to human health resulting from possible exposure to hazardous substances. ATSDR is planning to do a "Site Review Update" in 1994.

Comment B-5: RIDEM requested that in order to observe the progress of the on-site operations and to monitor for any sudden changes in the migration of contamination as a result of the remedial activities, monitoring of selected on-site wells should be continued on a routine basis.

EPA's Response: On-site monitoring of selected monitoring wells will be conducted on a routine basis as specified in the Record of Decision.

Comment B-6: RIDEM expressed concern with the proposed two year schedule for pilot testing and design and construction of treatment systems.

EPA's Response: The proposed schedule for design, pilot testing, and construction is estimated at approximately two years. The actual pilot test, however, can be viewed as a prototype version of the final treatment system. The intent is to use the prototype version to optimize the operation of the systems. While tests are being conducted, ground water and soil gas will be treated. As the systems are optimized, they are brought to full capacity within approximately two years after design is initiated.

Comment B-7: RIDEM stated that options should be available for improvements to the system prior to the five-year review. Yearly monitoring may determine that it is necessary to modify the number and locations of dewatering wells and extraction wells. Withdrawal rates will also have to be monitored to ensure proper coverage to remediate the source and concentrated zones of the plume.

EPA's Response: The long-term environmental monitoring specified in the ROD includes annual evaluations of the monitoring data. As specified in the ROD, during operation of the enhanced soil vapor extraction system and ground water extraction and treatment, the system's performance will be carefully monitored and operation of the systems will be adjusted as warranted by the performance data. Number and location of dewatering wells and extraction wells and withdrawal rates would be included in the system parameters to be optimized during the pilot test and adjusted during the systems operation.

Comment B-8: RIDEM requested that institutional controls be maintained for the duration of the remedy to protect human health. In addition, RIDEM stated that to secure the Site for the protection of human health and equipment, restrictions such as fences and/or shelters be installed for all areas of active remediation.

EPA's Response: The remedy specified in the ROD includes institutional controls such as access restrictions around areas of active soil remediation and restrictions on use of ground water and surface water. The institutional controls would remain in place until the cleanup levels are met. Fences are currently in place around the disposal area to restrict access. Similar measures will be included during remediation to restrict access.

Part C: Summary of Comments Received from the Potentially Responsible Parties (PRPs)

Both oral comments and written comments on EPA's Proposed Plan were submitted on behalf of the potentially responsible parties for the Picillo Farm Site. The written comments also included comments prepared by an environmental consultant and a report prepared by a real estate developer and home builder.

Comment C-1: The PRPs stated that had EPA conducted a site-specific analysis of the future use of ground water as drinking water, the Agency would have determined that residential development in the impacted area of the Site is highly unlikely. The PRPs stated that the Picillo Farm Site is not a likely area for land development because, among other things, the western portion of Rhode Island has not historically been an area of development, the development of more expensive subdivision lots as opposed to road-front lots would likely be necessary, Site access exists only through West Log Bridge Road which would impinge upon a major wetland, and even if Site cleanup is attained, development of a former hazardous waste site would be improbable. Thus, the potential development of the Site and the use of ground water as drinking water is an unlikely future land use scenario.

EPA Response: One of the primary objectives of EPA's Superfund Program is the restoration of contaminated ground waters consistent with their current or reasonably expected future use. The NCP states that "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site." (40 CFR §300.430(a)(1)(iii)(F)). Ground water is a valuable resource which should be protected and restored where necessary and practicable. As explained above, it is EPA's policy to consider the potential beneficial uses of the ground water and to protect against current and future exposures. Even though the current uses of ground water at the Picillo Site may not currently be drinking water, it is probable that it will be so in the future. The aquifer which is partially affected by the Site contamination, is presently being used as a drinking water source.

Based on the Baseline Risk Assessment, it is not unreasonable to assume that if the Site was not contaminated, the portion of the aquifer at the Site would also be used as a source for drinking water. Therefore, even though the ground water may be currently contaminated, EPA policy is to establish cleanup levels to return the ground water to its beneficial use as drinking water source.

The Baseline Risk Assessment identified that a potential future risk to human health exists at the Site through the possible ingestion of the ground water and surface water as drinking water. The Exposure Assessment Section (Section 4) of the Human Health Risk Assessment (HHRA) describes EPA's evaluation of land use and the demographic survey in detail. To evaluate current and potential future land use, EPA performed a demographic survey to characterize the human populations at, or near, the Site with respect to location, activity patterns, and the presence of certain populations which may be more susceptible to risks than the general population. A characterization of past and current land use was performed through the interpretation of aerial photographs, site visits, and document reviews pertaining to such issues as local land zoning. Physical characteristics of the Site and the surrounding area, such as geology, hydrogeology, hydrology, and soils (i.e., the parameters which may affect community development) were evaluated during the Remedial Investigation stage and are described in detail in Section 3 of the RI report.

Despite the PRPs' assertion that residential development in the impacted area is highly unlikely and therefore, makes the potential use of the ground water as drinking water highly unlikely, the following factors indicate that the future use of the ground water as drinking water is probable.

The area around and including the Site is zoned RR-2, which indicates that the area is zoned rural/residential. Lots are required to be a minimum of 2 acres (87,000 square feet), which would make this area less expensive to develop and more attractive to developers than other parts of the Western Coventry area which are zoned for 5-acre lots (218,000 square feet). Moreover, the area is in close proximity and has convenient access to major highways, such as Route 102 and I-95, that are within commuting distance to the City of Providence and other major cities in the State. In 1988, because of concerns about Site contamination, the Town of Coventry placed a moratorium prohibiting development within 1,800 feet from the property line of the Picillo Farm and setting conditional building restrictions within 3,600 feet. The following year, a local developer successfully challenged the moratorium. Since the lifting of the moratorium, most land available for road-front lots near the Site has been developed.

Within the last seven years, approximately 26 houses have been built within one mile of the Picillo Site, of which 22 have been built since the building moratorium was lifted in 1989. Construction of houses in this area is on-going and all of these houses use ground water in the same aquifer system as the Site for their drinking water supply. Development of the property on which there is a right-of-way to the Picillo property (called Piggy Hill Lane) has already taken place, as evidenced by a house recently built on this road within 3,000 feet of the disposal area. Two homes, which also use the ground water in the same aquifer as the Site for their drinking water supply currently exist on the Picillo Farm property within approximately 1,500 feet from the disposal area. In addition, several houses located near the Site, along Route 102 about 3,500 feet due east of the Site and along Perry Hill Road about 3,000 feet due north of the Site, use the same ground water for drinking water.

Furthermore, according to the Soil Conservation Services' soil types classification and the geotechnical data from the Remedial Investigation, the upland soils at the Site and adjacent properties would be acceptable for community development and on-site sewage systems. Residential development in the area has been built on similar soil types near the Site. Other geophysical characteristics of the Site analyzed during the RI and summarized in the ROD, such as hydraulic conductivity, depth to the water table and depth to the bedrock, indicate that the Site geology and hydrogeology do not preclude potential future development of the upland portion of the Site.

In addition, development in the area of Rhode Island near the Site is evidenced by on-going development in the West Greenwich area. Within two miles of the Picillo Site, in the Town of West Greenwich, a 19-Lot and a 27-Lot subdivision are being built. A 205-Lots subdivision has also been proposed in the area. All of these subdivisions are located in an area zoned for 2-acre lots and rely on individual drinking water wells within the same aquifer system as the Site.

Access to the Site can be gained by Piggy Hill Lane, from West Log Bridge Road and by another easement leading from Perry Hill Lane to the northwest corner of the Picillo Farm. An access right-of-way exists for the Picillo Farm property along Piggy Hill Lane which makes access to the Site obtainable. A legal description of the right-of-way in the May 22, 1922 deed (Book 41, page 525), as referenced in a legal description of the Picillo Farm property (Book 51, page 458), appears to give an absolute right of access to the Picillo Farm property. The Site can also be accessed from the West Log Bridge Road from several locations, and a new road can be built to avoid or minimize any wetland crossing. Furthermore, Rhode Island wetland regulations provide for wetland crossings if disturbance to the wetlands is mitigated, i.e., an equally sized new wetland is developed at a different location.

Comment C-2: The PRPs stated that no current actual or future actual risks to human health and the environment exist at the Site, and thus, no remediation need be implemented.

EPA Response: EPA disagrees with the PRPs' assertion that no risks exist at the Site which would warrant remediation. Region I maintains the position that future land use at the Picillo Farm Superfund Site could be residential, especially in view of the fact that past and current land use in the general locale of the Site is residential and that zoning indicates residential use (see response to Comment C-1).

Numerous people live in the vicinity of the Picillo Farm Site, located in the Western Coventry area. The existing residences in the area must rely on private wells as their source of drinking water because no public water system is presently available. Furthermore, the Town of Coventry has no plans to extend the public water supply into area of Western Coventry. Future residences on and near the Site would have to use ground water or surface water as their drinking water source.

Although assessment of future risks was evaluated on the basis of future on-site development, potential future risks also exist for homes built adjacent to (or near) the Site for the following reasons:

- The majority of the concentrated southwest plume is not located directly beneath the disposal area. The plume lies primarily outside the disposal area extending to the adjacent uplands and the Unnamed Swamp.

- Additional residential wells close to the Site could change the hydraulic characteristics of the aquifer and draw contaminated water to areas not currently contaminated, resulting in contamination of areas not currently contaminated and potential human exposure.

Potential development in this area continues as evidenced by the new home construction, new private wells and new percolation tests, which are used to determine the compatibility of the soils for septic systems for sewage treatment on-site.

In addition, the Ecological Risk Assessment identified that current risks to ecological receptors do exist from exposure to surface water and PCB-contaminated soil within the disposal area.

Comment C-3: The PRPs commented that the Rhode Island Water Quality Standards for surface water and the NCP's expectations that the aquifers will be restored to their beneficial use do not justify a remedy in the absence of either current or future actual risk.

EPA's Response: The information outlined in response to comments C-1 and C-2 provides sufficient evidence that the site poses risk to human health and environment. Therefore, remedial actions taken at the Site must comply with the applicable or relevant and appropriate requirements (ARARs), including the Rhode Island water quality standards and maximum contaminant levels (MCLs) established under the Safe Drinking Water Act.

Comment C-4: The PRPs stated that the Town of Coventry has produced no information that the Town intends to use the surface waters of the Unnamed Swamp for a drinking water supply.

EPA's Response: Waters classified as Class A waters by the State of Rhode Island are designated for (drinking) water supplies. Under the Rhode Island Water Quality Standards, all wetlands are classified as Class A waters. All other fresh waters which are not classified are considered to be Class A waters until classified. Therefore, the Unnamed Swamp and Great Cedar Swamp (both wetlands), and East Pond and Whitford Pond (neither of which have been classified) are Class A waters and are to be considered as potential sources of drinking water. Although no active remediation has been proposed for the surface waters, cleanup levels for surface waters will be met through the selected remedy.

Comment: C-5: The PRPs stated that residential wells are located upgradient of the Site. They added that the plumes of contamination now are essentially the same as those that existed years ago, and that the plumes flow into the swamps, away from the residential wells. The PRPs also stated that there is no threat to the Whitford Pond or the Great Grass Pond.

EPA's Response: Although the contaminated ground water plume flows in a westerly and southwesterly direction, evidence exists that contaminants may be migrating in a northeasterly direction. Volatile organic solvents were detected in overburden wells MW 59, 62, and 77 and bedrock wells MW 61 and 65. Aromatic solvents were detected in the shallow bedrock well MW 61. Semivolatile organic compounds (SVOCs) were detected in overburden wells MW 60, 62, and 77, and in shallow bedrock well MW 61. All of these wells are east and northeast of the historic disposal trenches and lay within the eastward ground water gradient.

Additionally, EPA has documented a bedrock trough, through seismic refraction surveying and shallow bedrock drilling, which leads to the northeast. This trough may accelerate the flow of chlorinated solvents to the east, may allow them to pool in the bedrock depression, and could accelerate their vertical migration into shallow bedrock fractures.

RIDOH and EPA have detected organic solvents at low concentrations (below EPA federal maximum contaminant levels [MCLs]) in seven residential wells northeast of the Site. The contaminants in these wells have been identified in high concentrations on site, and connection of this contamination to releases from the disposal areas on the Site has not been ruled out.

Comment C-6: The PRPs stated that even if it were to be assumed that a remedy was justified, source control without a management of migration component should have been proposed. The PRPs felt that the future use of the impacted ground water and surface water is unlikely, and therefore, no justification exists for spending an additional $9 million on a management of migration component to expedite ground water cleanup by 20 years.

EPA's Response: The likelihood of human health risks resulting from future ground water exposure has been shown to be a reasonable assumption as outlined in the response to comments C-1 and C-2. Since potential future ground water risks to human health are significant and probable, a remedy is necessary. EPA believes that the time of additional potential exposure to contaminated ground water should be reduced to the extent practicable. A significant amount of residential development is currently in progress around the Site and it is likely that this development will continue for at least the next 20 years. The homes in these newly developed areas will need to rely upon ground water wells (or surface water as an alternative) as their drinking water source. The impact that this use will have on the local hydrology and contaminant transport pathways is uncertain. Given this uncertainty, it is essential that contamination at the Picillo Farm Site be remediated as quickly as possible.

It should also be noted that the actual difference in the total cost of implementing the selected source control alternative (SC-2) without a management of migration component compared to a source control alternative with a management of migration component would be $3.6 million and not $9 million as stated by the PRPs. A decision to not implement an active management of migration component would not have precluded the need to monitor contamination in the ground water, such as provided by the No Action management of migration component, MM-1. More importantly, and as indicated in the Proposed Plan and the Feasibility Study, the source control component would require a dewatering system in order to effectively remediate the source. Without an active management of migration system, the cost of the selected source control alternative, SC-2, would include the cost of implementing a ground water treatment system to treat the ground water extracted during dewatering (currently this cost is included as part of the cost for the active treatment MM alternatives) and would double the time period of meeting cleanup levels to 40 years. See section 4 of the Feasibility Study.

Selected Remedy	PRPs Proposal
Source Control SC-2 $4.1 million (enhanced Soil Vapor Extraction)	Source control SC-2 $4.1 million
	Dewatering/ground water treatment system $4.3 million
Management of Migration MM-3 $11.6 million (extraction and treatment of ground water, including installation and O&M costs of the dewatering/ ground water treatment)	Management of Migration MM-1 $3.7 million (monitoring costs)
Total cost $15.7 million Remediation time 20 years	Total cost $12.1 million Remediation time 40 years

If MM-1 was implemented instead of an active management of migration alternative, the total SC-2 costs would be $8.4 instead of $4.1 million, since it would include $4.3 million for installation of a dewatering/ground water treatment system and the operation and maintenance of the system (in the selected remedy this cost is included as part of the management of migration alternative MM-3). Implementing MM-1 (costs of $3.7 million) and SC-2 would then cost a total of $12.1 million, compared to the $15.7 million total cost for implementing SC-2 (costs of $4.1 million) with the selected active management of migration alternative, MM-3 (costs of $11.6 million). The actual difference in the total costs is $3.6 million, not $9 million, to expedite ground water cleanup by 20 years. Based on the information in the ROD concerning the remedy selection and the response to comments C-1 and C-2 concerning potential future risks, EPA believes that the ability to expedite the cleanup by two decades supports the additional $3.6 million expenditure to implement the selected active management of migration alternative.

Comment C-7: The PRPs stated that it is particularly inappropriate to propose a pump-and-treat remedy where EPA has concluded that DNAPLs are likely to be present.

EPA's Response: The proposed remedial action at the Picillo Farm Site relies on the use of a two-prong approach. The first, and principal part of the approach is the treatment of the contaminated soils using a thermally enhanced vapor extraction system. This system will be used to remove residual contamination from the soil in the area near the water table, where the significant portion of the soil contamination was found during the RI, and to remediate any DNAPLs contamination that may exist in the shallow bedrock when the ground water table is lowered. The second part of the approach is the active containment of the dissolved contamination in the ground water through the use of ground water extraction and treatment. The active containment is not intended for a direct remediation of any DNAPLs, but as a means of controlling the migration of contaminants to the environment (e.g., wetlands, seeps, surface water). The Feasibility Study recognizes this specific use of the pump and treat system and states on page 3-154 that:

> "*Pump and treat has been used for many years* as a treatment alternative for the remediation of hazardous waste sites. The experience using this approach has proven that it may take hundreds of years to remediate a site by flushing water through the contaminated area; therefore, pump and treat alone is not the most time-effective treatment for remediation of a contaminated site. Because of the long cleanup time frame associated with pump and treat it is considered as an active containment alternative."

In addition, at least every five years EPA will review the data that has been collected and determine if the selected remedial alternative is working effectively and will reach the remedial objectives within the estimated time frame. If the thermally enhanced vapor extraction system has not removed any DNAPLs and the ground water concentrations are not decreasing as projected, EPA will review new technologies and make recommendations for changes in the remediation plan at that time.

Comment C-8: The PRPs stated that the pattern of soil contamination delineated in the RI and the FS does not support the proposed extent of source control activities (e.g., dewatering to bedrock and hot air injection in all former disposal areas). The bulk of the subsurface soil contamination in the former disposal trenches is found just above and below the water tables and the contaminant concentrations rapidly attenuate with depth.

EPA's Response: It is true that the majority of the contamination is near the water table, the water table in the area was found to fluctuate significantly, with up to five feet of fluctuations observed in some monitoring wells. Moreover, in some locations the concentration of contaminants below the highly contaminated region are at concentrations that are above the cleanup levels necessary to achieve ground water remediation to drinking water standards. For example, in SB-35 benzene and trichloroethene were both found above the clean up level at a depth of 34 and 49 feet below the surface. In SB 13, tetrachloroethene was found in the soil above the cleanup level at 24 and 29 feet below the surface, and the shallow bedrock is estimated to start at 27 to 30 feet. In addition, there is the potential for DNAPLs to be present in the shallow bedrock, and use of the thermally enhanced vapor extraction system in the shallow bedrock would enhance the removal of these contaminants which otherwise would continue to represent a source of contamination to the ground water. Based on the concern for the contaminants at depth above the cleanup level and the potential for DNAPLs in the shallow bedrock, the ground water dewatering system would be designed to allow dewatering into the shallow bedrock.

In addition, even where dewatering into the shallow bedrock may not be necessary to allow for the use of vapor extraction, the dewatering wells would be placed into the shallow bedrock to allow flexibility during the operation of the treatment system and to capture any DNAPLs that might be present in that region. Even though the dewatering wells are placed into the shallow bedrock they do not have to be used to dewater all the way to shallow bedrock. The actual dewatering depth will be set during the Remedial Design phase based on the depth of soil contamination above the cleanup levels and where there is an indication that DNAPLs might be present.

Comment C-9: A consultant for the PRPs stated that the monitoring program to evaluate the efficiency of the Site cleanup is excessive and not cost-effective. Quarterly sampling and full-scan analyses of ground water and surface water for 20 years is proposed, which represents 17% of the total Site remediation costs. However, EPA presents insufficient site-specific analyses to show that this monitoring program is required to protect human health or that this information is necessary to evaluate the remedial efficiency.

Annual or semi-annual monitoring of VOCs as indicator compounds would provide adequate information for evaluating remedial efficiency. Ground water elevations could be measured on a quarterly basis to allow mapping of the capture effectiveness of the ground water extraction system. Analysis of all target compound list and target analyte list compounds, pesticides, and PCBs could be performed at longer intervals.

EPA's Response: During the initial start-up of the ground water treatment system, quarterly sampling is required for at least VOCs and SVOCs to determine the removal/destruction rates for each contaminant of concern, and to allow timely optimizing of the system operation. After system optimization, EPA may reevaluate the frequency of sampling.

Analysis for VOCs as indicator compounds is not acceptable since other compounds, such as SVOCs and inorganic compounds, will also be treated. Their removal rates may not be directly comparable to the removal rate of the VOCs, and therefore they must be determined in the initial start up. After systems optimization, EPA may evaluate the use of indicator compounds to determine systems treatment efficiency.

Comment C-10: The PRPs' consultant stated that the human health evaluation greatly overestimated the potential risk of human exposure to fish contaminated with PCBs.

EPA's Response: Consistent with EPA policy, EPA used conservative assumptions in estimating risk due to ingestion of fish contaminated with the PCBs. Because a number of PCB samples was invalidated during the RI, the ROD specifies additional sampling for PCBs in surface water and sediment to verify the presence of PCBs in these media. However, it should be noted that in the exposure scenario, fish ingestion was combined with surface water ingestion as drinking water source and dermal contact and incidental ingestion while swimming to determine the risk posed by exposure to surface water in the Unnamed Swamp. Ingestion of surface water as drinking water source was found to pose an unacceptable risk even without considering the fish ingestion pathway. Thus, even if a less conservative evaluation of PCBs contamination in fish was performed, surface water would still be a media of concern in the human health risk evaluation.

Comment C-11: The PRPs' consultant stated that the cleanup level for PCBs in soil is overly conservative and that the calculation of the cleanup level was inconsistent with the ecological risk assessment. The PRPs' consultant also stated that potential ecological risk from exposure to the contaminated soil is overestimated, and that no cleanup of PCBs in surface soils is necessary.

EPA's Response: EPA does not agree that the ecological risk at the Site is overestimated and that the surface soils contaminated with PCBs requires no cleanup. EPA, however, modified the cleanup level for PCBs in surface soils to be more consistent with the site-specific ecological risk assessment. As described in the ROD, PCB cleanup level in surface soils was developed using a multi-zone foraging scenario for ecological receptors presented in the ecological risk assessment. The cleanup level of 1,300 ug/kg for PCBs has been selected based on protection of ecological receptors and is considered to be protective of human health and the environment.

Comment C-12: The PRPs' consultant stated that additional measures for remediation of SVOCs and the associated additional cost are not warranted.

EPA's Response: SVOCs represent a large portion of the contamination at the Site. In the Northwest Trench, total SVOCs were found in soil at concentrations as high as 5,400 mg/kg and in the West Trench as high as 8,700 mg/kg. While these concentrations were lower than the total VOC concentrations, they still represent significant concentrations of contaminants. Although the Baseline Human Health Risk Assessment identified an excess incremental risk from the SVOCs for six compounds, hundreds of additional SVOCs were tentatively identified near the historic trenches that may represent a risk to human health and the environment (see Appendix A of the FS). Because of the presence of SVOCs at the Site, EPA selected soil and ground water technologies that are appropriate for both SVOCs and VOCs so that they can both be extracted and treated together to minimize the treatment costs.

For the soils, EPA selected an enhanced vapor extraction system that, in combination with soil dewatering, will inject hot air into the contaminated soils and volatilize the SVOC and VOC contaminants. The enhanced system will not only remove the SVOCs, but will also significantly speed up the removal of the VOCs, thereby reducing the operation time and total operating costs and lessening the impact that the contaminants have on the environment. The selected ground water treatment system is ultraviolet/oxidation treatment. This technology will treat both VOCs and SVOCs; however, there would be little or no difference in the cost if the SVOCs did not have to be removed. It is important to note that air stripping (the alternative technology) may be considered by EPA only if the cost estimate changes to the extent that air stripping with carbon adsorption becomes more cost-effective than UV/oxidation.

Comment C-13: The PRPs' consultant stated that the ROD should conceptually establish conditions that would trigger reevaluation of the technical feasibility of continued remediation based on performance evaluations and, if it is determined that portions of the aquifer cannot be restored to drinking water quality, the ROD should establish contingency measures.

EPA's Response: Periodic review of the operation and effectiveness of the source control remedy and extraction and treatment of ground water will be conducted. If, following a reasonable period of the ground water system operation, EPA determines that the selected remedy cannot meet cleanup levels, EPA may consider contingency measures as a modification to the selected remedy. Examples of such contingency measures are given in the ROD.

If EPA determines that such contingency measures are necessary, and the significant or fundamental modifications to the remedy, such changes will be documented in a future decision document. In this case, specific conditions triggering reevaluation of the ability of the remedy to meet cleanup levels would be more appropriately determined based on the data collected during the design and implementation of the remedy.

Appendix 1
Community Relations Activities at Picillo Farm Superfund Site

Community relations activities conducted at the Picillo Farm Superfund Site have included:

- EPA and RIDEM announced that a cooperative effort between EPA and RIDEM would be implemented to fund excavation and disposal of waste from the northwest trench at the Site. (December 1980)

- EPA briefed residents of the disposal procedures for detonating lab packs. (September 1981)

- EPA prepared a Community Relations Plan. (October 1981)

- EPA held a public hearing at the Coventry Town Hall to discuss on-going removal activities and to distribute a fact sheet which outlined the chronology of events at the Site from September 1977 through September 1981. (December 1981)

- EPA announced that it had approved $4.9 million in Superfund money for the Site and that a cooperative agreement was reached between RIDEM and EPA to resume cleanup efforts. (January 1982)

- EPA issued a press release which announced that the EPA Administrator approved a cooperative agreement with the RIDEM under which agreement, the state of Rhode Island would begin removing 8,500 drums of chemical wastes, conduct a feasibility study for a ground water treatment system, and conduct additional sampling and analysis. (February 1982)

- EPA revised the community relations plan. (1984)

- EPA issued a press release which indicated that officials from RIDEM and EPA disagreed over cleanup of the Picillo Farm Site. (January 1984)

- EPA and RIDEM met with the Coventry Town Manager, other town officials, and residents to discuss concerns, the status of the Site, and future work. (April 1984)

- EPA and RIDEM met with members of Save our Water (SOW) to review SOW's records and to be brought up to date on SOW's past activities. (May 1984)

Appendix 1
Community Relations Activities at Picillo Farm Superfund Site

- EPA and RIDEM held a public meeting with Coventry residents and interested parties. The results of the risk assessment conducted at the Site were presented. (June 1984)

- EPA distributed a fact sheet that summarized the informational meeting held in June 1984. It also discussed upcoming community relations activities which would follow the release of the RI/FS. (January 1985)

- EPA and RIDEM issued a press release which announced costs for addressing remaining contamination at the Picillo Farm Site and discussed the opportunities for public involvement. (April 1985)

- EPA and RIDEM held a public meeting at the Western Coventry School and presented the results of the final RI/FS. (April 1985)

- EPA held a public hearing to accept public comment on the cleanup remedies for the Picillo Farm Site. (May 1985)

- EPA issued a press release which discussed the Record of Decision for the Site. The cleanup remedy called for disposing contaminated soil on site to prevent further soil or ground water contamination, and continued ground water monitoring. (October 1985)

- Pursuant to the 1986 amendments to CERCLA, EPA issued a press release which amended the 1985 Record of Decision. The revised cleanup remedy called for off-site disposal of the contaminated soil. (March 1987)

- EPA, RIDEM, and SOW held a public meeting at the Western Coventry School Library. EPA stated at the meeting that steps to remove PCBs on site and cleanup of ground water could not be continued without an additional study. (May 1987)

- EPA issued a press release announcing an informal public meeting. (September 1987)

- EPA and RIDEM held a public meeting at which time the cleanup settlement with the PRPs.was announced. (October

Appendix 1
Community Relations Activities at Picillo Farm Superfund Site

1987)

- EPA distributed a fact sheet containing the details of upcoming contaminated soil pile removal activities to be conducted by the PRPs, and information about ongoing studies being undertaken by EPA to address ground water contamination. (May 1988)

- EPA issued a press release announcing the commencement of the contaminated soil pile removal activities. (May 1988)

- EPA issued a press release which discussed the initiation of an RI/FS to further define the nature and extent of ground water contamination and the need for further cleanup measures at the Site. (May 1990)

- EPA issued a press release regarding enforcement action at the Site. Two companies were being held liable for the Picillo Farm Site costs under CERCLA/SARA. (June 1990)

- EPA and RIDEM conducted community interviews with local officials and interested residents. (June 1990)

- EPA revised and reissued the Community Relations Plan. (September 1990)

- EPA issued a press release discussing the availability of the Administrative Record. (September 1990)

- EPA issued a fact sheet which discussed on-going RI activities and announced a public meeting in February. (January 1991)

- EPA held a public meeting at the Western Coventry Elementary School Cafeteria to discuss the initial results of the RI. (February 1991)

- EPA issued a fact sheet which discussed results of the RI (November 1992)

- EPA issued a press release which described the Proposed Plan to address soil and ground water contamination. It also discussed opportunities for the public to comment on the

Appendix 1
Community Relations Activities at Picillo Farm Superfund Site

Proposed Plan. (June 1993)

- EPA distributed the proposed plan which provided a summary of all of the remedial alternatives which were reviewed in the FS and described EPA's recommended cleanup alternative. (June 1993)

- EPA and RIDEM held a public informational hearing to discuss the proposed plan. (June 1993)

- EPA held a public hearing to receive public comments on the proposed plan. (July 1993)

Appendix 2
Public Hearing Transcript

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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PROCEEDINGS AT PUBLIC HEARING
IN RE:

PROPOSED PLAN FOR THE PICILLO FARM
SUPERFUND SITE

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Western Coventry School
4588 Flat River Road
Coventry, Rhode Island
July 13, 1993
7:30 P.M.

BEFORE: RICHARD C. BOYNTON, HEARING OFFICER
ANNA KRASKO, PROJECT MANAGER
LEO KAY, COMMUNITY RELATIONS COORDINATOR

ORIGINAL

ALLIED COURT REPORTERS
115 PHENIX AVENUE
CRANSTON, RHODE ISLAND 02920
401/946-5500

MR. BOYNTON: If everybody is ready, my name is Richard Boynton, Chief of the Rhode Island Superfund section of EPA's Region I Boston office, and I have supervisory responsibility for the implementation of EPA's Superfund program and Superfund sites in Rhode Island. I will serve as the hearing officer for tonight's hearing. Also present tonight are Anna Krasko, the EPA project manager for the Picillo site, and in the front row is James Ball, the State project manager for the Picillo site, and Warren Angell, the State DEM supervisor for the site. The purpose of this hearing tonight is to accept formal oral comments on the Picillo Superfund Site Remedial Investigation and Feasibility Study and EPA's proposed plan for addressing contamination at the site. Since this is a hearing, we will not be responding to comments or questions tonight, but will respond to them after the close of the comment period in a formal document called the Responsiveness Study, which will become part of the administrative record for the site. EPA conducted a public information hearing on the proposed plan on Wednesday, June 29, 1993, at this location in which we presented information concerning the proposed plan and responded to questions. The public comment period began on June 30th, the next day, and will end on Thursday, July 24, 1993.

Now, I'd like to describe for you the format for the hearing. First, Anna Krasko will give a brief overview of the proposed plan. Following Anna's presentation, we'll accept any oral comments you may wish to make for the record. Those of you wishing to comment should have already indicated a desire to do so by filling out the index cards available at the front door as you came in. Also available, if you don't already have one, are copies of the proposed plan. If you have not completed a card and wish to make a comment, please complete one and/or during the course of the hearing. We need these cards to make sure that we get your name and affiliation correct for the record.

I will call on those wishing to make a comment in the order of which you signed up to speak, and when called on, I'd ask you that come up to the front of the room and state your name and address and/or your affiliation so that our reporter can record your name and address for the record.

Please limit your oral comments to about 15 minutes. If your presentation will take longer than 15 minutes, I'd ask you that you summarize the important points you wish to make this evening and then provide EPA with a copy of the full text of your comments. If you do this, the text in its entirety will be transcribed into the hearing record. From your comment, we may ask you some questions regarding your comments to assist us in clarifying your statement.

After all the comments have been heard, I will close the formal hearing. If you wish to submit written comments, they must be postmarked no later than July 29, 1993 and mailed to our office in Boston. The address can be found on Page 3 of the proposed plan, and also we've written it up here in the front of the room on the easel.

At the conclusion of the hearing, you could see any of the EPA representatives here tonight if you have any questions on process for making written comments. All the oral comments will be received tonight, and those written comments received during the comment period will be addressed in our Responsiveness Study and become part of the administrative record for the site.

The Responsiveness Study will be included with a decision document called the Record of Decision that EPA prepares at the conclusion of the comment period.

Do we have any questions about the conduct of the proceeding before we begin? All right. If we don't have any questions then, Anna will now give a brief overview of the proposed plan for the Picillo Farm site.

MS. KRASKO: Thank you, Dick. As Dick just mentioned, last month EPA announced the proposed clean-up plan for the Picillo Farm Superfund site. In its plan, EPA evaluated a range of clean-up options ranging from no action to various degrees of treatment for the soil and groundwater. And EPA selected a preferred alternative to clean up the remaining soil and groundwater of the site.

EPA proposes to clean up the soil contamination with both volatile organic and semi-volatile organic contaminants using a thermally-enhanced soil vapor extraction. With this technology, heated air would be pumped through contaminated soil to volatilize the contaminants. The volatilized contaminants would then be thermally destroyed in the unit called catalytic oxidation system. The system would convert gasses into mostly water and carbon dioxide. In addition, a small amount of surface soil contaminated with PCBs will be excavated and removed and disposed of off-site.

EPA's proposed plan also calls for the pumping and treating of groundwater. The contaminated groundwater will be extracted from the ground and treated by either ultraviolet oxidation or air stripping. Carbon adsorption would be used as a polishing step. Groundwater at the fringes of the contaminated plume would be allowed to naturally attenuate.

The proposed cleanup is estimated to cost approximately $16 million. The soil is estimated to be cleaned up in six years, and the groundwater treatment is expected to take approximately 20 years.

Thank you.

MR. BOYNTON: Thank you, Anna. Now, I'd like to begin accepting oral comments. First, I'd like to offer the State an opportunity to make comments for the record, and speaking for the State would be James Ball, the State project officer.

MR. BALL: My name is James Ball. I'm a senior engineer with the Department of Environmental Management. Based upon the information available at this time, the Department of Environment Management tentatively concurs with the remedy as proposed by the Environmental Protection Agency.

Department personnel have conducted a thorough review of the Remedial Investigation and Feasibility Study, as well as other technical documents generated, including the proposed plan.

As a result of this review, we have generated comments and concerns dealing with continued monitoring and additional sampling locations. We'll be providing a written comments letter to the Environmental Protection Agency during this comment period that includes all of our concerns in more detail. I will only outline our main concerns this evening.

Comment Number 1: Both the Department of Environmental Management and the Environmental Protection Agency are aware of the public's concern with residential well monitoring within a half mile of the site. To address this issue, it should be stated in the Record of Decision that residential well monitoring will be included in the remedy and will be continued until some time certain in the future when all available data substantiates a termination of this program.

Comment Number 2: The Department of Environmental Management requests that the Environmental Protection Agency provide a technical memorandum that recommends a frequency for residential well monitoring that is protective of human health.

Comment Number 3: Due to the fact that the delineation of the plume has been extrapolated in the area of the unnamed swamp, it may be necessary for the Environmental Protection Agency to evaluate the option of extending the sampling locations and monitoring well locations to more conclusively delineate the extent of contamination. This concern has always been expressed by citizens of this area.

Comment Number 4: Currently the proposed plan calls for deep bedrock wells, sentinel wells, to act as an early warning system should contamination travel in the deep bedrock aquifer in an easterly direction. The State strongly concurs with this proposal. However, as the citizens of this area have expressed concern for contamination potentially traveling in a westerly direction in the deep bedrock aquifer, the State recommends that the Environmental Protection Agency evaluate the placement of a similar sentinel well system to the west of the site.

Although the Department of Environmental Management would like to see an expedited remedy chosen for the site, we believe that these concerns should be addressed in the proposed plan prior to finalization.

That concludes what we consider to be our major concerns. As I have previously mentioned, we will be providing the Environmental Projection Agency with a detailed comment letter. Copies of this letter will also be forwarded to the appropriate local representatives and will also be entered into the administrative record. Thank you.

MR. BOYNTON: Thanks, Jim. Next I'd like to give Cindy Fagan, the Coventry Conservation Commission Chairman, an opportunity to make a statement.

MS. FAGAN: The statement that I was going to make our DEM has already made. I did want to make sure that the wells in the area and additional wells are going to be tested periodically throughout the whole 20 years that it takes for the cleanup of the groundwater contamination. And I would also like to be advised as to when these testings are taking place and also on the soil as well.

MR. BOYNTON: Thank you.

MS. FAGAN: Thank you.

MR. BOYNTON: Next I'd like to ask Bob Haviland of the Rhode Island Department of Health, Division of Drinking Water Quality. He asked to make a statement.

MR. HAVILAND: My name is Dave Haviland. I'm with the Rhode Island Department of Health Division of Drinking Water Quality. The following comments are in response to the proposed clean-up plan for the Picillo Farm Superfund Site. The plan for continued monitoring of residential drinking water wells, specifically those wells within a half mile radius of the Picillo Farm, should be included in the Record of Decision. Provisions for the monitoring of the existing homes and new developments should be included in the plan.

It should be stated in the Record of Decision that the monitoring of residential wells within a half mile radius of the disposal area will be funded by the principal responsible party.

All monitoring of private drinking water wells, whether by the Environmental Protection Agency or the State of Rhode Island, should be coordinated with the Rhode Island Department of Health, Division of Drinking Water Quality.

MR. BOYNTON: Thank you, Bob. Next is Crystal Martin. Do you wish to make a comment for the record?

MS. MARTIN: No, I have no comment.

MR. BOYNTON: Okay. Thank you. Would Virginia Soucy like to make comments for the record?

MS. SOUCY: Not at this time.

MR. BOYNTON: Not at this time, okay. Robert Guastini?

MR. GUASTINI: Guastini.

MR. BOYNTON: G-U-A-S-T-I-N-I.

MR. GUASTINI: That's correct.

MR. BOYNTON: Robert P., Greenville, Rhode Island.

MR. GUASTINI: Greene, not Greenville.

MR. BOYNTON: Greene. Greene, Rhode Island. Excuse me.

MR. GUASTINI: I've got a letter here that I addressed to Anna on behalf of my own personal concerns and also the members of SOW. That's Save our Water for the record. And I've got about four points I want to cover here, and I will maybe summarize a little bit. But first of all, the response time of 30 days allowed by EPA is unreasonable. This study took two years by EPA or nearly two years by EPA, associates and contractors. There's not near enough time for any technical review of this proposal for a lay person, or in my opinion, it was not communicated very well to the State of Rhode Island local authorities, and that needs to be evaluated. So, therefore, any decision as to whether this is a viable plan, I think we just have to sit back and wait, and that will leave the door open obviously, and we'll see how the cleanup progresses.

So, I don't think we can pass judgment of whether it's a good plan, or at least I can't, or a bad plan because simply we haven't had the opportunity to review it or to bring in any expertise in to do that. And I know that there was a phone call made to my office by somebody from EPA, and I don't recall who that was, and asked if I would -- was concerned about it, if I wanted to do the extension, and what I said at that point was no, I did not want to belabor it; we've got to get on the act here; within the future, I think there should be more consideration by EPA.

There was no mention of surface water cleanup in this proposal. Everything that I could see is really aimed at looking at the cleanup of surface -- excuse me -- groundwater. I don't really to this date know of where we stand with surface water problems other than the PCBs laying on top of the soil down there. So, I would like to know if any action is going to be taken, or if it's being addressed as part of the cleanup.

At the initial onset of the cleanup of the Picillo dump, which was around 1980 and thereabouts, by EPA and the State, and there was a lot of commitments made to residents around the area concerning drinking wells within a half mile radius of the site. That commitment, both by EPA, the Rhode Island DEM, the Rhode Island Health, and the residents stated that there would be a testing period of every six months. Now, I know that the State said we ought to continue on with this, and I think the good person from the Town said the same thing from the environmental, but the key was six months, okay? And, and the reason I'm bringing this up is that because at that time that was felt to bring some peace of mind to the people that lived in that vicinity. Now, we've lost that peace of mind, if you will, okay? And more importantly what that was supposed to do was to be the early warning signal for any contaminants that was flowing out and beyond the site that would be a flag that would go up and that would be -- that data would be transmitted to EPA via DEM, okay? The well sampling was taken by the Department of Health. And if you go back in the records -- I'm not just dreaming this up. The records clearly state in the State's records someplace and in your records, you will find that that monitoring was in fact taken every six months or thereabouts, and that was discontinued. So, you don't need my word. You don't need anybody else to send you a letter. Just go back and check your records. It's all there.

And I feel, I really feel absolutely humiliated that somebody would come back and not trust what we're saying here. I think that's very poor on the state of DEM and the State of Rhode Island. So, we would like to know, and I'd like to be, pleased be advised of what EPA actually will take to be sure the continued, indefinite cleaning or -- sorry -- monitoring of the wells, and who will be responsible, and who will be financing it. Will EPA and the Superfund? If not, why not? I think there's enough money to do that. And I think if you go back through your records, I thought that was part of the agreement way, way back.

There seems to be much confusion over -- the fourth point -- over the communications between the responsible parties considering the unfair response time that was given to residents or local authorities, and I think what's got to happen here is that EPA is herewith requested to provide all data, all correspondence to the undersigned. Included in that distribution should be the Town of Coventry, the Rhode Island DEM, and the Department of Health. And I'm sure that you're aware of the Freedom of Information Act can be enacted or can be invoked to get this information. So, as of now there should be no excuses as to why people didn't get on the mailing list or people not knowing what's going on around this community. There's a responsibility there, and I expect EPA to do that, okay?

Also, I think that, and lastly, there ought to be -- EPA's requested to conduct a quarterly or provide a quarterly report to the Western Coventry residents in the status of the cleanup efforts, its problems and its accomplishments, and that's all I got. It's a little more formal here.

MR. BOYNTON: Could I ask you one question about your first point?

MR. GUASTINI: Sure.

MR. BOYNTON: You talked about the response time of 30 days, and then you said something about in the future we should consider that. Do I understand to mean that --

MR. GUASTINI: What I said was, I thought what I said was that the response time of 30 days starting one day after we had the meeting, which was the 29th or whatever it was, the first of July, was totally, was totally, as far as I'm concerned, not enough time to give anybody, even an educated person, the time -- that's educated in this field -- a time to really look at the data that was provided. After all, you've had it for two years. Why do you keep that stuff secret? Why don't you pass it on to us so we can understand it, so we can be intelligent and ask the correct questions that have to be asked. And that's my concern. Now, in the future, what I'm saying is that you have a responsibility, you should have a responsibility, and we'll enact that responsibility to enforce you to provide that data to the organization, Save our Water, to the Town of Coventry, to the Rhode Island DEM, to the Department of Health --

MS. FAGAN: To Conservation.

MR. GUASTINI: -- to Conservation, or whoever is requesting it. We want to know, in other words, what's going on. We want to read your lips. We want to hear it. We want to see it. And we want to ask questions. So, I can call up Jim down at the State House, like I did today, and say, "Jim, what do you think?" And I want to be able to talk intelligently to him.

MR. BOYNTON: Okay. I understand your comment.

MR. GUASTINI: So, I think that the rule ought to be changed, the 30 days. That's all I got to say.

MR. BOYNTON: Okay. Thank you for your comments. Does Marion Sykes wish to make a statement? That's S-Y-K-E-S.

MRS. SYKES: That's correct.

MR. BOYNTON: Perry Hill Road, Coventry, Rhode Island.

MRS. SYKES: That's right, 220 Perry Hill Road, Coventry, Rhode Island. My comments of the proposed plan dated June, 1993 for cleanup at the Picillo farm site. First of all, funding. Proceed with the plan and do not wait for funding. Waiting for funding first could be a much larger wait if tied up in the courts.

DEM participation. I would insist that a DEM representative be on the site during all operations. Town officials should be notified of the progress on a minimum of a monthly basis. Residents, DEM, town officials, and health department should be notified immediately of the following:

1. If contaminants begin to move further off the site.

2. If contaminants begin to break out of the aquifer.

3. Residential wells should be tested at the start and then periodically during the work process. And I capitalize, immediately if there is a break in the aquifer.

4. Periodic meetings should be held to inform the community of progress or lack of.

5. In case of an emergency, I would like to see a plan implemented to ensure the safety of the community.

Notes: If trucks are entering or leaving the site, a time schedule should be set up when schools are in session so they will not be on Perry Hill Road at the time school busses would be traveling on that road.

Also, it's been a long, hard, trying battle, and I hope that this plan is finally going to be the answer. Thank you.

MR. BOYNTON: Thank you. Deming Sherman, would you like to make a statement? That's S-H-E-R-M-A-N.

MR. SHERMAN: Good evening. My name is Deming Sherman. I'm an attorney with offices in

Providence. And I'd like to read a statement, and we will be submitting a formal written comment later on this month.

My statement is as follows: I speak on behalf of several companies that the EPA believes are liable, among others, for additional costs of cleanup at the Picillo site. These companies did not own the site. They did not operate the site. They did not knowingly send any materials to the site. Any waste materials that were brought to this Picillo site were illegally diverted from other licensed disposal facilities.

As I indicated, we will be submitting formal written comments at a later time; however, we wish to make some general comments this evening.

Our companies are sensitive to the concerns of the neighbors. Together, we have spent more than $10 million to pay for the investigation and the cleanup of the Picillo site. We believe that any additional monies should be wisely spent and should respond to the real risks, not hypothetical ones.

We think that the proposed plan, costing at least an additional $16 million, is based primarily on future hypothetical risks rather than on actual risks which the EPA itself acknowledges are minimal. All the potential risks have been evaluated. That is to say, risks such as potential human exposure to soil, to dust, to air emissions, to drinking water from wells, swamp water. The only real risk presented by this site is to someone who builds a home on the site and drills a drinking water well and consumes water.

As the EPA itself stated in the proposed plan on Page 11, and I quote, "EPA concluded that the major risk to public health would result from ingestion of contaminated groundwater and surface water. This is not a current risk, because the contaminated groundwater surrounding the site and the unnamed swamp are not presently used as water supplies. If in the future residents were to use the groundwater from the contaminated aquifer or the unnamed swamp as a drinking water supply, such use would pose unacceptable long-term risks to human health," end of quote.

We think that the $16 million would be better spent on other sites where there are actual risks, including other sites in Rhode Island. The concerns of the residents can be best addressed by developing a monitoring plan to provide continuing assurance that no contaminants are flowing towards the neighboring residences. This would assure an early warning system that would trigger remedial action years before any contamination reached a drinking water well.

We note that there is no evidence that the contamination on the site is flowing toward the residences north and east of the site. Indeed the EPA has found that the plumes of contamination now are essentially the same as those that existed years ago, and that the plumes flow again to the swamps. The contamination is not flowing downstream from the swamps. Therefore, there is no threat to Whitford Pond. Our inquiries of the Town of Coventry have produced no information that the Town intends to use the surface waters of the unnamed swamp for drinking water supply. The unnamed swamp in fact will probably not be used as a drinking water supply for regulatory and ecological reasons. The remaining contamination is confined to the area under the site and the small area between the site and the swamps. The only real risk to anyone's health would be if one were to build a home on the Picillo property, drill a drinking water well, and drink that water.

The proposed plan is built on the premise that the site is likely to be developed for residences, and that the groundwater under the site will be used for drinking water for those residences. To our knowledge, the EPA has never tested this premise. If it did, it would find that the premise is a flawed one for a number of reasons.

First: Development of the site is not likely because it is substantially landlocked and most development in the area is along roads.

Second: There are wetlands near the site that will restrict development in any case.

Next, the Picillo property is tied up with numerous liens, including mortgages, judgments, and taxes. It will take a monumental effort and a substantial amount of money to clear the title to sell the property to any potential developer. And there is no evidence that anyone has any intention of doing so now or in the future.

Even assuming that this property could be developed economically, the Town of Coventry, among others, will have to improve the property for settlement -- for development, excuse me. This property is not along the road and will have to be subdivided into a house lots under a subdivision plan. This means that the Town must approve a subdivision on a former hazardous waste site listed on the National Priorities List. We find it hard to imagine that the Town, even assuming a total cleanup of the site, would approve such a plan. And we find it harder to believe that someone would knowingly purchase a home site on the Picillo site given its history.

In addition, there are new and stringent disclosure laws that have just taken effect in Rhode Island that would require full disclosure of the site to a potential buyer as a former hazardous waste site. We cannot imagine that properties could be sold for home sites in light of such required disclosure.

Finally, it is highly unlikely that a potential owner could obtain financing for a house on a former hazardous waste site. As you know, the FHA right now will not approve mortgage insurance for properties within two miles of the site. We cannot imagine that it would approve mortgage insurance for lots and houses on the site.

In short, the assumption that the site can be developed flies in the face of reality.

We think that the only realistic use of this site in the future is for open green space. With the proper institutional controls, by that I mean, such things as ordinances restricting the drilling of drinking water wells on the property, and similar kinds of restrictions, with these controls, the site can be restricted with no risk to the public health, welfare, and safety. The Picillo site, as it exists today, does not represent a real risk to public health and therefore does not warrant the expenditure of an additional $16 million for unrealistic, hypothetical future risks.

Thank you very much.

MR. BOYNTON: Thank you. Is there anyone else here tonight that would like to make a comment for the record?

MR. GUASTINI: I have a question.

MR. BOYNTON: No questions during the hearing. We can close the hearing and have questions afterwards.

MR. GUASTINI: Well, it's a question pertaining to the hearing, not a question about the dump. Can we rebut any of the --

MRS. SYKES: Any of the testimony.

MR. GUASTINI: Can we, can we clarify or change or modify or add?

MR. BOYNTON: You can -- to your own testimony?

MR. GUASTINI: Yeah.

MR. BOYNTON: If you would like to tonight, or in a comment, you could do that if you wanted to make another comment for the record.

MR. GUASTINI: Yeah, I just wondered in the passage I just heard that I'd just like to make a notation on that. There is no law, to my knowledge, in the State of Rhode Island pertaining to full disclosure of a contaminated site. That's only if it's a used home, not a new home or a new home site, which probably ought to be changed. And so, that ought to be clarified, I believe.

MR. BOYNTON: Thank you. Do you have any questions?

MS. KRASKO: No.

MR. BOYNTON: Do you have any questions?

MR. BALL: No.

MR. BOYNTON: If there are no further comments, I'd like to thank you all for participating tonight and remind you that the comment period will close on Thursday, July 29th for making written comments and, therefore, this hearing is closed. Now, if somebody has some questions, we'll be happy to entertain some questions off the record.

(HEARING CLOSED AT 8:15 P.M.)

C-E-R-T-I-F-I-C-A-T-E

I, CLAUDIA RATHBUN, RPR-CM, do hereby certify that the foregoing transcript is true, complete and accurate, taken at the time of the above-entitled matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 15th day of July, 1993.

Claudia Rathbun, Notary Public

CLAUDIA RATHBUN, NOTARY PUBLIC/RPR-CM

IN RE: PUBLIC HEARING -- PROPOSED PLAN FOR THE PICILLO FARM SUPERFUND SITE

Date: July 13, 1993

APPENDIX E

RECORD OF DECISION
PICILLO FARM SUPERFUND SITE

ADMINISTRATIVE RECORD INDEX